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

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

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

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

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

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

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

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

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

Message of the Bhagavad Gita

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

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

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

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

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

**Course on Organic Farming and Sustainability**

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

**Benefits of Indian Medicinal Systems**

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

**Traditional Fine Arts of India**

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

**Science of Worship in India**

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

### CHEMISTRY 3 0 0 3

**Unit 1**

**Chemical Bonding**

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

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**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' 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, Nernst equation and its application, reference electrodes- SHE, Ag/AgCl, Calomel.

**Photochemistry**

Photochemistry, laws of photochemistry - Stark-Einstein law, Beer-Lamberts law, quantum efficiency-determinant, photochemical processes - Jablonsky diagram, internal conversion, inter-system crossing, fluorescence, phosphorescence, chemiluminescence and photo sensitization, photo polymerization.
SYLLABUS
B. Tech. - Electrical & Electronics Engg.
2015 admissions onwards

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 Govariker, “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 - biodegradable 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
Chemical and biochemical degradation of polymers - degradation of metals and ceramics - calcification of biomaterials.

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

Unit 3
Biological testing of biomaterials: In vitro and in vivo assessment of tissue compatibility - evaluation of blood materials interaction - microscopy in biomaterials.

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

TEXTBOOK:
REFERENCES:

15CHY233 CATALYTIC CHEMISTRY 3 0 0 3

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

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

Unit 2
Catalysis by macromolecules, Phase transfer catalysis.

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

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

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


TEXTBOOKS:

REFERENCES:
15CHY235 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 - Polymides - 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:**

**REFERENCE:**

15CHY236 CHEMISTRY OF NANOMATERIALS 3 0 0 3

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

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.

Carbon nanostructures: Carbon Clusters: Fullerenes, structure, synthesis, alkali doped C60 - superconductivity in C60, applications of fullerenes. Carbon nanotubes: Classification, properties, synthesis, characterization, and potential applications, growth mechanism of carbon nanotubes.

Other Nanostructures: Quantum Dots: Preparation, properties and applications of Au, CdS and CdSe quantum dots, Fabrication and applications of conducting polymer nanotubes, TiO2 and metallic nanotubes.

Molecular Electronics and Machines: Molecular electronics: Working of Molecular and supramolecular switches, transistors and wires. Molecular machines: Working of Molecular motors, rotors, cars, elevators and valves.

**TEXTBOOKS:**

**REFERENCES:**

15CHY237 CHEMISTRY OF TOXICOLOGY 3 0 0 3

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

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

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


Future Considerations for Environmental and Human Health: Changes in toxicology - evaluation of future risk assessment - more fundamental aspects of toxicology -

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.
15CHY239  COMPUTATIONAL CHEMISTRY AND MOLECULAR MODELLING

**Unit 1**

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

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


Introduction to Quantum mechanics - Schrödinger 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 Schrödinger 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 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), nickel/carbon, nickel-silver oxide batteries; lithium primary cells - liquid cathode, solid cathode and polymer electrolyte types and lithium-ferrous sulphide cells (comparative account).

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

Unit 3

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

TEXTBOOKS:

REFERENCES:
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.
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.
15CHY247 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
**SYLLABI** 
**B. Tech. - Electrical & Electronics Engg.** 
2015 admissions onwards

**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: Tacticity, R/S system of nomenclature of central and axial molecules.

**Unit 2**
Atropisomerism - isomerism of biphenyls - alenes and spirananes - ansa compounds - Geometrical isomerism, E, Z Isomerism. Asymmetric synthesis.

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

**Unit 3**

**TEXTBOOKS:**

**REFERENCES:**

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

**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, polycetal, 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.
B. Tech. - Electrical & Electronics Engg. 2015 admissions onwards

Schools of Engineering Amrita Vishwa Vidyapeetham

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

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.


REFERENCES:

15CHY331 BATTERIES AND FUEL CELLS 3 0 0 3

Unit 1
Background Theory: Origin of potential - electrical double layer - reversible electrode potential - standard hydrogen electrode - emf series - measurement of potential - reference electrodes (calomel and silver/silver chloride) indicator and ion selective electrodes - Nernst equation - irreversible processes - kinetic treatment - Butler-Volmer equation - overpotential - 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.


15CSE100 COMPUTATIONAL THINKING AND PROBLEM SOLVING 3 0 2 4

Unit 1

Unit 2

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

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

B. Tech. - Electrical & Electronics Engg. 2015 admissions onwards

15CSE102  COMPUTER PROGRAMMING  3 0 0 3

Unit 1

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:

SYLLABI

B. Tech. - Electrical & Electronics Engg. 2015 admissions onwards

15CSE301  COMPUTER ORGANIZATION AND ARCHITECTURE  3 0 0 3

Unit 1

Unit 2

Unit 3
Memory Organization - Introduction, Cache Memory Organization, Main Memory & Interleaving, I/O Organization, Modern Processors, Parallel Processing.

TEXTBOOKS:

15CSE330  INFORMATION TECHNOLOGY ESSENTIALS  3 0 0 3

Unit 1
Computer hardware and system software concepts: Computer Architecture, system software, Operating Systems, Computer Networking, Programming fundamentals; problem solving concepts, modular approach through use of functions, error handling techniques, structured Programming and data structures, structured statements, string handling functions, sorting and searching, file handling functions, Object oriented concepts; Managing software complexity, concepts of object oriented programming, abstraction, class, object, member data, member methods, encapsulation, data hiding, inheritance, polymorphism, binding.

Unit 2
Analysis of algorithms; principles and tools for analysis of algorithms, analysis of popular algorithms, code tuning techniques, intractable problems, Relational Database management; basic RDBMS concepts, database design, SQL comments, embedded SQL concepts, OLTP concepts.
Unit 3
System development methodology; software engineering development life cycle (SDLC), quality concepts and quality system procedures, analysis and design methods, structured programming concepts and principles of coding, software testing. User interface design: process of user interface design, elements of user interface design, speech user interface, web design issues. Introduction of web architecture: basic architecture of web application, security, and performance of web based applications, architecture documents.

REFERENCES:

15CSE374 INTRODUCTION TO DATA STRUCTURES 3 0 0 3 AND ALGORITHMS

Unit 1

Unit 2

Unit 3

SYLLABI B. Tech. - Electrical & Electronics Engg. 2015 admissions onwards

TEXTBOOKS:

REFERENCES:

15CUL101 CULTURAL EDUCATION I 2 0 0 2

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

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

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

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

15CUL111 CULTURAL EDUCATION II 2 0 0 2

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

Unit 2
4. Who is a Wise Man?
5. A Ruler’s Dharma
6. The Story of King Shibi
Unit 3
7. Introduction to the Bhagavad Gita
8. Bhagavad Gita – Action without Desire

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

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

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

15CUL230 ACHIEVING EXCELLENCE IN LIFE - AN INDIAN PERSPECTIVE

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;

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)
7. Art of Man Making - Swami Chinmayananda published by Chinmaya Mission, Bombay
8. Will Power and its Development- Swami Budhananda published by Advaitha Ashram, Kolkatta
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, Kolkatta
15. Valmiki Ramayana – 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 indispensable 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 blueprint 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.
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 – Data flow modeling – Behavioral modeling – Switch level modeling.

Unit 2

Unit 3

TEXTBOOKS:

REFERENCES:
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 household 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

15EEE201 ANALOG ELECTRONIC CIRCUITS

Unit 1
BJT: Current - Voltage characteristics, BJT as an amplifier and as a switch, brief idea of dc analysis, Biasing circuits, small signal operation and models, single stage BJT amplifiers, BJT internal capacitances and high frequency model - Frequency response of CE amplifier. Emitter follower, Darlington-pair. Applications of Diodes: Design of Clipper, clamper circuits and Voltage doubler.

Unit 2
MOS Field Effect Transistors: Introduction, device structures and physical operations, i-v characteristics, brief analysis as an amplifier, and as a switch, Biasing, small signal operation and models, single stage MOS Amplifiers, MOSFET capacitances, frequency response of CS amplifiers.


Unit 3
Power amplifier: Analysis and Comparison of power amplifiers in Class A, B, AB, D.
Self and mutual inductance - coupled circuits – dot convention; Laplace representation of circuits; solutions using Laplace transforms.

Unit 3
Three phase Circuits: Three phase systems – balanced and unbalanced - Three phase 3-wire and 4-wire circuits – Star and Delta connected source and loads; Phasor Diagram analysis; Complex power.

Two-Port Networks: z, y, ABCD, abcd, hybrid and inverse hybrid parameters and relationships among different network parameters.

TEXTBOOK:

REFERENCES:

15EEE203 ELECTROMAGNETIC THEORY 3 1 0 4

Unit 1
Vectors and co-ordinate systems: Cartesian, cylindrical and spherical co-ordinate systems- scalar and vector fields.

Electric and Magnetic fields: line, surface and volume integrals - Coulomb’s law - Gauss’s law - Biot-Savart’s law - Ampere’s circuital law – applications - boundary conditions for electric and magnetic fields - Lorentz force equation.

Unit 2

Electric potential - Poisson’s and Laplace’s equations – capacitance - energy stored - magnetic scalar and vector potentials - magnetic circuits – inductance - energy stored-conductance.

Unit 3
Uniform plane waves and sinusoidally varying waves in time domain and in free space – polarization - power flow and Poynting vector - wave parameters - plane waves in material media - skin effect - reflection and transmission of uniform plane waves - normal and oblique incidence in conductor and dielectric interfaces.

TEXTBOOK:

REFERENCES:

15EEE211 ANALOG INTEGRATED CIRCUITS 3 0 0 3

Unit 1

Unit 2

Active Filters: Frequency response characteristics of major active filters, first and higher order low pass and high pass filters, all pass filters.

Unit 3
Oscillators and waveform generators: Requirements for oscillations, Op-amp RC oscillators, square wave generators, triangle and saw tooth waveform generators, astable and monostable operations, Voltage controlled oscillators - IC 555 timer, astable and monostable operation.

SYLLABI B. Tech. - Electrical & Electronics Engg. 2015 admissions onwards

TEXTBOOKS:

REFERENCES:

15EEE212 ELECTRICAL MACHINES I 3 1 0 4

Unit 1
Basics of electric and magnetic circuits, Principles of electromechanical energy conversion, Basic concepts of rotating machines, Dynamic Equation of Electromechanical Systems.

Unit 2
DC Machines: EMF and Torque, Circuit Model, Armature Reaction, Compensating Winding, Commutation, Methods of Excitation, Magnetization Characteristic, Self-excitation, Types – shunt, series, compound generators and Characteristics of DC Generators, Types and Characteristics of DC Motors, Starting of DC Motors, Speed Control of DC Motors, Braking of DC Motors, Efficiency and Testing, Permanent Magnet DC Machine Applications.

Unit 3

TEXTBOOK:

REFERENCES:

15EEE213 ELECTRICAL MEASUREMENTS 3 0 0 3

Unit 1
Qualities of measurements: Introduction, performance characteristics, errors in measurements, types of static error, sources of error, dynamic characteristics, statistical analysis, standards.

DC and AC bridges: Wheatstone bridge, Kelvin’s Bridge, inductance and capacitance measurements-Maxwell’s bridge, De-sauty’s bridge, Schering bridge, Wein bridge and Anderson bridge.


Unit 2
Instrument Transformers: Current Transformer, ratio and phase angle error, potential transformer.

Measurement of Power and Energy: EDM type wattmeter and Power factor meters, energy meter, calibration of meters.

Oscilloscope: Basic principle, CRT features, block diagram of oscilloscope, sampling, storage oscilloscopes, Digital storage oscilloscope, applications of CRO.

Transducers: Electrical transducers, selecting a transducers, resistive transducers, strain gauge, thermistor, RTD, inductive transducers, LVDT, capacitive transducer, piezo electric, photo voltaic cell, photo diode, photo transistors.

Unit 3
Digital Voltmeters: Ramp and dual slope integrating type DVM. Successive approximation type analog to digital conversion techniques, resolution and sensitivity.
of digital meters, digital frequency, time and phase measurements. Smart energy meter and net metering.

Instrumentation Systems: Block diagram, Signal conditioning systems, Instrumentation amplifier.

Data Acquisition and Data transmission: Objectives of DAS, single/multichannel DAS, digital to analog converters, data loggers, RTU, data transmission systems, advantages of digital transmission, time division multiplexing.

**TEXTBOOK:**

**REFERENCE:**

**15EEE281 ELECTRIC CIRCUITS LAB.** 0 0 2 1

Familiarization of Electrical measuring Instruments, Verification of network theorems, Series – Parallel circuits, Resonance Circuits, Separation of resistance and reactance, Power factor improvement, Three phase power measurement in balanced and unbalanced circuits. Characteristics of semiconductor devices, half wave and full wave rectifiers.

**15EEE282 ELECTRONIC CIRCUITS AND SIMULATION LAB. I** 0 0 2 1

Familiarization with simulation software - simulation of circuits using ORCAD.


**15EEE285 ELECTRICAL MACHINES LAB. I** 0 0 2 1

DC MACHINES
Performance characteristics, dc shunt, series and compound generators, study of starters, predetermination of efficiency of dc machines, load test, speed control of dc shunt and series motors.

**15EEE286 ELECTRICAL MEASUREMENTS LAB.** 0 0 2 1


**15EEE287 ELECTRONIC CIRCUITS AND SIMULATION LAB. II** 0 0 2 1

Simulation of Electric and Electronics circuits using MATLAB.

Experiments on analog electronic circuits - Schmitt trigger, Linear Voltage Regulator etc.

**15EEE301 CONTROL SYSTEMS** 3 0 0 3

**Unit 1**
Introduction to control systems, Mathematical models of physical systems, Block diagram, Signal flow graph, Feedback control system characteristics, reduction of parameter variations, control over system dynamics and disturbance signals, Use of software tools to analyze and design of control system, Performance of feedback control systems.

**Unit 2**

**Unit 3**
Stability in the Frequency domain, Nyquist criterion, Nichol's chart. Introduction to design of feedback systems, Lead-Lag compensation networks, PID controllers, Control system design case studies - Turbine governor, Robotic hand, ship steering.

**TEXTBOOK:**

**REFERENCES:**

15EEE302 DIGITAL SYSTEMS 3 0 0 3

Unit 1
Introduction to Logic Circuits, Logic Families: Variables and functions, inversion, Truth tables, Logic Gates and Networks, Boolean algebra, Synthesis using AND, OR, NOT, NAND and NOR gates, Design Examples, Introduction to Logic families such as ECL, TTL.


Number Representation and Arithmetic Circuits: Addition of unsigned Numbers, Signed numbers, Fast Adders.

Unit 2

Flip Flops, Registers, Counters: Basic Latch, Gated SR latch, master slave and edge triggered D flip-flops, T flip-flop, JK flip-flop, registers, counters, reset synchronization, other types of counters, Simple Control for MCB.

Synchronous Sequential Circuits: Basic Design Steps, State Assignment Problem, Mealy state Model, Serial Adders Example, State minimization, Sequential Circuit design for drive control.

Unit 3

TEXTBOOK:

REFERENCES:
signals, Basic operations on signals, Basic (Continuous / Discrete) signals - unit step, unit impulse, sinusoidal and complex exponential signals etc.


Unit 2


Unit 3
Sampling: Sampling theorem, Reconstruction of signal, Aliasing, Sampling of discrete time signals, Sampling of real time signals from PT, Reconstruction and Analysis of such signals, MATLAB exercises for generation of signals.

z-Transform: Definition, ROC, Inverse z-Transform, Properties, Transform analysis of LTI Systems.

Interrelationship amongst different representation and Transforms.

TEXTBOOK:

REFERENCES:

Unit 1
Discrete Fourier Transforms: Review of main concepts form Signals and Systems course- Frequency domain sampling and reconstruction of discrete time signals - The DFT as a Linear Transformation - Relationship of the DFT to other Transforms - Properties of DFT - Linear Filtering methods based on DFT - Efficient computation of the DFT-FFT Algorithms. Efficient computation of DFT of Two real sequences - efficient computation of the DFT of a 2N- Point Real sequences - Use of FFT in Linear filtering and correlation.

Unit 2
Digital Filters: Introduction, Specifications of practical filters.


b) IIR Filters: Design from Analog filters - Design by Approximation of Derivatives, Impulse Invariance and Bilinear Transformation. IIR filters for extraction of fundamental frequency.

c) Characteristics of commonly used Analog filters, Frequency transformations for analog and digital filters.

Unit 3
Digital Filters Realizations: Structures for the realization of Discrete time system - Structures for FIR systems - direct form structures, cascade form structures, frequency sampling structures, Lattice structures. Structures for IIR systems - Direct form structures, Cascade form structures, Parallel form structures and Analysis of Finite Word Length Effect and limit cycle oscillations in recursive systems.

Applications of DSP:
Multirate Digital Signal Processing, Sampling rate conversion, Decimation and interpolation, Introduction to QMFs.

Linear predictive coding, forward linear prediction, Levinson-Durbin algorithm, signal synthesis, Application in power systems.

TEXTBOOK:
SYLLABI B. Tech. - Electrical & Electronics Engg. 2015 admissions onwards

REFERENCES:

15EEE312 ELECTRICAL ENERGY SYSTEMS I 3 0 0 3

Unit 1
Structure of electric power system. General layout of power system. Methods of electric power generation - Grid systems advantages - EHV AC and HVDC transmission - Variable load on power stations - Load curve and load duration curve - Power factor improvement – Tariff-Transmission line parameters - Skin effect and proximity effect - Inductance of single phase and three phase transmission line single and double circuit lines - symmetrical and unsymmetrical spacing.

Unit 2
Capacitance of three phase transmission line - single and double circuit lines - symmetrical and unsymmetrical spacing - bundled conductors - Performance of transmission lines - Efficiency and regulation - Short, medium and long lines - ABCD constants - Ferranti effect - surge impedance - Real and reactive power flow in transmission lines - shunt and series compensation - corona loss. Cables - Construction and characteristics of single and three core cables - Insulation resistance and capacitance of a single core cable, most economical conductor size - Grading of cables.

Unit 3
Insulators – types - voltage distribution in suspension type insulators - string efficiency - Grading of insulators - Mechanical design of transmission lines - sag and span - supports at same level and different levels - sag template and stringing chart – Substations - types, general layout, Neutral grounding, Distribution systems: comparison of distribution systems – radial and ring – two wire dc, ac single phase and three phase systems – current and voltage calculations in distributors with concentrated and distributed loads.

TEXTBOOK:

REFERENCES:

SYLLABI B. Tech. - Electrical & Electronics Engg. 2015 admissions onwards


15EEE313 POWER ELECTRONICS 3 0 0 3

Unit 1

Unit 2

Unit 3
Inverters: Applications – Half bridge inverter – Full bridge inverter with square wave and single pulse width modulated operations – Sine PWM scheme: Single phase full bridge with unipolar voltage switching, performance parameters, AC and DC side currents - Sinusoidal pulse width modulation for three phase inverters, Expressions for phase to neutral voltages – Current regulated modulation - Rectifier mode of operation of inverters - AC side filters - Schemes to generate triangular carrier and sinusoidal reference – Introduction to Space vector pulse width modulation – Multilevel inverter and UPS.

TEXTBOOKS:

REFERENCES:
1. Muhammad H. Rashid, "Power electronics – circuits, devices and applications" Third edition,
SYLLABI  B. Tech. - Electrical & Electronics Engg.  2015 admissions onwards

15EEE314  MICROCONTROLLER AND APPLICATIONS  3 0 0 3

Unit 1 Introduction to Microprocessors
Registers - File registers - Memory Organization - Tristate logic – Buses - Memory
Address register – Read/Write operations. ROM, RAM, PROM, EPROM, E2PROM.
Introduction to elementary processor – Organization - Data Transfer Unit
( DTU) operation - Enhanced Data Transfer Unit (EDTU) – opcode - machine language
- assembly language - pipeline and system clock. Architecture of 8085 – Addressing
modes - Data transfer, data processing and program flow control instructions -
Simple assembly language programs.

Unit 2 Introduction to Microcontrollers
PIC16F877 Architecture - Program and Data memory organization - Special Function
Registers - Addressing modes, Instruction set. MPLAB Integrated Development
Environment – Introduction to Assembly language and Embedded C programming –

Unit 3 PIC Peripherals
Timers/Counters - Watchdog Timer – Capture/Compare/PWM (CCP) - Analog to
Digital Converter (ADC) – EEPROM - Serial Communication – USART - Development
of Application Programs and interfacing - LED, LCD, Keyboard, DC and Stepper

TEXTBOOK:

REFERENCES:
1. Martin R. Bates, “Programming 8 bit PIC Microcontrollers in C with Interactive Hardware

15EEE330  ADVANCED CONTROL SYSTEMS  3 0 0 3

Unit 1
State Variable Analysis and Design: Introduction, concept of state, state variables
and state model, state modeling of linear systems, linearization of state equations.
State space representation using physical variables, phase variables & canonical
variables.

SYLLABI  B. Tech. - Electrical & Electronics Engg.  2015 admissions onwards

15EEE314  MICROCONTROLLER AND APPLICATIONS  3 0 0 3

Unit 1  Derivation of transfer function from state model, diagolization, Eigen values, Eigen
vectors, generalized Eigen vectors. Solution of state equation, state transition
matrix and its properties, computation using Laplace transformation, power series
method, Cayley-Hamilton method, concept of controllability & observability, methods
of determining the same.

Unit 2
Pole Placement Techniques: stability improvements by state feedback, necessary
& sufficient conditions for arbitrary pole placement, state regulator design, and
design of state observer, Controllers- P, PI, PID. Non-linear systems: Introduction,
behavior of non-linear system, common physical non-linearity-saturation, friction,
backlash, dead zone, relay, multi-variable non-linearity.

Phase plane method, singular points, stability of nonlinear system, limit cycles,
construction of phase trajectories. Liapunov stability criteria.

TEXTBOOK:

REFERENCES:

15EEE331  ADVANCED MICROCONTROLLERS  3 0 0 3
(Prerequisite: 15EEE314 – Microcontroller and Applications)

Unit 1
dsPIC 30F series: Introduction to 16 bit microcontrollers - dsPIC 30F – CPU, Data
memory, Program Memory - Instruction set - Programming in Assembly and C-
Interrupt Structure.

Unit 2
Peripherals of dsPIC 30F: I/O Ports, Timers, Input Capture, Output Compare, Motor
Control PWM, QEI.10 bit A/D Converter, UART, CAN Unit, Application Development.

Unit 3
MSP430 and peripherals: MSP430F2274 - MSP430X22X2 device pin out, DA Package,
Functional Block diagram description, Inputs, Outputs, Timers, ADC. Application
Development.
15EEE332 COMMUNICATION ENGINEERING 3 0 0 3

Unit 1
Introduction: Communication, Communication systems - Block diagram description of Analog and Digital Systems; Review of Fourier Representation, Waveform Spectra, Bandwidth; Noise - Sources of Noise and their Manifestations into Communication Systems, Noise Figure, Significance of SNR Considerations in Communication Systems.

Modulation: Necessity, Introduction to Analog and Digital Modulation.

Unit 2


Pulse Communication: Introduction, PWM, PPM, PCM.

Unit 3
Introduction to Digital Communications: Fundamentals of Data Communication Systems, FSK, PSK and QAM.

Applications in Power Systems: Power line carrier, Elements of carrier channel, transmitter, line traps, carrier communication, carrier relaying, power system communication, telemetry, telecontrol.

TEXTBOOKS:

15EEE333 DEREGULATED POWER SYSTEM 3 0 0 3

Unit 1

Unit 2
Electricity Market: Competitive market - supply and demand functions, market equilibrium, types of market. Market power and mitigation, imperfect market. Transmission open access: transmission pricing, pricing scheme, concept of distribution factors – Location based Marginal Pricing LMPs.

Unit 3

TEXTBOOKS:
SYLLABI  B. Tech. - Electrical & Electronics Engg.  2015 admissions onwards

15EEE334  DESIGN OF ELECTRICAL APPARATUS  3 0 0 3
(Prererequisite: 15EEE303 Electrical Machines II)

Unit 1
Introduction: Design factors, Limitations in design, Thermal design aspects, standard specification.

DC machines: Specific loadings, output equation, Design of main dimensions. Design of Armature windings, Design of field system, Design of interpole and commutator.

Transformers: Output equation-volt per turn, main dimensions for three phase and single phase transformers, window dimensions & Yoke design and coil design. Design of tank with tubes.

Unit 2
Induction motor: Specific loadings, output equation, main dimensions, stator design, number of slots, shape and area of slots, rotor design for squirrel cage and slip ring types.

Synchronous machines: Output equation, main dimensions for salient pole and cylindrical rotor alternators, stator design, rotor, pole design for salient pole generators, pole winding calculations, design of cylindrical rotor.

Unit 3
Optimization techniques as applied to design of electrical machines; Study of cooling systems. Computer aided design: Advantage of computer aided design. Flow chart for computer aided design. Standard specifications: Indian standard specifications for copper conductor, power transformers and induction motor. Recent developments in core and insulation materials used in electrical machines;

TEXTBOOK:

REFERENCES:

SYLLABI  B. Tech. - Electrical & Electronics Engg.  2015 admissions onwards

15EEE335  DESIGN OF ELECTRICAL SYSTEMS  3 0 0 3

Unit 1
General Introduction, Gathering specific data, Adoption of design - parameters for the particular project, Selection of basic design philosophies, Detailing the electrical System, Preparation of as - erected drawings and design - manuals.

Maximum-demand – MD estimation, Demand factors for HV motors, Calculation of MD on the MCCs, MD, estimation for an entire load-centre substation and MSS, Statutory Inspector's approach to MD estimation.

Unit 2
Sizing of transformer capacity on basis of MD calculations, Consideration and constraints in the sizing of transformers CB ratings, Split bus arrangements, sizing of power-transformer capacity, Sizing of distribution transformer, capacity at ICSS, Techno-economic studies on selection of transformer sizes, sizing the transformer to meet HV motor, starts and voltage dips.

Short-circuit calculations, SC analysis, standards for the SC analysis, Passive and dynamic reactance to be considered for SC analysis, Reactance multipliers for first cycle diagram for SC analysis of 415V system. The computation of AC components of fault currents, Determination of DC component of the fault current and the total fault current, IEC equations, The impact of CB status on fault levels.

Unit 3
Selection of cable sizes, Continuous rating of cables (Standard rating and net-rating), Thermal ampacity of cables, Short time short circuit rating of cables, Mechanical withstand of short circuit forces, Techno economic consideration in selection of cables, SC-withstand capacity of 1.1 kV cable, Voltage drops in 415V motor, feeders and voltage drop based ampacity. The use of copper cables for motors of rating less than 7.5 kW.

TEXTBOOK:

REFERENCES:
1. TNEB Hand book
2. IEEE Hand book
15EEE336 DIGITAL CONTROL SYSTEMS 3 0 0 3

(Prerequisite: 15EEE301 Control Systems)

Unit 1
Sampled data - Signal reconstruction, Discrete transfer functions, discrete system stability frequency response analysis, models for sampled continuous systems, state space analysis of discrete time systems, errors and non-linearity due to quantization in ADC.

Unit 2
Discrete time sensitivity functions, internal model principle for digital control, design by pole assignment. System identification, RLS method, minimum variance control, self-tuning methods, dead beat control, state estimation, Luenberger observer.

Unit 3
Kalman filter DSP based digital control SCADA, Architecture and design. Introduction to control system tool box. Design of state variables feedback systems, controllability and observability.

TEXTBOOK:

REFERENCES:
2. Web resources
3. Selected papers from journals

15EEE337 DIGITAL IMAGE PROCESSING 3 0 0 3

Unit 1

Image enhancement in Spatial domain: Introduction to image enhancement, basic grey level transforms, Histogram, Histogram-processing equalization, Matching & colour histogram, Enhancement using arithmetic/logic operations, spatial filtering, Smoothing spatial filtering, Sharpening spatial filtering.

Unit 2
Image transform: Fourier transform, SHFT, DFT, FFT, DCT, Hadamard Transform, Wavelets transform (CWT, DWT), KLT, SVD, Applications.

TEXTBOOK:

REFERENCES:
2. R. C. Gonzalez, R. E. Wood “Digital image processing using MATLAB”, Pearson Education, 2004

15EEE338 DIGITAL SIGNAL PROCESSORS 3 0 0 3

Unit 1

Unit 2
Blackfin Processor: Blackfin 5xx DSP – Architecture-Instruction set – Addressing modes.

Unit 3

TEXTBOOK:
REFERENCES:

15EEE339 ELECTRICAL SAFETY 3 0 0 3

Unit 1

Unit 2

Unit 3
Earth fault protection - earthing standards - FRLS insulation – grounding - equipment grounding earth leakage circuit breaker (ELCB) - Role of environment in selection - safety aspects in application - protection and interlock self-diagnostic features and fail safe concepts - surge withstand capability test requirements - Classification of hazardous zones - intrinsically safe and explosion proof electrical apparatus - increase safe equipment - their selection for different zones - temperature classification - grouping of gases - use of barriers and isolators -equipment certifying agencies.

REFERENCES:

15EEE340 ELECTROMAGNETIC COMPATIBILITY 3 0 0 3
(Pre-requisite: 15EEE203 Electromagnetic Theory)

Unit 1
Review of electromagnetic principles: Maxwell’s equations, plane waves, transmission lines.

Introduction to Finite Element method, Introduction to electromagnetic compatibility, sources of EMI, Transient EMI, Basic definitions of EMC.

Unit 2
EMI Coupling Principles, Conducted, Radiated and Transient Coupling, Common Impedance Ground Coupling, Crosstalk, EMI Control Techniques - Shielding, Grounding, Bonding.

Unit 3
Radiated Common Mode and Ground Loop Coupling, EMI Test Instruments, Various Test Methods and Calibration Procedures, Isolation Transformer, Transient Suppressors, Cable Routing, Signal Control, Component Selection and Mounting Units, EMI Specifications, Civilian & Military Standards.

TEXTBOOK:

REFERENCES:
4. Rajeev Thottappillil, Course Material on electromagnetic Compatibility, KTH Royal Institute of Technology, Stockholm.

15EEE341 EMBEDDED SYSTEMS DESIGN 3 0 0 3
(Prerequisite: 15EEE314 Microcontroller and Applications)

Unit 1

Unit 2

Unit 3

TEXT / REFERENCES:
5. NXP LPC 17xx datasheet. (www.nxp.com)

15EEE342 FLEXIBLE AC TRANSMISSION SYSTEMS 3 0 0 3

Unit 1
FACTS concept and General system considerations - Transmission Interconnections, Flow of power in an AC system, Loading capability, Power flow and dynamic stability considerations of a transmission interconnection, basic types of FACTS controllers, IEEE definitions, FACTS devices in India and abroad.

Shunt compensation and shunt FACTS devices - Concept of shunt compensation, objectives of shunt compensation, variable impedance type shunt compensators (TCR, TSC, FC-TCR, TSC-TCR) - circuit diagram, principle of operation, working, waveforms / characteristics.

Unit 2
Switched converter type shunt compensator (STATCOM) - circuit diagram, principle of operation, working, waveforms / characteristics, control schemes for shunt compensators.

Series compensation and Series FACTS devices - Concept of series compensation, objectives of series compensation, variable impedance type series compensators (GCSC, TSSC, TCSC), Switching converter type series compensators - circuit diagram, principle of operation, working, waveforms/characteristics, control schemes for series compensators.

REFERENCES:

15EEE343 FUNDAMENTALS OF SOFT COMPUTING 3 0 0 3

Unit 1

Unit 2

Unit 3

TEXTBOOKS:
15EEE344  HIGH VOLTAGE ENGINEERING  3 0 0 3

Unit 1
Introduction: different types of dielectrics, uniform and non-uniform electric field, electric field in some geometric boundaries.

Conduction and breakdown in gases: Collision process, ionization process, Townsend’s theory, streamer theory, Pashen’s law, breakdown in non-uniform fields and corona discharges - Vacuum insulation.

Conduction and breakdown in liquid dielectrics: Classification of liquid dielectrics, breakdown in liquid dielectric. Different types of solid dielectric materials - breakdown in solid dielectrics - field configuration in the presence of voids.

Breakdown in composite dielectric.

Unit 2
Generation of high voltages - ac voltages, dc voltages, impulse voltages. Generation of impulse currents.

Measurement of high voltages and currents - High DC, AC and impulse voltages, Direct, Alternating and Impulse currents.

Unit 3
Non-destructive insulation test techniques, measurement of insulation resistance under dc voltage, measurement of loss angle and capacitance, partial discharge measurement.

Testing of high voltage apparatus based in International and Indian standards - non-destructive testing - testing of insulators – bushings – cables - isolators and circuit breakers – transformers - surge arresters.

TEXTBOOK:

REFERENCES:

15EEE345  ILLUMINATION ENGINEERING  3 0 0 3

Unit 1
Radiant energy and visible spectrum, energy conversion to light, colour, eye and vision; different entities of illuminating systems.

Light sources: daylight, incandescent, electric discharge, fluorescent, arc lamps and lasers; Energy efficient lamps; Luminaries, wiring, switching and control circuits.

Unit 2
Laws of illumination; Illumination from point, line and surface sources. Photometry and spectrophotometry; photocells. Environment and glare. General illumination design, Illumination levels, loss factors, lamp selection and maintenance.

Interior lighting – industrial, residential, office departmental stores, indoor stadium, theater and hospitals.

Unit 3
Exterior lighting - flood, street, aviation and transport lighting, lighting for displays and signaling - neon signs, LED-LCD displays beacons and lighting for surveillance.

Energy Conservation codes for lighting; lighting controls – daylight sensors and occupancy sensors; controller design.

TEXTBOOK:

REFERENCES:
15EEE346  INDUSTRIAL ELECTRONICS  3 0 0 3
(Prerequisite: 15EEE201 Analog Electronic Circuits)

Unit 1
Input transducers and Sensors: Position, displacement, velocity, acceleration, force, flow pressure, level temperature, humidity. Telemetry 0-10V and 4-20mA systems.

Thermocouples, RTD, LVDT, Servo-pots, strain gauges, P, PI, PID converters, average to rms converters.

Actuators, DC and AC stepper motors, Dosing equipment weigh feeders, dosing pumps, extrusion – bulk and film electronic components. Medical equipments.

Unit 2
Programmable controllers and PLCs. Rotory encoders, digipots.

Automation: Transfer machines, robotics basics, Application of PLCs.

Industrial heating: Arc furnace, high frequency heating, High frequency source for induction heating, dielectric heating and microwave heating, Ultrasonic- Generation and applications.

Unit 3
High voltage equipments: voltage multipliers, electrostatic charging, precipitation, and painting. Plasma torches, particle accelerators electron beam welding, ion implantation, thrusters and gas lasers. Case studies of industrial applications.

TEXTBOOK:

REFERENCES:

15EEE347  INTRODUCTION TO COMPUTER NETWORKS  3 0 0 3

Unit 1
Introduction to computer networks:
Uses of Computer Networks, Network Hardware, Network Software, Network Reference Models, Example Networks - The Internet, Connection-Oriented Networks: X.25, Frame Relay, ATM, Ethernet,

TEXTBOOK:

REFERENCES:

15EEE348  MANAGEMENT OF POWER DISTRIBUTION  3 0 0 3

Unit 1
Cogeneration, Wheeling and banking, Power pooling and trading, Energy storage schemes. Distribution reform, Quality of supply and Benchmarking.

Unit 2


Unit 3
Distribution in deregulated market, Micro Economics in distributed generation, Micro grid, Distribution automation, SCADA, Smart Meters and its applications.

TEXTBOOKS / REFERENCES:
15EEE351  
**POWER CONVERTERS  3 0 0 3**  
(Prerequisite: 15EEE313 Power Electronics)

**Unit 1**
DC-DC Switched Mode Converters: Operating principles, Steady state analysis for continuous and discontinuous current operations, Performance calculations of Buck converter, Boost converter, Buck-boost converter, Cuk converter & Full bridge converter - Comparison of DC-DC converters.

**Unit 2**
Switched Mode DC Power Supplies: Overview of linear and switched mode power supplies, Other types of converters: Flyback converter, Forward converter, Push pull converter, Half bridge converter & Full bridge converter.

**Unit 3**
Design of snubbers, drive circuits, magnetics, Voltage feed forward - PWM control and current mode control, Feedback compensators, unity power factor rectifiers.

Introduction to resonant converters - classification of resonant converters - Basic resonant circuit concepts. Zero current and Zero voltage switching.

Simulation of DC-DC converters and complete SMPS systems.

**TEXTBOOK:**

**REFERENCES:**

15EEE352  
**POWER PLANT INSTRUMENTATION  3 0 0 3**

**Unit 1**
Introduction to Unit operation and Unit Process: Material and Energy Balance. Significance of Instrumentation and layout of thermal, hydroelectric, nuclear, gas turbine, solar, wind Power plants.

Instrumentation and Equipments of Various Unit Operations: Evaporation, Distillation, Leaching, Gas Absorption, Heat exchangers, Humidification and Dehumidification, Drying, Size Reduction, Crystallization, Mixing.

**TEXTBOOKS:**

**REFERENCE:**

15EEE353  
**POWER QUALITY  3 0 0 3**

**Unit 1**
Introduction to power quality concepts: Need for PQ improvement, causes & effects - effects on utility side, and effects on customer side, Terms & definitions of power quality indices, PQ standards - IEEE / IEC.

**Unit 2**
Harmonic Analysis: Major sources, Minor sources of harmonics, Measurement and analysis techniques for harmonics.

**Unit 3**
Power Quality Improvement: Conventional compensation & FACTS compensation, Types of FACTS controllers, Control of FACTS devices, Tuned filters, Design of filters, Active filters- review of active filters, basic functioning of shunt & series active filters, Control of active filters, Hybrid filters - review of hybrid filters, working.

Improved power quality converters (IPQC) - review of IPQCs. Custom power-park, Custom power devices.
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**TEXTBOOK:**

**REFERENCES:**

15EEE354  POWER SYSTEM MANAGEMENT  3 0 0 3

**Unit 1**

**Unit 2**

**Unit 3**

**TEXTBOOKS / REFERENCES:**

15EEE355  POWER SYSTEM PROTECTION AND SWITCHGEAR  3 0 0 3

**Unit 1**

**TEXTBOOKS:**

**REFERENCES:**
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15EEE356  
POWER SYSTEM STABILITY  
3 0 0 3

Unit 1  

Unit 2  

Unit 3  

Methods of improving stability - Transient stability enhancement - Small signal stability enhancement.

TEXTBOOK:  

REFERENCES:  

15EEE357  
POWER SYSTEMS OPERATION, CONTROL AND STABILITY  
3 0 0 3

(Prerequisite: 15EEE402 Electrical Energy Systems II)

Unit 1  
Power system operation – state transition and control – data acquisition, state estimation, security assessment and security enhancement – functions of control centers – system load variations – system load characteristics – Real and Reactive power flows and control.

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15EEE358  
PROCESS CONTROL AND INSTRUMENTATION  
3 0 0 3

Unit 2  
Basic P-f and Q-V loops, Load frequency control - modeling, analysis and control of single and multi-area – tie line with frequency bias control. Need for Automatic Voltage regulator – Modeling – static and dynamic analysis – Reactive power-voltage control devices. Economic load dispatch with and without losses – solution by iteration method (no derivation of loss coefficient) – Base point and participation factor – Economic controller added to LFC.

Unit 3  

TEXTBOOK:  

REFERENCES:  
Basic control actions, characteristics of ON-OFF, P, I and D control, PI, PD and PID control modes. Response of controllers for different types of test inputs, pneumatic and electronic controllers to realize various control actions, selection of control mode for different processes, optimum controller settings, tuning of controllers - process reaction curve method, continuous cycling method, damped oscillation method, Ziegler Nichols methods.

1/4 decay ratio, feed forward control, ratio control, cascade control, averaging control, multivariable control, hybrid control, expert systems.

Distillation column, control of top and bottom product compositions, reflux ratios, control of chemical reactors, control of heat exchanger, steam boiler, drum level control and combustion control, P&I diagrams.

Unit 3

Process Automation - Role of digital computer system in process control, Distributed instrumentation and control system - PLC, DCS, SCADA.

TEXTBOOK:
Stephanopoulos. G. “Chemical Process Control”, Prentice Hall of India, New Delhi, 1984

REFERENCES:
1. Dale E. Seborg, Thomas F. Edgar, Duncan A. Mellichamp, “Process Dynamics and Control”, Wiley Dreamtech India (P) Ltd, New Delhi, 2004

15EEE359 RENEWABLE ENERGY AND ENERGY CONSERVATION 3 0 0 3

Unit 1

Solar Energy:
Solar radiation, its measurements and analysis. Solar angles, day length, angle of incidence on tilted surface, Sunpath diagrams, Shadow determination. Extraterrestial characteristics, Effect of earth atmosphere, measurement & estimation on horizontal and tilted surfaces.

Principle of Photovoltaic Conversion - Dark and illumination characteristics, Figure of merits of solar cell, Efficiency limits, Variation of efficiency with band-gap and temperature. Equivalent circuit. Crystalline and thin-film cells. Multi-junction cells. Concentrated PV cell.

Module, panel and array – series and parallel connections. Maximum power point tracking. SPV applications - battery charging, pumping and lighting, power plant. PV system design.

Small Hydro Power - Resource assessment, Environmental restrictions, SHP schemes – types, construction and equipment selection, Load frequency control.

Unit 2

Aerodynamic principles - lift and drag forces. Power coefficient and Betz limit. Types and characteristics of wind turbines.


Development of windfarms, site selection, wake effect, performance indices.

Small WEGs – stand-alone and hybrid systems.

Unit 3
Biomass energy – Gasifiers and dual fuel engines; Ocean-thermal energy conversion; Tidal energy conversion; Wave energy conversion; Geothermal energy conversion; MHD; Hydrogen and fuel cells.

Energy Conservation in electrical equipment: Energy efficient lighting – luminous efficiency of lamps, efficient lamps, energy conservation codes and lighting design. Energy conservation in motors – estimation of operating efficiency of industrial motors, right selection of motor ratings, energy efficient motors; auto-stop control, delta-star operation, voltage control; Energy conservation in variable speed operation
of pumps and fans – demerits of mechanical resistance control, advantages of
variable speed drives, specific energy consumption, system design using VSD.

**TEXTBOOKS / REFERENCES:**

**15EEE360 SMART GRID 3 0 0 3**

**Unit 1**
Concept of Smart Grid, Definitions, Need and Functions of Smart Grid, Opportunities & Barriers of Smart Grid. Today’s grid versus smart grid.

Present development & International policies in Smart Grid. Smart Grid – Overview and stakeholders.

**Unit 2**
Smart Grid Technologies: Communication Technologies for Smart Grid, Interoperability and connectivity,


**Unit 3**
Renewable Energy and Storage Technologies – Distributed generation and storage. Interfacing of RE generation systems and energy storage systems on Smart Grid.

REFERENCES:

TEXTBOOK:

REFERENCES:

15EEE362 UTILISATION OF ELECTRIC ENERGY 3 0 0 3

Unit 1
Electric Lighting - Definition of terms; laws of illumination; Luminaries; Lighting requirements; Illumination levels; lamp selection and maintenance; Lighting schemes, calculations & design – Interior lighting – industrial, Factory, residential lighting; Exterior lighting - Flood, street lighting, lighting for displays and signaling - neon signs, LED-LCD displays beacons and lighting for surveillance; Energy Conservation codes for lighting; lighting controls – daylight sensors and occupancy sensors; controller design.

Unit 2
Electric Drives - Selection of motors in various applications; Electric drive systems in various industries; speed control of motors, variable speed drives, Specifications of commonly used motors. Energy efficient drives.

Space conditioning systems - Heating, Ventilation, and Air Conditioning (HVAC) systems: Principle of air conditioning, vapour pressure, refrigeration cycle, eco-friendly refrigerants; Electrical Circuits used in Refrigeration and Air Conditioning and Water Coolers;


Unit 3
Electric Heating – Comparison with other heating methods; Resistance heating, Induction heating, Arc furnace, Dielectric heating; Electric welding – types, equipment and modern techniques.

Electric Traction - Traction systems; Speed-time curves and mechanics of train movement; Traction motors; Control of motors; Electric braking methods; Regeneration. Electric Vehicles – Types of electric vehicles and hybrid vehicles; motors and batteries for EV; Drive systems for electric traction.

TEXTBOOK:

REFERENCES:

15EEE381 DIGITAL SYSTEMS AND SIGNALS LAB. 0 0 2 1

Half adder and full adder implementation - Boolean Equation Implementation - Multiplexer and Demultiplexer implementation - Asynchronous and Synchronous counters Implementation using D, T and JK flip flops.

Generation of signals - ramp, sine, exponential, etc. using MATLAB; Discrete Linear Convolution implementation; Fourier transform and Fourier Series Implementations; DFT Implementation; Power signal analysis using FT/DFT.

15EEE382 ELECTRICAL MACHINES LAB. II 0 0 2 1

No load and load characteristics of three phase alternators - Regulation by different methods and efficiency calculation - no load, blocked rotor and load tests on single phase and three phase induction machines - Characteristics of synchronous induction motor and induction generator -Speed control and starting methods of AC machines - synchronization to infinite bus bars - V curves and inverted V curves of synchronous motor.

15EEE385 DSP AND MICROCONTROLLER LAB. 0 0 2 1

Simple logic programs to understand MPLAB; LED Blinking Program, Timer 0,1 and Timer 2 Programming; key board Interfacing; ADC-PWM interfacing with dc motor using PROTEUS.

DFT analysis’ Circular convolution using m file; Filter Design using FDA tool and Testing; SIMULINK analysis of harmonic signal.
15EEE386  POWER ELECTRONICS LAB.  0 0 2 1

SCR characteristics, MOSFET switching characteristics, AC phase control using SCR, Triac and Diac, Single phase half controlled bridge converter, UJT Relaxation Oscillator for SCR triggering application, Series Inverter, Single phase transistorized inverter, Speed control of DC Motor using Chopper Drive, Simulation of full bridge converter, single phase single pulse width modulated MOSFET inverter, sinusoidal unipolar pulse width modulation.

15EEE387  OPEN LAB.  0 1 2 2

This is a hands-on sections for the students. By the sixth semester, the students are adept in different core streams like Power Electronics, Power Systems, Electrical machines, Energy systems, Digital Signal Processing etc. The students will apply their acquired knowledge and develop an application related to one or more of the core areas and implement a pragmatic setup, justifying the application.

15EEE390 / 15EEE490  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.

15EEE401  ELECTRIC DRIVES AND CONTROL  3 1 0 4
(Pre-requisite: 15EEE313 Power Electronics)

Unit 1

DC motor drives: Basic characteristics, Operating modes, Single phase and three phase controlled rectifier fed DC drives, Dual converters drives, Chopper drives, Rheostatic and regenerative braking, effects of changes in supply voltage and load torque, closed loop control schemes.

Unit 2

Unit 3
Synchronous motors: Speed torque characteristics and torque angle characteristics. Fixed and variable frequency operation modes, Self-control modes.

Special machines: Brushless DC motor, Switched Reluctance Motor, introduction to the relevant converter circuits.

TEXTBOOK:

REFERENCES:

15EEE402  ELECTRICAL ENERGY SYSTEMS II  3 1 0 4
(Pre-requisite: 15EEE312 Electrical Energy Systems I)

Unit 1

Unit 2

Unit 3
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TEXTBOOK:

REFERENCES:

15EEE481 DRIVES AND CONTROLS LAB. 0 0 2 1
DC Machine modeling and simulation; Phase-controlled DC Motor Drives; DC/DC Chopper Controlled DC Motor Drives; Induction Motor Drives; Stepper motor drive; Servo drive.

15EEE482 POWER SYSTEMS LAB. 0 0 2 1
Development of software packages to calculate line parameters, Load flow analysis, Short circuit analysis, Transient stability analysis, Power system transients, Load frequency dynamics and Economic dispatch.

15EEE495 PROJECT PHASE I 2 cr
Each student is to do a project and prepare a seminar paper related to Electrical Engineering in an approved format and present it at the end of the semester.

15EEE499 PROJECT PHASE II 10 cr
The project shall be focused on the synthesis of the knowledge gained over the past seven semesters, by taking up a work of relevance to Electrical and Electronics Engineering covering Design / Development / Realization / Application / Performance Analysis / State-of-the-art Technology.

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 ruminant on human values.

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

Unit 2
Writing: Prewriting techniques - Kinds of paragraphs - basics of continuous writing.

Grammar & Usage: Parts of Speech, Tenses, Concord, Phrasal Verbs, Modal Auxiliaries, Modifiers (Workbook) - Any two pieces from the text.

Unit 3
Practical sessions (Listening & Speaking): Introduction to English pronunciation including minimal pairs and word stress – differences between British and American English – Listening comprehension and Note-taking - Any two pieces from the text.

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

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

Poems:
   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

1. 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
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:
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 Indianess.

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

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

TEXTBOOKS / REFERENCES:

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

Unit 1 Population - Identity
How to introduce yourself (name, age, address, profession, nationality); Numbers; How to ask questions;
Grammar – Pronouns - subjects; Regular verbs of 1st group (er) in the present; Être (to be) and avoir (to have) in the present; Interrogative sentence; Gender of adjectives.

Unit 2 The suburbs - At the train station
Introduce someone; Buy a train ticket or a cinema ticket; Ask for information; Official time; Ask for a price; The city (church, town hall, post office…)
Grammar – Pronouns - subjects (continuation); Gender of adjectives (continuation); Plural of nouns and adjectives; Definite and indefinite articles; Interrogative adjectives; I would like (Je voudrais).

Unit 3 Paris and the districts - Looking for a room
Locate a room and indicate the way; Make an appointment; Give a price; Ordinal numbers; Usual time; Ask for the time.
Grammar - Imperative mode; Contracted articles (au, du, des); negation.

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

Vocabulary: Food items

**Unit 3**
Numbers above 1000. Orientation in Shopping plazas: asking the price, where do I find what, saying the opinion.

Grammar: Accusative – definite article. Adjectives and plural forms.

Vocabulary: Furniture and currencies.

**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.

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

To have an elementary exposure to German language; specifically
1. to have some ability to understand simple spoken German, and to be able to speak it so as to be able to carry on life in Germany without much difficulty (to be able to do shopping, etc.);
2. to be able to understand simple texts, and simple forms of written communication;
3. to have a basic knowledge of German grammar;
4. to acquire a basic vocabulary of 500 words;
5. to be able to translate simple letters with the use of a dictionary; and
6. to have some familiarity with the German life and culture.

(This will not be covered as part of the regular classroom teaching; this is to be acquired by self-study.)

Some useful websites will be given.

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

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

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

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

Some German culture. Films.

**15HIN101 HINDI I 1 0 2 2**

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

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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  
2002

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

Unit 2

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

REFERENCES:
**15HUM231**

**GLIMPSES INTO THE INDIAN MIND:**

**THE GROWTH OF MODERN INDIA**

**Unit 1**

*Introduction*

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

**Unit 2**

Selected writings / selections from the complete works of the following authors will be taken up for study in a chronological order:

- Raja Ram Mohan Roy
- Dayananda Saraswati
- Bal Gangadhar Tilak
- Rabindranath Tagore

**Unit 3**

Selected writings / selections from the complete works of the following authors will be taken up for study in a chronological order:

- Swami Vivekananda
- Sri Aurobindo
- Ananda K. Coomaraswamy
- Sister Nivedita
- Mahatma Gandhi
- Jawaharlal Nehru
- B.R. Ambedkar
- Sri Chandrasekharendra Saraswati, the Paramacharya of Kanchi
- Dharampal
- Raja Rao
- V.S. Naipaul

**Conclusion**

**REFERENCES:**

1. Tilak, Bal Gangadhar. The Orion / Arctic Home in the Vedas.
2. Tagore, Rabindranath. The History of Bharatarvarsha / On Nationalism / Greater India.
8. Nehru, Jawaharlal. "The Quest" from Discovery of India.

**15HUM232**

**GLIMPSES OF ETERNAL INDIA**

**Unit 1**

*Introduction*

A peep into India’s glorious past

Ancient India – the vedas, the vedic society and the Sanatana Dharma – rajamandala and the Cakravartins – Ramarajya – Yudhisthira’s ramarajya; Sarasvati - Sindhu Civilization and the myth of the Aryan Invasion; Classical India – Dharma as the bedrock of Indian society – Vaidika Brahmanya Dharma and the rise of Jainism and Buddhism – the sixteen Mahajanapadas and the beginning of Magadhan paramountcy – Kautilya and his Arthasastra – Chandragupta Maurya and the rise of the Mauryan empire – Gupta dynasty Indian art and architecture – classical sanskrit literature – Harasvadhanava; 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 wrecked 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, Brihadaryaka Upanishad, Saptasati Devi Mahatmyam, Ramayana, Mahabharata, Manusmriti, Kautilya’s Arthasastra and Mrichchhakatikam of Sudraka; The role and position of Indian women vis-a-vis Islam and European cultures; The great women of India.

Modern India

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

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

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

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

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

Ancient India – up to 600 B.C.
Early India – the vedic society – the varnashramadharma – socio-political structure of the various institutions based on the four purusartha; The structure of ancient Indian polity – Rajamandala and Cakravartins – Prajamandala; Socio-economic elements from the two great Epics – Ramayana and Mahabharata – the concept of the ideal King (Sri Rama) and the ideal state (Ramaraja) – Yudhisthira’s ramarajya; 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 mahajana padas and the emergence of the srenis – states and cities of the Inda-Gangetic plain.

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

Medieval India: 1200 A.D. – 1720 A.D.
Advent of Islam – changes in the social institutions; Medieval India – agrarian economy, non-agricultural production and urban economy, currency system; Vijayanagara samrajya and maritime trade – the story of Indian supremacy in the Indian Ocean region; Aspects of Mughal administration and economy; The Maratha and other provincial economies.
Unit 3
Modern India: 1720 - 1947
the Indian market and economy before the arrival of the European traders; Colonisation and British supremacy (dismantling of everything that was ‘traditional’ or ‘Indian’) – British attitude towards Indian trade, commerce and economy and the resultant ruining of Indian economy and business – man-made famines – the signs of renaissance: banking and other business undertakings by the natives (the members of the early Tagore family, the merchants of Surat and Porbander, businessmen of Bombay, etc. may be referred to here) – the evolution of the modern banking system; Glimpses into British administration of India and administrative models; The National movement and nationalist undertakings in business and industry; the Tatas and the Birlas; Modern India: the growth of large-scale industry – irrigation and railways – money and credit – foreign trade; Towards partition – birth of two new nations – division of property; The writing of the Indian Constitution – India becomes a democratic republic – a new polity is in place.

Independent India – from 1947
India since Independence – the saga of socio-political movements; Indian economy since Independence – the fiscal system – the five year plans – liberalisation – the GATT and after; Globalisation and Indian economy; Impact of science and (new/emerging) technology on Indian economy; Histories of select Indian business houses and business entrepreneurship.

Conclusion
REFERENCES:
1. The Cultural Heritage of India. Kolkata: Ramakrishna Mission Institute of Culture.
2. Kautiya, Arthasastra.
15HUM235 INDIAN CLASSICS FOR 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.

REFERENCE:
The Bhagavad Gita, Commentary by Swami Chinmayananda

15HUM236 INTRODUCTION TO INDIA STUDIES

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

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

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

Unit 2
Modern India: Challenges and Possibilities.

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

15HUM237 INTRODUCTION TO SANSKRIT LANGUAGE AND LITERATURE

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

Unit 1

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

Unit 3
Introduction to Sanskrit Classical Literature - Kavya Tradition - Drama Tradition - Stotra Tradition - Panchatantra Stories.

Unit 4

Unit 5
Indology Studies - Perspectives and Innovations.

TEXTBOOKS AND REFERENCE BOOKS:
1. Vakya Vyavahara - Prof. Vempaty Kutumba Sastri, Rashtriya Sanskrit Sansthan, New Delhi
2. The Wonder that is Sanskrit - Dr. Sampadananda Mishra, New Delhi
3. Science in Sanskrit - Samskritha Bharathi, New Delhi

15HUM238 NATIONAL SERVICE SCHEME

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

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

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

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

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

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


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

Project Work / Practical

15HUM239 PSYCHOLOGY FOR EFFECTIVE LIVING

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:
2. Reference Books:
15HUM240  PSYCHOLOGY FOR ENGINEERS  2002

Unit 1
Psychology of Adolescents: Adolescence and its characteristics.

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

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

TEXTBOOKS:

REFERENCE BOOKS:

15HUM241  SCIENCE AND SOCIETY – AN INDIAN PERSPECTIVE  2002

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 science
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 Somasutvan 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:
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
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Advanced Study (IAS), 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  2 0 0 2

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

Arjuna Vishada 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.

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

Unit 3


TEXTBOOKS / REFERENCES:

15HUM243  THE MESSAGE OF THE UPANISHADS  2 0 0 2

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.

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  1 0 2 2

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

Cookery Practicals - Balanced Diet

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

Practicals - Traditional Foods

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

Practicals - Value added foods

TEXTBOOKS:

REFERENCE BOOKS:

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

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

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

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

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

Students will be given detailed lectures on Calligraphy.

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

By the end of the semester they the students will master the subject in all means. They will be able to speak Japanese as fluently as they speak English. Students will be encouraged to write stories and songs in Japanese language themselves.
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15KAN111  KANNADA II  1 0 2 2

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

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

Unit 2
Nanna Hanate - Dr. G. S. Shivarudrappa
Ella Marethiruvaga - K. S. Nissaar Ahmed
Saviraru Nadigalu – S Siddalingayya

Unit 3

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

Unit 5
Essay writing: Argumentative & Analytical
Précis writing

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

15MAL101  MALAYALAM I  1 0 2 2

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

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

Unit 5
Error-free Malayalam: 1. Language; 2. Clarity of expression; 3. Punctuation – Thettillatha Malayalam
Writing - a. Expansion of ideas; b. PrecisWriting; c. Essay Writing; d. Letter writing; e. Radio Speech; f. Script / Feature / Script Writing; g. News Editing; h. Advertising; i. Editing; j. Editorial Writing; k. Critical appreciation of literary works (Any one or two as an assignment).

REFERENCES:

15MAL111  MALAYALAM II  1 0 2 2

OBJECTIVES: To appreciate the aesthetics & cultural implications; to enhance creative thinking in mother-tongue; to learn our culture & values; to equip students read & write correct Malayalam; to correct the mistakes in pronunciation; to create awareness that good language is the sign of complete personality.
Unit 1
Ancient poet trio: Kalayanasougandhikam, (kallum marangalun... namukkennarika vrikodara) Kunjan Nambiar - Critical analysis of his poetry - Ancient Drama: Kerala Sakunthalam (Act 1), Kalidasan (Translated by Attor Krishna Pisharody).

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: Kannerum Kinavum, V. T. Bhattathirippadu - Socio-cultural literature - historical importance.

Unit 5
Error-free Malayalam - 1. Language; 2. Clarity of expression; 3. Punctuation - Thettillatha Malayalam

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

REFERENCES:
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).


REFERENCES

REFERENCES

15MAT203 TRANSFORMS AND COMPLEX ANALYSIS 3 1 0  4

Unit 1

Unit 2


Unit 3
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15MAT303  OPTIMIZATION TECHNIQUES  2 1 0 3

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:

REFERENCES:

15MEC100  ENGINEERING DRAWING - CAD  2 0 2 3


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TEXTBOOK:

REFERENCES:

15MEC111  FUNDAMENTALS OF MECHANICAL ENGINEERING  3 0 0 3

Unit 1

Unit 2

First Law of Thermodynamics – for a closed system undergoing a cycle, for a process, energy as a property, specific heats, first law of TD applied to steady flow devices.

Second Law of Thermodynamics – concept of heat engines and refrigerators, Kelvin plank and Clausius statements, irreversibility, Carnot cycle, Clausius inequality, thermodynamic temperature scale, concept of entropy, principle of increase of entropy.

Unit 3
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TEXTBOOKS:

REFERENCES:

15MEC180 WORKSHOP A 0 0 2 1

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

2. Pneumatics and PLC Workshop

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.

10MEC305 THERMAL ENGINEERING AND FLUID MACHINERY 3 0 0 3

Unit 1


Unit 2
Fluid Machinery: Classification of fluid flow, properties of fluid, pressure variation in a fluid at rest, measurement of pressure, continuity, momentum and energy equations, applications of Bernoulli equation, Components of hydro power plant, centrifugal pumps – working principle, performance characteristics. Hydraulic turbines – classification, principles and operations of Pelton wheel, Francis turbine and Kaplan turbine.

Unit 3
Heat Transfer: Modes of heat transfer – conduction, convection and radiation. One dimensional steady state heat conduction through plane wall and cylinder, concept of insulation, critical thickness of insulation, heat transfer from extended surfaces, heat transfer with heat generation.

TEXTBOOKS:

REFERENCE BOOKS:

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Carpentry: Study of tools, planning practice and making joints

REFERENCE:
Concerned Workshop Manual
**SYLLABI**

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**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

**SYLLABI**

**B. Tech. - Electrical & Electronics Engg.**

**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 principle, 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 altitude control - coning maneuver - Yo- yo despin mechanism - gyroscopic attitude control - gravity-gradient stabilization.

**TEXTBOOKS:**
SYLLABI
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REFERENCE BOOKS:

15PHY233 BIOPHYSICS AND BIOMATERIALS 3 0 0 3

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

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:

15PHY234 INTRODUCTION TO COMPUTATIONAL PHYSICS 3 0 0 3

Unit 1
Differentiation: Numerical methods, forward difference and central difference methods, Lagrange’s interpolation method.

Integration: Newton - cotes expression for integral, trapezoidal rule, Simpsons’s rule, Gaussian 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 Hjroth Jensen, Department of Physics, University of Oslo, 2003 (Available in the Web)

15PHY238 ELECTRICAL ENGINEERING MATERIALS 3 0 0 3

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

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

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

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

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

TEXTBOOK:

REFERENCES:

15PHY239   ELECTROMAGNETIC FIELDS AND WAVES   3 0 0 3

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

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

Unit 2
Poisson’s and Laplace’s equations, uniqueness theorem, examples of the solution of Laplace’s equation, solution of Poisson’s equation.
Unit 3

TEXTBOOK:

REFERENCE:

15PHY241 LASERS IN MATERIAL PROCESSING 3 0 0 3

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

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


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
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.

REFERENCES:
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:

15PHY245                     NUCLEAR ENERGY: PRINCIPLES           3 0 0 3
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
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TEXTBOOK:

REFERENCES:

15PHY248 PHYSICS OF LASERS AND APPLICATIONS 3 0 0 3

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


Unit 2
Properties of LASERS
Gain mechanism, threshold condition for PI (derivation), emission broadening - line width, derivation of $\Delta \lambda_0$ FWHM natural emission line width as deduced by quantum mechanics - additional broadening process: collision broadening, broadening due to dephasing collision, amorphous crystal broadening, Doppler broadening in laser and broadening in gases due to isotope shifts. Saturation intensity of laser, condition to attain saturation intensity.

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

Unit 3
Types of LASERS

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

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

Applications of LASERS in other fields:

REFERENCES:

15PHY250 QUANTUM PHYSICS AND APPLICATIONS 3 0 0 3

Unit 1

Unit 2
Bosons and Fermions - symmetric and antisymmetric wavefunctions - elements of statistical physics: density of states, fermi energy, Bose condensation - solid state physics:
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.
15PHY251  THIN FILM PHYSICS  3 0 0 3

Unit 1

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

Unit 2

Properties of thin film: Optical behaviors: transmission, reflection, refractive index, photoconductivity, and photoluminescence.

Unit 3
Electrical behaviors: sheet resistivity, electron mobility and concentration, Hall effect, conduction in MIS structure.

Mechanical behaviors: stress, adhesion, hardness, stiffness.

Applications of thin films in various fields: Antireflection coating, FET, TFT, resistor, thermistor, capacitor, solar cell, and MEMs fabrication of silicon wafer: Introduction. preparation of the silicon wafer media, silicon wafer processing steps.

TEXTBOOK:

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
Way - Open star clusters - Globular clusters - Size, shape and structure of the Milky Way – observations of the hydrogen line - Other galaxies - Elliptical galaxies - Spiral galaxies - The Hubble classification of galaxies - The universe - The Cepheid variable distance scale - Starburst galaxies - Active galaxies - Groups and clusters of galaxies - Superclusters - The structure of the universe - Cosmology – the Origin and Evolution of the Universe - The expansion of the universe - The cosmic microwave background - The hidden universe: dark matter and dark energy - The Drake equation - The Search for Extra Terrestrial Intelligence (SETI) - The future of the universe.

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

REFERENCE BOOK:

15PHY333 CONCEPTS OF NANOPHYSICS AND NANOTECHNOLOGY

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

Nanoelectronics 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:

15PHY335 MEDICAL PHYSICS

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.


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 - radioisotope production – dosimetry – safety - radiation hazards – PET.

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

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

**TEXTBOOK:**

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

15PHY338  PHYSICS OF SEMICONDUCTOR DEVICES  3 0 0 3

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


Unit 2

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

Unit 3


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

**TEXTBOOKS:**

**REFERENCES:**

15PHY532  ASTROPHYSICS  3 0 0 3

Unit 1

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

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

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.

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

Unit 1
Introduction: geologic time; earth as a system, the rock cycle, early evolution, internal structure & face of earth, dynamic earth. Matter and minerals: atoms, isotopes and radioactive decay; physical properties & groups of minerals; silicates, important 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 radioactive, the geologic time scale, difficulties in dating. Earth’s evolution: birth of a planet, origin of the atmosphere and oceans, Precambrian (formation of continents); Phanerozoic (formation of modern continents & earth’s first life); Paleozoic (life explodes); the Mesozoic (dinosaurs); Cenozoic era (mammals). Global climate change: climate & geology, climate system, detecting change; atmospheric basics & heating the atmosphere; natural & human causes; carbon dioxide, trace gases, and climate change; climate-feedback mechanisms, aerosols, some possible consequences.

TEXTBOOK:

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

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

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

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

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

TEXTBOOK:
REFERENCES:

15PHY542 OPTOELECTRONIC DEVICES 3 0 0 3

Unit 1

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

Unit 2
Semiconductor light-emitting diodes: Structure and types of LEDs and their characteristics, guided waves and optical modes, optical gain, confinement factor, internal and external efficiency, semiconductor heterojunctions, double-heterostructure LEDs.

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

REFERENCES:

15SAN101 SANSKRIT I 1 0 2 2

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, Kalidas’a works and Bhagavad Gita.

Ramayana – chapter VIII - verse 5, Mahabharata - chapter 174, verse -16,
Bhagavad Gita – chapter - IV verse 8, Kalidasa’s Sakuntala Act IV – verse 4

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

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

15SAN111

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, Kalidas’a 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. Pravesahā; Publisher: Samskrita bharati, Aksharam, 8th cross, 2nd phase, girinagar, Bangalore -560 085
2. Sanskrit Reader I, II and III, R. S. Vadyar 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

15SSK221

SOFT SKILLS I

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

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

Presentations: Preparations, outlining, hints for efficient practice, last minute tasks, means of effective presentation, language, gestures, posture, facial expressions, professional attire.

Vocabulary building: A brief introduction into the methods and practices of learning vocabulary. Learning how to face questions on antonyms, synonyms, spelling error, analogy, etc. Faulty comparison, wrong form of words and confused words like understanding the nuances of spelling changes and wrong use of words. Listening skills: The importance of listening in communication and how to listen actively.

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

Problem solving level I: Number system; LCM &HCF; Divisibility test; Surds and indices; Logarithms; Ratio, proportions and variations; Partnership;
Problem solving level II: Time speed and distance; work time problems;

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

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

TEXTBOOKS:
5. Quantitative Aptitude by R. S. Aggarwal,S. Chand
6. Quantitative Aptitude – Abijith Guha, TMH.
7. Quantitative Aptitude for Cat – Arun Sharma. TMH.

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


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.

Spatial 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
www.the grammarbook.com - online teaching resources and other useful websites.

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

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

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

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

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

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

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

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
   www.ther grammarbook.com - online teaching resources
   www.englishpage.com- online teaching resources and other useful websites.

15SWK230 CORPORATE SOCIAL RESPONSIBILITY 2002

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 2002

Unit 1
Mental Health – concepts, definition, Bio-psycho-social model of mental health. Mental health and mental illness, characteristics of a mentally healthy individual, Signs and symptoms of mental health issues, presentation of a mentally ill person.
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”wrnhttp.cmhaontario.ca/
6. Mental Health Act 1987 (India) www.thelaw.org/infra.htm
7. Persons with disabilities Act 1995 (India) socialjustice.nic.in
8. The Factories Act 1948 (India) www.caia.in/Image/19ulabourlawshb.pdf

Unit 2
Epic literature: cilappatikāram maturaik kāṭṭam (valakkuttaikkāti 50-55)
Spiritual Literature: tiruppavai(3,4) – tēvāram (mācīvilaiyum)
Medieval Literature: bāratiyar kāṭṭaḷ pāṭṭu (eḻ vilayāṭṭu pillai) – bārattaccaṭ kutūmpavilkku (tavin tālāṭtu).

Unit 3
Novel: Jeyakāntaṭ “kuru pīṭṭam”
Essay: Anūṇa “e tāḷṭaṇa tamilakamē”

Unit 4

Unit 5
Tamil Grammar: Col vakaikal - vēṟṟumai urupukal - vallattam mukumitham mūṟṟam - canti(puṭṭarcei) - ilakkafakkuṟṟuṇṇu.
Practical skills: Listening, speaking, writing and reading

Textbooks:
>
> Anūṇa “e tāḷṭaṇa tamilakamē” nakkōṟṟu pālpekkōṟṟu.  
> <Cokítīṭcīṟ ciprpamāṭṭu> “nalla kūḷṭtakōḷ mukumīṭham” mūṟṟu paṭṭippakkam, 2008.  
SYLLABI  
B. Tech. - Electrical & Electronics Engg.  
2015 admissions onwards

Unit 5

tamil moli äyvil kaññi payaññpätu. - Karuttu parimäram - vilampara moñjyamaippu - pëccu - nàlakam pàtaippu - cëjukata, kata, putìñjum pàtaippu.

Textbooks:

- Ms. Vananadha “tamiḻ kaññiyam” tamiḻ vañjukkum, 2012
- pot moñjum “nàññ tamil ilakkalam” nàññ pàppiñ kàrunj, vaññiñj, tìrùnñtjantspar. 2007.

ISTAMIII  
TAMIL I I  
2002

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: NattupuJP pàṭalkal, kàtakkal, pàlamojikal - cirukataikal ñõrənmum valarcciyum, ciruñalakkiyikal: Kàlírktapu pàranti (pàrantiyatu) - makkajaj pàlù 35.

Kappiyakal: Cilkaptikkañnu - máññikkalai nàñjiyiyál ñiyvù mårçum aïmperum - aïchjrùn këppiyakal tòñjārjàc cyetikal.

Unit 2

tìñjai ilakkayumum nìttiyakkiyumum - patiññkajjkañjakku nukal tòñjarañ pìra cyetikal - tìrukkuñj (añjpu, pàþpu, kalvi, ojukkam, nàþpu, vëymai, këjvi, ceyjriñ, periyjyiniñnuññkàññj, vëjpuññarvù pìñjyj atikàjrrütul ñìña cyetikal.

Açnàñkàl: Ulakanjti (1-5) - ëlàjti (1,3,6). - Cittarkal: Kàññveç cìttar pàtálkal (ñànjatkal kàlippu - 1,4,6,7,8), mårçum akçypcü cìttar pàtálkal (1-5).

Unit 3

tamiḻ ilakkayam: Yàkkìka vakaikal - tañjùjii piñjìvìjii - nèñkkàruj ayàrtàru

Unit 4