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 Smriti - Overview of the four Vedas and the ten Principal Upanishads - The central problems of the Upanishads – The

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

Message of the Bhagavad Gita

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

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

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

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

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

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

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

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

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

15CHY100 CHEMISTRY 3 0 0 3

Unit 1
Chemical Bonding
Review of orbital concept and electronic configuration, electrovalency and ionic bond formation, ionic compounds and their properties, lattice energy, solvation enthalpy and solubility of ionic compounds, covalent bond, covalency, orbital theory of covalency - sigma and pi bonds - formation of covalent compounds and their properties. Hybridization and geometry of covalent molecules - VSEPR theory - polar and non-polar covalent bonds, polarization of covalent bond - polarizing power, polarisability of ions and Fajan’s rule, dipole moment, percentage ionic character from dipole moment, dipole moment and structure of molecules - co-ordinate covalent compounds and their characteristics, molecular orbital theory for H2, N2, O2 and CO, metallic bond - free electron, valence bond and band theories, weak chemical bonds – inter and intra molecular hydrogen bond - van der Waals forces.
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:
Syllabi B. Tech.- Electronics & Instrumentation Engg. 2015 admissions onwards

15CHY233 CATALYTIC CHEMISTRY  3 0 0 3

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

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

Unit 2
Catalysis by macromolecules, Phase transfer catalysis.

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

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

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


Textbooks:

References:

15CHY234 CHEMISTRY OF ADVANCED MATERIALS  3 0 0 3

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


Unit 2

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


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

Textbooks:

References:


Unit 2

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

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

Unit 3
Florescence and Phosphorescence - chemiluminescence - photo sensitization.

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

TEXTBOOK:

REFERENCE:

15CHY236 CHEMISTRY OF NANOMATERIALS 3 0 0 3

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

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: Fullerences, structure, synthesis, alkali doped C60 - superconductivity in C60, applications of fullerences. 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,

Unit 3
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:
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.


TEXTBOOK:

REFERENCES:

15CHY238 COLLOIDAL AND INTERFACIAL CHEMISTRY 3 0 0 3

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


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

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

Unit 3
Characterization of Colloids, Rheological properties - Classification, Interfacial rheology, Interfacial tension, Electrochemistry of interfaces - Electric double layer. Stability of charge stabilized colloids, DLVO theory, Hamaker constant, Boltzmann distribution, Debye length, specific ion adsorption, stern layer, electrostatic, steric and electrosteric stabilization, zeta potential, surface tension, wetting and spreading, contact angle - Young's modulus, practical application - solid surfaces - surface mobility, characteristics and formation.

TEXTBOOKS:

REFERENCES:
2. J. W. Goodwin, “Colloids and Interfaces with Surfactants and Polymers”, John-Wiley and Sons Ltd, 2004
15CHY239  COMPUTATIONAL CHEMISTRY AND MOLECULAR MODELLING

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

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


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

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

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

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

Ab-initio calculations: Gaussian implementations – Gamess - Thermodynamic functions - Koopman’s theorem - Isodesmic reactions, DFT for larger molecules - Computer aided assignments/mini projects with softwares - Introduction to HPC in Chemical calculations.

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

TEXTBOOKS:

REFERENCES:

15CHY241  ELECTROCHEMICAL ENERGY SYSTEMS AND PROCESSES

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

Unit 2
Batteries: Primary batteries: The chemistry, fabrication and performance aspects, packing classification and rating of the following batteries: (The materials taken their function and significance, reactions with equations, their performance in terms of discharge, capacity, and energy density to be dealt with). Zinc-carbon (Leclanche type), zinc alkaline (Duracell), zinc/air, zinc-silver oxide batteries; lithium 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:

15CHY242 ENVIRONMENTAL CHEMISTRY 3 0 0 3

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


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

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

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

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

TEXTBOOKS:

REFERENCES:
SYLLABI
B. Tech.- Electronics & Instrumentation Engg.  2015 admissions onwards


15CHY243  FUELS AND COMBUSTION  3 0 0 3

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

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


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

Flue gas analysis by chromatography and sensor techniques.

Unit 3

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

TEXTBOOK:

REFERENCES:

15CHY244  GREEN CHEMISTRY AND TECHNOLOGY  3 0 0 3

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

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

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

REFERENCES:
1. Hand Book of Green Chemistry and Technology; by James Clarke and Duncan Macquarrie; Blackwell Publishing.
15CHY245 INSTRUMENTAL METHODS OF ANALYSIS 3 0 0 3

Unit 1

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

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


Unit 3

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

TEXTBOOKS:

REFERENCES:

15CHY246 MEDICINAL ORGANIC CHEMISTRY 3 0 0 3

Unit 1

TEXTBOOKS:

REFERENCES:

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

15CHY248 ORGANIC REACTION MECHANISMS 3 0 0 3

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

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

TEXTBOOK:

REFERENCES:

15CHY249 ORGANIC SYNTHESIS AND STEREOCHEMISTRY 3 0 0 3

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

Stereochemistry: Tactility, R/S system of nomenclature of central and axial molecules.
Unit 2
Atropisomerism - isomerism of biphenyls - alenes and spiranes - ansa compounds - Geometrical isomerism, E, Z Isomerism. Asymmetric synthesis.

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

Unit 3

TEXTBOOKS:

REFERENCES:

15CHY250 POLYMER MATERIALS AND PROPERTIES 3 0 0 3

Unit 1

Unit 2
Manufacturing, mechanical, thermal, electrical and chemical properties and applications of commodity plastics - PE, PP, PVC, PS, Engineering plastics - ABS, PC, PMMA, polyamide, polyacetal, PET, PBT, PTFE, High performance polymer - PES, PEI, PEEK, conducting polymer.

Unit 3
Thermoset materials - PF, UF, MF, epoxy and unsaturated polyester resin, Rubber - natural rubber, synthetic rubber - SBR, PB, nitrile, chloroprene, butyl, silicone - compounding and additives.

TEXTBOOK:

REFERENCES:
SYLLABUS  
2015 admissions onwards

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.


Unit 3  

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

REFERENCES:
S Y L L A B I  B. Tech.- Electronics & Instrumentation Engg.  2015 admissions onwards

T E X T B O O K S :

R E F E R E N C E S :

1 5 C H Y 3 3 2  C O R R O S I O N  S C I E N C E  3 0 0 3

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

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

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

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

Corrosion Inhibitors: Passivators - Vapour phase inhibitor.

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


T E X T B O O K S :

R E F E R E N C E S :

1 5 C S E 1 0 0  C O M P U T A T I O N A L  T H I N K I N G  A N D  P R O B L E M  S O L V I N G  3 0 2 4

Unit 1
Basics: Introduction, Information and data, Data encoding, Logic: Boolean logic, Applications of propositional logic.

Unit 2

T E X T B O O K S :
2. R. G. Dromey, “How to solve it by Computer”, PHI, 2008

1 5 C S E 1 0 2  C O M P U T E R  P R O G R A M M I N G  3 0 0 3

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

Unit 2

Unit 3
Strings: fixed length and variable length strings, strings and characters, string input output, array of strings, string manipulation functions, sorting of strings.
Enumerated types, Structures: Structure vs array comparison, complex structures, Structures and functions, Union, binary input output, Command line arguments.

TEXTBOOK:

REFERENCES:

15CSE180 COMPUTER PROGRAMMING LAB. 0021
Solving simple problems with operators, programs on conditional control constructs, programs on loops (while, do-while, for), programs using user defined functions and library functions, programs on Files, arrays, matrices (single and multi-dimensional arrays), programs using DMA, programs on strings, structures.

REFERENCE:

15CSE313 SOFTWARE ENGINEERING 2023
Unit 1

Unit 2

TEXTBOOK:

REFERENCES:

15CSE330 INFORMATION TECHNOLOGY ESSENTIALS 3003
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 AND ALGORITHMS


TEXTBOOKS:

15CUL101 CULTURAL EDUCATION I

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

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

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 - 2002 AN INDIAN PERSPECTIVE

OBJECTIVES: The course offers to explore the seminal thoughts that influenced the Indian Mind on the study of human possibilities for manifesting excellence in life. This course presents to the students, an opportunity to study the Indian perspective of Personality Enrichment through pragmatic approach of self analysis and application.

Unit 1
Goals of Life – Purusharthas
What are Purusharthas (Dharma, Artha, Kama, Moksha); Their relevance to Personal life; Family life; Social life & Professional life; Followed by a Goal setting workshop;

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

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

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

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

Communication Skills - An Indian Perspective;

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

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

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

REFERENCE BOOKS:
1. Awaken Children (Dialogues with Sri Mata Amritanandamayi) Volumes 1 to 9
2. Complete works of Swami Vivekananda (Volumes 1 to 9)
3. Mahabharata by M. N Dutt published by Parimal publications – New Delhi (Volumes 1 to 9)
4. Universal message of Bhagavad-Gita (An exposition of Gita in the light of modern thought and Modern needs) by Swami Ranganathananda. (Vols.1 to 3)
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 2002

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.
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 blue-print of perfect action.

REFERENCES:
The Bhajja Govindam and the Bhagavad Gita.

15CUL232 EXPLORING SCIENCE AND TECHNOLOGY 2002 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:
IFIIs interactive multimedia DVD on Science & Technology in Ancient India.

15CUL233 YOGA PSYCHOLOGY 2002

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
How to make mind peaceful? - Cultivating opposite virtues: happiness – friendliness

Patanjali Yoga Sutra – 7
Five causes of Pain - avidya – ignorance (Root Cause) - asmita – ‘I-Feeling’ - raga
– attraction - dwesha – repulsion - abhinivesha – clinging to life.

Unit 3
Patanjali Yoga Sutra – 8
Necessity of Yoga practice - eight parts of Yoga practice - five Yamas: ahimsa –

Patanjali Yoga Sutra – 9

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

Report review
Conclusion

REFERENCES:

1. The course book will be “The four chapters of Freedom” written by Swami Satyananda
   Saraswati of Bihar School of Yoga, Munger, India.
2. “The message of Upanishads” written by Swami Ranganathananda. Published by Bharathiya
   Vidya Bhavan.
3. Eight Upanishads with the commentary of Sankaracharya, Translated by Swami
   Gambhirananda, Published by Advaita Ashram, Uttarana.
4. ‘Hatha Yoga Pradipika Swami Mukdhirnanda, Yoga Publications Trust, Munger, Bihar, India

15ECE111 SOLID STATE DEVICES 3 0 0 3

Unit 1
Introduction to Semiconductor materials, Crystal Structure of Silicon and GaAs –
Planes – directions - planes and planar atomic densities - Unit cell characteristics -
Unit 2
Reactance and Impedance - Response in RLC circuits to sinusoidal voltage - Real and Reactive Power - Power factor - Complex Power and Power Triangle: Introduction to Three Phase Systems - Balanced 3-Phase STAR and DELTA connections of Load - Three phase power.

Unit 3

TEXTBOOKS:

REFERENCES:
SYLLABI

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

15ECE211 ELECTRONIC CIRCUITS  3 1 0 4
(Pre-requisite: 15ECE111 Solid State Devices)

Unit 1
Diode Fundamentals: Diode characteristics - Physics of diode operation and modeling of diodes.
Diode applications: Rectifiers - Clipper and clamping circuits - Voltage multipliers - Voltage regulator using zener diode.

Unit 2
Bipolar junction transistors: Introduction - Operation of BJT-I-V characteristics of BJT. BJT Applications: BJT biasing techniques - Analysis of BJT as a switch and as an amplifier - Small signal analysis - Single stage BJT amplifiers (CE, CB, CC) - BJT high frequency models and amplifier frequency analysis.

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

TEXTBOOK:
REFERENCES:

SYLLABI

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

TEXTBOOK:
REFERENCES:

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

Unit 1

Unit 2

Unit 3
Applications of DSP – a few case studies.

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

15ECE281 DIGITAL CIRCUITS AND SYSTEMS LAB. 0 0 2 1

1. Familiarization of Digital trainer kit and study of logic gates.
2. Realization of Boolean expressions using logic gates
3. Realization of Boolean expressions using universal gates
4. Realization of code converters
5. Design of Adders/Subtractors
6. Design of Multiplexers/De-Multiplexers
7. Design of Encoders/Decoders
8. Study of flip-flops
9. Design of Synchronous counters
10. Design of Asynchronous counters

15ECE286 ELECTRONIC CIRCUITS LAB. 0 0 2 1

1. P-N junction Diode and Zener Diode Characterization.
2. Rectifier with and without filters
3. Clippers/Clampers
4. Shunt regulator
5. BJT Characterization
6. Single stage CE amplifier

15ECE302 CONTROL SYSTEMS ENGINEERING 3 1 0 4

(Pre-requisite: 15CSE204 Signal Processing I)

Unit 1

Unit 2

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

TEXTBOOK:

REFERENCES:

15ECE303 LINEAR INTEGRATED CIRCUITS 3 0 0 3

(Pre-requisite: 15ECE211 Electronic Circuits)

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:
7. Application Notes and Data Sheets of ICs from various manufacturers.

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

Unit 1

Unit 2

Unit 3

TEXTBOOKS:

REFERENCES:
SYLLABI B. Tech.- Electronics & Instrumentation Engg. 2015 admissions onwards

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

TEXTBOOKS:

REFERENCES:

15ECE315 BIOMEDICAL INSTRUMENTATION 3 0 0 3

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

15ECE320 ACTIVE FILTER DESIGN 3 0 0 3

(Pre-requisite: 15ECE303 Linear Integrated Circuits)

Unit 1
Introduction to Active Filtering - Categories of Filters - LP, HP, BP, BE and All Pass Filters - Second Order s-domain equations in each case and their pole-zero plots. Filter approximations – Butterworth, Chebyshev, Elliptic and Bessel - Phase and group delay characteristics of approximation functions - Delay equaliser functions - Frequency transformations.

Unit 2
Review of opamp characteristics: Single opamp biquads - First order LP, HP, BP, All pass filters - Biquad topologies - Analysis and design of single opamp Biquads with second order response. Use of bridged T network in active Filters - Sensitivity analysis of single opamp filters.

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

TEXTBOOK:

REFERENCES:
Syllabi
B. Tech. Electronics & Instrumentation Engg. 2015 admissions onwards


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

Unit 1

Unit 2

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

Textbook:

References:

15ECE323 AVIATION ELECTRONICS 3 0 0 3

Unit 1

Textbook:

References:
15ECE325 BIOMEDICAL SIGNAL PROCESSING 3 0 0 3

(Pre-requisite: 15ECE212 Signal Processing II)

Unit 1

Unit 2

Unit 3

TEXTBOOKS:

REFERENCES:
and memory data addressing capabilities - Address generation unit - Programmability and program execution - Speed issues - Features for external interfacing.

Unit 2
Programmable digital signal processors: Commercial digital signal processing devices - Data addressing modes of TMS320C54XX digital signal processors - Data addressing modes of TMS320C54XX processors - Memory space of TMS320C54XX processors - Memory space of TMS320C54XX processors - Program control - TMS320C54XX instruction & programming - On-chip peripherals - Pipeline operation of TMS320C54XX processors.

Unit 3

TEXTBOOK:

REFERENCES:

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

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

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

Unit 1

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

Unit 3

TEXTBOOK:
REFERENCES:

15ECE330 IMAGE PROCESSING 3 0 0 3
(Pre-requisite: 15ECE212 Signal Processing II)

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCE:

15ECE331 PATTERN RECOGNITION TECHNIQUES 3 0 0 3
AND ALGORITHMS
(Pre-requisite:15MAT213 Probability and Random Processes)

Unit 1
Statistical decision making techniques: Bayes’ theorem - Multiple features - Conditionally independent features - Decision boundaries - Unequal costs of error - Estimation of error rates - Leaving one out technique - Characteristic curves.

TEXTBOOK:

REFERENCES:

15ECE332 SPARSE SIGNAL AND IMAGE PROCESSING 3 0 0 3
(Pre-requisite:15ECE212 Signal Processing II)

Unit 1

Unit 2
Introduction to image processing and wavelet transform: The origins of digital image processing - Examples of fields that use digital image processing - Image digitization and sampling - Image sensing and acquisition - Image sampling and quantization - Image enhancement - Image compression. Continuous wavelet transform (CWT) - Discrete wavelet transform - Haar scaling function nested spaces - Signal decomposition and signal reconstruction using (DWT).
Unit 3
Compressed sensing and Sparse Signal Representation: Sparse signals - Single pixel imaging - Compressible signals - over complete dictionaries - Coherence between bases - Compressed sensing and signal reconstruction - Restricted isometry property - Unconstrained and constrained optimization algorithms – Applications of compressed sensing in different fields.

TEXTBOOK:

REFERENCES:
Unit 1

Unit 2

15ECE339 ANALOG IC DESIGN
(Pre-requisite: 15ECE211 Electronic Circuits)

Unit 3

TEXTBOOK:

REFERENCES:
4. Relevant Datasheets from Texas Instruments, Maxim and Harris Semiconductors.

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

Unit 1

Unit 2

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

TEXTBOOKS:

REFERENCES:

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

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

Unit 2

Unit 3

TEXTBOOKS:

REFERENCES:
Unit 2
Electronic system level verification: Verification languages (Verilog and System Verilog) - Verification flows and methodologies (UVM) - HW-SW co-verification.

Unit 3
Open source tools – Bluespec and Accellera, case study.

TEXTBOOKS:

REFERENCES:

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

Unit 1

Unit 2

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

TEXTBOOKS:
Unit 2

Unit 3

TEXTBOOKS:

REFERENCES:

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

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

15ECE371 VLSI FABRICATION TECHNOLOGY 3 0 0 3

Unit 1
Brief History of Semiconductor technology, Scaling Trends and Scaling Methodologies, Scaling Challenges, ITRS Roadmap; Starting material, silicon structure and properties, Czochralski and Float Zone crystal growth, GaAs growth; Silicon oxidation methods and properties, Deal Grove Model, Photolithography – masks, pattern transfer techniques, minimum resolvable feature sizes, UV sources, photoresists.

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

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

TEXTBOOK:

REFERENCES:
**SYLLABI**

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

**Amrita Vishwa Vidyapeetham**

**2015 admissions onwards**

**15ECE373**

**VLSI SYSTEM DESIGN**

**3 0 0 3**

*(Pre-requisite: 15ECE313 VLSI Design)*

**Unit 1**

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

**Unit 2**


**Unit 3**


**TEXTBOOKS:**


**REFERENCES:**


**15ECE376**

**AGENT - BASED MODELLING**

**3 0 0 3**

**Unit 1**


**Unit 2**

Data mining techniques for intelligent Agents: Association rule mining – Clustering - Classification and evolutionary algorithms.

**TEXTBOOK:**


**REFERENCES:**


**15ECE377**

**ECONOMETRICS**

**3 0 0 3**

**Unit 1**


**Unit 2**


**Unit 3**


**TEXTBOOK:**


**REFERENCES:**

15ECE378    FINANCIAL ENGINEERING  3 0 0 3

Unit 1

Unit 2

Unit 3

TEXTBOOKS:

REFERENCES:

15ECE379    SIGNAL PROCESSING FOR BUSINESS APPLICATIONS  3 0 0 3

Unit 1

TEXTBOOKS:

REFERENCE:

15ECE382    MICROCONTROLLER LAB.  0 0 2 1

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

15ECE383    LINEAR INTEGRATED CIRCUITS LAB.  0 0 2 1

1. Current mirror
2. Amplifier using current biasing
3. Op-Amp characterization
Schools of Engineering

Amrita Vishwa Vidyapeetham

SYLLABI

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

4. Inverting and Non-inverting Amplifier
5. Integrator, Differentiators
6. Schmitt trigger
7. Astable multivibrator using 555 Timer

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15EEE180 WORKSHOP B 0 0 2 1

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

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

S 72

15EEE202 ELECTRIC CIRCUITS 3 1 0 4

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

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Network Reduction: Source transformation; Star-Delta transformation.
Network Theorems: Thevenin and Norton’s theorems; Superposition theorem, maximum power transfer theorem, Tellegen’s theorem, Reciprocity theorem.

Introduction to Graph Theory – Definitions; Incidence matrix, Fundamental tie-set matrix, Fundamental cutest matrix, Formulation of network equations using KCL and KVL.

Unit 2
Transient Analysis: Time domain analysis of first and second order circuits - with DC Excitation - Frequency response of Series and Parallel circuits - Resonance - Q-factor and Bandwidth;
Steady State Analysis of single phase AC circuits: Phasor representation and analysis of circuits applying network theorems; Power factor – power factor correction.

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:
15EIE201  INDUSTRIAL INSTRUMENTATION I  3 1 0 4

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

15EIE211  ELECTRICAL AND ELECTRONIC MEASUREMENTS  3 1 0 4

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:
15EIE285  MEASUREMENTS LAB.  0 0 2 1

1. Experiments with DC bridges
2. Experiments with AC bridges
3. Calibration of single phase energy meter
4. Calibration of WATT meter
5. Calibration of ammeter
6. Calibration of voltmeter
7. Experiments using CRO
8. Experiments using DSO
9. Experiments using DMM

15EIE301  ELECTRICAL MACHINES  3 1 0 4

Unit 1


Unit 2


Unit 3

**DC Machines: simple DC machine - commutation and problems - power flow and losses - types equivalent Circuit - Magnetization Characteristic - separately excited – Shunt – PM - Series - Compounded DC Motors - Starting of DC Motors.

15EIE311  INDUSTRIAL INSTRUMENTATION II  3 0 0 3

(Personal: 15EIE201 Industrial Instrumentation I)

Unit 1

Unit 2

Unit 3

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

REFERENCES:

15EIE312  PROCESS CONTROL  3 0 0 3
(Pre-requisite: 15ECE302 Control Systems Engineering)

Unit 1

Unit 2

Unit 3

TEXTBOOKS:

REFERENCE:

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

15EIE330  ADVANCED PROCESS CONTROL  3 0 0 3
(Pre-requisite: 15EIE312 Process Control)

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

15EIE331  DIGITAL CONTROL AND STATE VARIABLE METHODS  3 0 0 3
(Pre-requisite: 15ECE302 Control Systems Engineering)

Unit 1
Unit 1


Unit 2


Unit 3


TEXTBOOK:

REFERENCES:

15EIE332 EMBEDDED SYSTEMS FOR INSTRUMENTATION 3 0 0 3

Unit 1

Hardware Fundamentals: Introduction to Embedded Systems; Application Areas; Hardware / Software Architectures of Embedded System-Compiling; Linking and Locating;

Downloading and Debugging: Emulators and Simulators; Types of Memory; Flash Memory; Built-in on the Microprocessor Control and Status Register; Device drivers and its design; CISC / RISC - RTOS and Architectures; Selecting Architecture.

TEXTBOOK:

REFERENCES:

REFERENCE:

15EIE333 FIBER OPTICS AND LASER INSTRUMENTATION 3 0 0 3

(Pre requisite: 15EIE201 Industrial Instrumentation I)

Unit 1


Unit 2

LASER properties and Applications Single mode operation, mode locking, Q-switching, properties of LASER lights - directionality, line width, beat coherence etc. Applications - Overview (more detailed coverage for instrumentation related applications), Alignment, measurement of length, pollution detection, velocity measurement, holography, holographic interferometry, inspection, analysis technique, recording, communication, heat source, medical, printing, isotope separation, atomic fusion. Optical Fiber Fundamentals Physics of light, Refractive Index, Total internal reflection, Optical fiber basics, concept of mode, types of fibers, attenuation.
dispersion, multimode and single mode fibers, light sources (LEDs and LDs) and detectors (PIN diode, APDs).

**Unit 3**
Optical Fiber Applications Overview - Communications, illumination and sensors. Fiber optic sensors - Advantage over conventional sensors, block diagram of fiber optic sensors, intensity modulated sensors, phase modulated sensors, spectrally modulated sensors, distributed fiber optic sensors. Industrial applications of fiber optic sensors - Introduction, temperature measurement, pressure measurement, level measurement, flow measurement, vibration measurement, chemical analysis, current measurement, voltage measurement, issues for industrial applications. Fiber optic smart structures - Introduction, fiber optic sensor systems, applications of fiber optic smart structures and skins, example of Application of fiber optic sensors to smart structures.

**TEXTBOOKS:**

**REFERENCES:**
1. R. P Khare, "Fiber optics and Optoelectronics", Oxford University Press, 2004
2. Eric Udd, "Fiber Optic Sensors-An Introduction for Engineers and Scientists", Wiley Interscience, 2006

**15EIE334 INSTRUMENTATION PROJECT MANAGEMENT 3 0 0 3**

**AND SYSTEM DESIGN**

**Unit 1**

**Unit 2**

**Unit 3**
Control valves - Basic characteristics and operation of Ball - Plug - Globe - Butterfly and Gate valves - Control Valve Trends - Control Valve Sizing - General Recommendations - Characteristics - Gain and Rangeability - Actuator Selection - Positioners - I/P Transducers - Energy Supplies.

**TEXTBOOK:**

**REFERENCES**

**15EIE335 INTELLIGENT CONTROL SYSTEMS 3 0 0 3**

**Unit 1**

**Unit 2**

**Unit 3**
Fuzzy Model Based Control: T-S Fuzzy model - Linear Matrix Inequality (LMI) Technique - Fixed Gain state Feedback Controller Design Technique - Variable Gain Controller Design using Single Linear Nominal Plant and each Linear Subsystem as Nominal Plant - Controller Design using Discrete T-S Fuzzy System.
SYLLABI  B. Tech.- Electronics & Instrumentation Engg.  2015 admissions onwards

TEXTBOOKS:

REFERENCES:

15EIE336  SENSORS AND SIGNAL CONDITIONING  3 0 0 3

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

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

15EIE337  VIRTUAL INSTRUMENTATION  3 0 0 3

Unit 1

Unit 2

Unit 3

TEXTBOOKS:

REFERENCES:

15EIE381  SIGNAL PROCESSING LAB.  0 0 2 1

1. Generation of sequences
2. Basic operations on signals
3. Properties of system
4. Convolution
5. Interconnection of systems
6. Frequency response of LTI Systems
7. Frequency domain representation
8. Time shifting property - DTFS
9. LTI System - analysis
10. Sampling of analog signals and study of aliasing
11. Computation of DFT using direct / linear transformation method
12. Properties of DFT
13. Computation of 2-N point DFT of a real sequence by using an N point DFT just once.
14. Linear filtering using Overlap add / save method
15. Design of FIR filter (different windowing technique)
16. Design of IIR Butterworth filter
17. Applications of DSP - a few case studies

**15EIE385 PROCESS CONTROL LAB.**

1. Experiments with process control simulator
2. Experiments with interacting and non-interacting systems
3. Experiments on Multi Process Trainer
4. Experiments on Pressure Control Trainer
5. Experiments with control valves
6. Experiments on Flow Control Trainer
7. Study of I/P and P/I converter
8. Experiments on Level Control Trainer
9. Experiments on DC motor Control Trainer
10. Experiments on AC motor Control Trainer

**15EIE386 OPEN LAB.**

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

**15EIE390 / 15EIE490 LIVE-IN-LAB.**

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.

**15EIE401 DATA ACQUISITION AND COMMUNICATION**

*Pre-requisite: 15ECE304 Microprocessor and Microcontroller*

**Unit 1**
Fundamentals of data acquisition: Transducers and sensors – Field wiring and communications cabling – Signal conditioning – Data acquisition hardware – Data acquisition software - Host computer.

Data acquisition and control system configuration: Computer plug – in I/O – Distributed I/O - Stand-alone or distributed loggers / controllers - IEEE488 (GPIB) remotely programmable instruments - RS232 and RS485 communication.


**Unit 2**

**Unit 3**

**TEXTBOOKS:**

**REFERENCES:**
15EIE402  INDUSTRIAL AUTOMATION  3 1 0 4
(Pre-requisite: 15EIE312 Process Control)

Unit 1

Unit 2

Unit 3

Distributed Control Systems (DCS) (only concept): Introduction – history and concept of DCS – distributed vs centralized – Advantages of DCS – explanation of a typical commercially available DCS.

TEXTBOOKS:

REFERENCES:

15EIE403  POWERELECTRONIC DEVICES AND CIRCUITS  3 1 0 4
(Pre-requisite: 15ECE211 Electronic Circuits)

Unit 1

Unit 2

Unit 3

TEXTBOOKS:

REFERENCES:

15EIE481  INDUSTRIAL AUTOMATION LAB.  0 0 2 1
Experiments on industrial automation systems like DCS, PLC, SCADA and data acquisition using LABVIEW and MATLAB with data acquisition cards

15EIE495  PROJECT PHASE I  2 cr
• Design development and realization of selected problems and solutions based on EIE domain.
• Review and analysis of state of the arttechnology based research and development.
• Publication-oriented academic research.
• Industry-oriented problems and its solutions.
• Demonstration of working prototype model.
• Preparation of project report in prescribed format.

15EIE499       PROJECT PHASE II       10 cr

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

15ENG111       COMMUNICATIVE ENGLISH       2 0 2 3

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

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

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

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

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

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

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

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

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

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

Language through Practice: Compilation by Amrita University for internal circulation

15ENG230       BUSINESS COMMUNICATION       1 0 2 2

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

Unit 1

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

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

Activities
Case studies & role-plays.

BOOKS RECOMMENDED:

15ENG231 INDIAN THOUGHT THROUGH ENGLISH 1 0 2 2

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

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

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

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

REFERENCES:

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

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

Unit 1 Poems

REFERENCES:

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

Unit 2 Short Stories

Unit 3 Prose

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

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

15ENG233 TECHNICAL COMMUNICATION 1 0 2 2

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


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

Unit 3 Technical paper writing: Library research skills - documentation style - document editing – proof reading – formatting.

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:

15ENV300 ENVIRONMENTAL SCIENCE AND SUSTAINABILITY 3 0 0 3

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

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

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

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

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

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

Unit 3

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

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

TEXTBOOKS / REFERENCES:

**SYLLABI**

**B. Tech.- Electronics & Instrumentation Engg. 2015 admissions onwards**

**SYLLABI**

**B. Tech.- Electronics & Instrumentation Engg. 2015 admissions onwards**

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

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

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

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

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

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

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

**TEXTBOOK:**
Metropole St Michel - Publisher: CLE international

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

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

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

**Unit 2 Small jobs**
Conversation on the phone; Give Time indications; Answer a job offer; Describe a job; Suggest a meeting time.

**TEXTBOOK:**
Metropole St Michel - Publisher: CLE international

**15GER230** GERMAN FOR BEGINNERS I  1 0 2  2

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

Numbers 1-100; Saying the telephone number.

Countries and Languages.

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

Vocabulary: Professions.

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

Numbers till 1000. Saying a year.

Alphabets – spelling a word.

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

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

Vocabulary: Leisure activities, weekdays, months and seasons.

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

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

Some useful websites will be given.

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

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

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

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

Some German culture. Films.

15HIN101 HINDI I 1 0 2 2

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

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

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

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

**B. Tech.- Electronics & Instrumentation Engg. 2015 admissions onwards**

**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 Itaha Rachana : Dr. H. Parameswaran, Radhakrishna publishing House, New Delhi

**15HIN111 HINDI II**

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

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

**Unit 2**
Communicative Hindi - Moukhik Abhiivyakti

**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**

**SYLLABI**

**B. Tech.- Electronics & Instrumentation Engg. 2015 admissions onwards**

**BOOKS:**
2. Gadya Manjusha: Editor: Govind, Jawahar Pusthakalay, Mathura

**15HUM230 EMOTIONAL INTELLIGENCE**

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

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; Dharmapal; Raja Rao; V.S. Naipaul.

Conclusion.

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

15HUM232 GLIMPSES OF ETERNAL INDIA 2002

Unit 1
Introduction
A peep into India’s glorious past
Ancient India – the vedas, the vedic society and the Sanatana Dharma – rajamandala and the Cakravartins – Ramarajya – Yudhisthira’s ramarajya; Sarasvati - Sindhu Civilization and the myth of the Aryan Invasion; Classical India – Dharma as the bedrock of Indian society – Vaidika Brahmanya Dharma and the rise of Jainism and Buddhism – the sixteen Mahajanapadas and the beginning of Magadhan paramountcy – Kautiya and his Arhasatra – Chandragupta Maurya and the rise of the Mauryan empire – Gupta dynasty Indian art and architecture – classical sanskrit literature – Harsavardhana; Trade and commerce in classical and medieval India and the story of Indian supremacy in the Indian ocean region; The coming of Islam – dismantling of the traditional Indian polity – the Mughal empire – Vijayanagara samrajya and days of Maratha supremacy.

Unit 2
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, Manusmrit, Kautiya’s Arhasstra and Mṛchchhākatikām 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:
SYLLABI  B. Tech.- Electronics & Instrumentation Engg.  2015 admissions onwards

11. Mahadevan, T. M. P. Invitations to Indian Philosophy: Madras: University of Madras.
17. Aurobindo, Sri. The Indian Renaissance / India’s Rebirth / On Nationalism.
25. Danino, Michel. The Invasion That Never Was.
34. Dharampal. Archival Compilations (unpublished)

15HUM233 Glimpses of Indian Economy and Polity  2 0 0 2

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

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

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 purusarhas; The structure of ancient Indian polity – Rajamandala and Cakravartins – Prajamandala; Socio-economic elements from the two great Epics – Ramayana and Mahabharata – the concept of the ideal King (Sri Rama) and the ideal state (Ramarajya) – Yudhisthira’s ramarajya; Sarasvati - Sindhu civilization and India’s trade links with other ancient civilizations; Towards chiefdoms and kingdoms – transformation of the polity: kingship – from gopali to bhumati; The mahajanapadas and the emergence of the srenis – states and cities of the Indo-Gangetic plain.

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

TEXTBOOKS:

REFERENCE BOOKS:
2. WHO Report on Adolescent Health: 2010

TEXTBOOKS:

REFERENCE BOOKS:
2. WHO Report on Adolescent Health: 2010

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

Practicals - Therapeutic Diets

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

Practicals - Ethnic Foods

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

Practical - Cooking without Fire or Wire-healthy Snacks

UNIT 1
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   2002

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

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

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

Unit 2
Modern India: Challenges and Possibilities.

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

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

TEXTBOOK:
Material given by the Faculty

BACKGROUND LITERATURE:
1 Selections from The Cultural Heritage of India, 6 volumes, Ramakrishna Mission Institute of Culture (Kolkata) publication.
2 Selections from the Complete Works of Swami Vivekananda, Advaita Ashrama publication.
3 Invitations to Indian Philosophy, T. M. P. Mahadevan, University of Madras, Chennai.
4 Outlines of Indian Philosophy, M. Hiriyanna, MLBD.
5 An Advanced History of India, R. C. Majumdar et al, Macmillan.
6 India Since 1526, V. D. Mahajan, S. Chand & Company
7 The Indian Renaissance, Sri Aurobindo.
8 India's Rebirth, Sri Aurobindo.
9 On Nationalism, Sri Aurobindo.

12 Universal Message of the Bhagavad Gita, Swami Ranganathananda, Advaita Ashrama.
13 Awaken Children: Conversations with Mata Amritanandamayi
14 Indian Aesthetics, V. S. Seturaman, Macmillan.
15 Indian Philosophy of Beauty, T. P. Ramachandran, University of Madras, Chennai.
16 Web of Indian Thought, Sister Nivedita
17 Essays on Indian Nationalism, Anand Kumaraswamy
18 Comparative Aesthetics, Volume 2, Kanti Chandra Pandey, Chowkhamba, Varanasi
19 The Invasion That Never Was, Michel Danino
20 Sanskara, U. R. Ananthamurthy, OUP.
21 Hayavadana, Girish Karnard, OUP.
22 Naga-Mandala, Girish Karnard, OUP.

15HUM237   INTRODUCTION TO SANSKRIT LANGUAGE   2002

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

Unit 1

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

Unit 3

Unit 4
Unit 5
Indology Studies – Perspectives and Innovations.

TEXTBOOKS AND REFERENCE BOOKS:
1. Vakya Vyaavahara- Prof. Vempaty Kutumba Sastri, Rashtriya Sanskrit Sansthan, New Delhi
2. The Wonder that is Sanskrit - Dr.Sampadananda Mishra, New Delhi

15HUM238 NATIONAL SERVICE SCHEME 2 0 0 2

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.


15HUM239 PSYCHOLOGY FOR EFFECTIVE LIVING 2 0 0 2

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

Unit 2 The Nature and Coping of Stress

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

TEXTBOOKS:

REFERENCE BOOKS:

15HUM240 PSYCHOLOGY FOR ENGINEERS 2 0 0 2

Unit 1
Psychology of Adolescents: Adolescence and its characteristics.

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

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

TEXTBOOKS:
15HUM241 SCIENCE AND SOCIETY – AN INDIAN PERSPECTIVE

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

Unit 2
Indian sciences
Introduction; Ancient Indian medicine: towards an unbiased perspective; Indian approach to logic; The methodology of Indian mathematics; Revision of the traditional Indian planetary model by Nilakantha 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 Advanced Study (IIAS), Rashtrapati Nivas, Shimla, sometime ago. The same has been very kindly made available to us by Professors Dr M.D. Srinivas (Chairman) and Dr J.K. Bajaj (Director) of the CPS.

15HUM242 THE MESSAGE OF BHAGAVAD GITA

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

ArjunaVishada Yoga: Arjuna’s Anguish and Confusion – Symbolism of Arjuna’s Chariot.

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

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 Smriti - Sanatana Dharma: its uniqueness - The Upanishads and Indian Culture - Upanishads and Modern Science.

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

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

REFERENCES:
1. The Message of the Upanishads by Swami Ranganathananda, Bharatiya Vidyabharan
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, Mypore.
7. Upanishad Ganga series – Chinmaya Creations

15HUM244 UNDERSTANDING SCIENCE OF 1 0 2 2
FOOD AND NUTRITION

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

Cookery Practicals - Balanced Diet

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

Practicals - Traditional Foods

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

Practicals - Value added foods

TEXTBOOKS:

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

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

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

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

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

Students will be given detailed lectures on Calligraphy.

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

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

15KAN101  KANNADA I  1 0 2  2

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

Unit 1
Adalitha Kannada: bhash, swaroopa, befavanigeya kiru parichaya
Paaribhaashika padagalu
Vocabulary Building

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
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Unit 2
Nanna Hanate - Dr. G. S. Shivarudrappa
Mankuthimmana Kaggada Ayda bhagagal - D. V. Gundappa (Padya Sankhye 5, 20, 22, 23, 25, 44, 344, 345, 346, 601)
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. - Kamadhenu Pustaka Bhavana
4. K. S. Nissar Ahmed – 75 Bhaavageetegalu – Sapna book house
5. Dr. Da. Ra. Bendre – Saayo Aata – Shri Maata Publication

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

Unit 4
Literary Criticism: Itihhasa studies - Bharatha Paryadanam - Vyasaante Chiri - Kuttikrishna Mararu - Outline of literary Criticism in Malayalam Literature - Introduction to Kulti Krishna Mararu & his outlook towards literature & life.

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

REFERENCES:

15MAL111  MALAYALAM II  1 0 2 2

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

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

Unit 2
**SYLLABI**  
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### 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:**  

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

### Unit 1 Calculus

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


### Unit 3 Matrix Algebra
Review: System of linear Equations, linear independence

**SYLLABI**  
2015 admissions onwards


**TEXTBOOKS:**  

**REFERENCE BOOKS:**  

**15MAT121**  
**VECTOR CALCULUS AND ORDINARY DIFFERENTIAL EQUATIONS**  
3 1 0 4

### Unit 1

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

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

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

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

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TEXTBOOK:

REFERENCE BOOKS:

15MAT204  TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS  2 1 0 3

Unit 1

Unit 2
Convolution, Integral Equations, Partial Fractions, Differential Equations, Systems of Differential Equations. (Sections: 6.1 to 6.7)


Unit 3

Partial Differential Equations: Basic Concepts, Modeling; Vibrating String, Wave Equation, Separation of Variables, Use of Fourier Series, Heat Equation; Solution by Fourier Series. (Sections: 12.1-12.5)

TEXTBOOK:

REFERENCE BOOKS:

15MAT212  COMPLEX ANALYSIS AND NUMERICAL METHODS  2 1 0 3

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCE BOOKS:

15MAT214  PROBABILITY AND STATISTICS  2 1 0 3

Unit 1

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

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

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

TEXTBOOK:

REFERENCE BOOKS:

15MEC100  ENGINEERING DRAWING - CAD  2 0 2 3


TEXTBOOK:

REFERENCES:

15MEC180  WORKSHOP A  0 0 2 1

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

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

Study of PLC and its applications - Simple programming using ladder diagrams.

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

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

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

REFERENCE:
Concerned Workshop Manual

15MEC205  FLUID AND THERMAL ENGINEERING  3 0 2 4

Unit 1

Unit 2

Unit 3
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TEXTBOOK:

REFERENCES:

15MEC332  ENTERPRISE MANAGEMENT  3 0 0 3

Unit 1


Unit 2

Unit 3

TEXTBOOKS:

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

15MEC411  OPERATIONS RESEARCH  3 0 0 3

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

Unit 2
Decision theory: Decision trees. Game theory - two persons zero sum, mixed strategies; 2xn and mx2. Network models - project networks - CPM/PERT, project scheduling,
crashing networks and cost considerations, resource leveling and smoothing, shortest route problem, minimal spanning tree problem, maximal flow problem.

Unit 3
Sequencing model - 2 machines n jobs, m machines n jobs - n jobs 2 machines. Inventor models - deterministic and probabilistic models, Queueing models - poison arrival and exponential service times, single server, multi-server. Simulation: Monte Carlo simulation - simple problems.

**TEXTBOOK:**

**REFERENCES:**

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15PHY100

**PHYSICS**

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

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15PHY181

**PHYSICS LAB.**

15PHY230

**ADVANCED CLASSICAL DYNAMICS**
**Unit 3**

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

Practical rigid body problems

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

**TEXTBOOKS:**

2. H. Goldstein, Charles Poole, John Safko, Classical Mechanics, Pearson education, 2002
   (Third Edition)

**REFERENCE BOOKS:**


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**15PHY233 BIOPHYSICS AND BIOMATERIALS 3 0 0 3**

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

**Unit 1**


**Unit 2**

Bioceramics, Biopolymers, Metals, ceramics and composites in medicine: Properties, applications, suitability & modifications required for certain applications.
SYLLABI B. Tech.- Electronics & Instrumentation Engg. 2015 admissions onwards

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

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, Hall effect and carrier density.

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.


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

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.

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

Unit 3
Electromagnetic waves: EM wave motion in free space, wave motion in perfect dielectrics, plane wave in lossy dielectrics, Poynting vector and power consideration, skin effect, reflection of uniform plane waves, standing wave ratio. Transmission line equations, line parameters - examples, dipole radiation, retarded potentials, electric dipole radiation.


15PHY240 ELECTRONIC MATERIAL SCIENCES 3 0 0 3

Unit 1
Types of bonding in solids, Crystallography and crystalline defects: Crystallography, Directions and planes, Crystalline defects, line defects, Planar defects, Volume defects; Binary and Ternary Phase Diagrams: Lever rule and phase rule, Eutectic, peritectic and Eutectoid systems, Applications of Phase diagrams; Basic Quantum Physics - atomic structure, Use of band theory and occupation statistics to explain existence and basic properties of metals and nonmetals. Working of Semiconductor Devices using band diagrams and their electrical characteristics: pn junctions, BJT, MOSFET.
Unit 2
Use of band theory to explain optoelectronic properties of materials and optoelectronic devices: LEDs, Solar Cells, Lasers, pin diodes, photodiodes; Magnetic properties and Superconductivity: Magnetic moments and Magnetic Permeability, types of magnetism, saturation magnetization, magnetic domains, soft and hard magnetic materials, superconductivity and its origin, Giant Magneto Resistance, Josephson effect, Energy band diagrams and Magnetism, Applications of magnetic materials - Magnetic recording materials, etc.

Unit 3

TEXTBOOK:

REFERENCE:
rapid thermal annealing; principles of optical lithography – optics and diffraction, light sources and spatial coherence, physics of pattern transfer, modulation transfer function; chemistry of lithographic processes: organic and polymeric photoresists, developing and exposure, contrast; principles of non-optical lithography: electron beam, X-ray lithography, resists, sources; etching: chemistry of wet etching, plasma physics, chemistry of plasma etching and reactive ion etching; chemical mechanical polishing.

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

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

REFERENCE:

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

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

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

TEXTBOOK:

REFERENCES:

15PHY248 PHYSICS OF LASERS AND APPLICATIONS 3 0 0 3

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


Unit 2
Properties of LASERS
Gain mechanism, threshold condition for PI (derivation), emission broadening - line width, derivation of \( \Delta \omega_{FWHM} \) 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 shift. 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.

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

Unit 3

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

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

REFERENCES:

15PHY251 THIN FILM PHYSICS 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 - donar acceptor levels, trap and recombination centers, excitons, phonons.

Unit 2

Properties of thin film: Optical behaviors: transmission, reflection, refractive index, photoconductivity, and photoluminescence.
Telescope (VLT) - The Hubble Space Telescope (HST) - The future of optical astronomy - Radio telescopes - The feed and low noise amplifier system - Radio receivers - Telescope designs - Large fixed dishes - Telescope arrays - Very Long Baseline Interferometry (VLBI) - The future of radio astronomy - Observing in other wavebands – Infrared – Sub-millimetre wavelengths - The Spitzer space telescope - Ultraviolet, X-ray and gamma-ray observatories - Observing the universe without using electromagnetic radiation - Cosmic rays - Gravitational waves.

Unit 3

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

REFERENCE BOOK:

15PHY333 CONCEPTS OF NANOPHYSICS AND NANOTECHNOLOGY 3 0 0 3

Unit 1
Introduction
Introduction to nanotechnology, comparison of bulk and nanomaterials – change in band gap and large surface to volume ratio, classification of nanostructured materials. Synthesis of nanomaterials - classification of fabrication methods – top down and bottom up methods.

Concept of quantum confinement and phonon confinement

Unit 2
Tools for characterization:

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

Unit 3

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 3 0 0 3

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

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.

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

Unit 2

Theory of 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.

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 radioactivity, the geologic time scale, difficulties in dating. Earth’s evolution: birth of a planet, origin of the atmosphere and oceans, Precambrian (formation of continents); Phanerozoic (formation of modern continents & earth’s first life); Paleozoic (life explodes); the Mesozoic (dinosaurs); Cenozoic era (mammals). Global climate change: climate & geology, climate system, detecting change; atmospheric basics & heating the atmosphere; natural & human causes; carbon dioxide, trace gases, and climate change; climate-feedback mechanisms, aerosols, some possible consequences.

TEXTBOOK:

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

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

**Unit 3**
Time-series properties: examples, conventional linear methods, a case study, time-delay embeddings.

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

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

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

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

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

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

**TEXTBOOK:**

**REFERENCES:**

**15PHYS542**

**OPTOELECTRONIC DEVICES**

**Unit 1** Properties of semiconductors: Electron and photon distribution: density of states, effective mass and band structure, effect of temperature and pressure on band gap, recombination processes.

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.

**References:**

**15SAN101**

**SANSKRIT I**

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

**Unit 1** Introduction to Sanskrit language, Devanagari script - Vowels and consonants, pronunciation, classification of consonants, conjunct consonants, words – nouns and verbs, cases – introduction, numbers, Pronouns, communicating time in Sanskrit. Practical classes in spoken Sanskrit
SYLLABI

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

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

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

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

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

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

15SAN111

SANSKRIT II

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

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

Unit 2
Ktavatu Pratyaya, Upasargas, Ktvanta, Tumunnanta, Lyabanta.
Three Lakaras – brief introduction, Lot lakara.
SYLLABI

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

Listening skills: The importance of listening in communication and how to listen actively.

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

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

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

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

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

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
5. www.the grammarbook.com - online teaching resources
6. www.englishpage.com- online teaching resources and other useful websites.

15SSK321 SOFT SKILLS II 1 0 2 2


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

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

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

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

Data sufficiency: Concepts and problem solving.

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

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

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

REFERENCES:
3. The BBC and British Council online resources
4. Owl Purdue University online teaching resources
15SSK331  SOFT SKILLS III  1 0 2  2

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

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

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

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

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

Problem solving level IV: Geometry; Trigonometry; Heights and distances; Co-ordinate 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:
15SWK231 WORKPLACE MENTAL HEALTH 2002

Unit 1

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 “Mental Health promotion, A how to guide” www.cmhaontario.ca/
6. Mental Health Act 1987 (India) www.tnhealth.org/mha.htm
7. Persons with disabilities Act 1995 (India) socialjustice.nic.in
8. The Factories Act 1948 (India) www.caaan.in/image/19labourlawshb.pdf
SYLLABI
B. Tech. - Electronics & Instrumentation Engg. 2015 admissions onwards

1STAM111  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

Unit 2
tiṉai ilakkiyamum nitiṭilakkiyamum - pāṭṭiṟṟukkarṇikku nulikal tōṇṟaṇṭa pīṟṟa ceytiyaṟkal - tirukkuṟṟal (aṟṟupu, paṟṟupu, kalvi, oḷḷukkam, naṟṟpu, vyāyai, kēḷvi, ceṇanaṟṟi, pōmr̥ṟumtiṟṟukkarṇikku, vāḷḷumparam puruṟṟaṭṭu tōṇṟāṟṟuṟṟi ceṇaṟṟi).

Aṟṟukkal. Ulakauṟṟi (1-5) – elai (1,3,6). - Cittanakal. Kaṭuveli cittan pāṭṭaṇkal (tuṟntak kalippu – 1,4,6,7,8), maṟṟum akappēy cittar pāṭṭaṇkal(1-5).

Unit 3
tamil ilakkaṟṟam: Vakkīya vakaikal – tāṟṟiyūpi pāṟṟiyūi – nēṟṟkūṟṟu ayaṟkūṟṟu

Textbooks:
- Mūvāṭṭarācāri: "tamil ilakkaṟṟam" caṇṭha vaṟṟum pāṭṭiṟṟukkarṇam, 2012
- pōṭ māṭṭināṟṟat: "dūṟṟu tāṟṟiyūpi pāṭṭiṟṟa" dūṟṟu pōmr̥ṟuṟṟikku, vāḷḷumparam, tiruvairavaṟṟal. 2007.