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

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

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

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

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

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

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

Lessons from the Upanishads
Introduction to the Upanishads: Sruti versus Smrti - Overview of the four Vedas and the ten Principal Upanishads - The central problems of the Upanishads – The Upasnahds 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. Hariramritam 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 worshiptfulness for everything in this universe found universal acceptance as it in India. Indian religious life even today is a practical demonstration of the potential for realisation of this profound truth. To see the all-pervading consciousness in everything, including animate and inanimate, and constituting society to realise this truth can be seen as the epitome of civilizational excellence. This course will discuss the principles and rationale behind different modes of worship prevalent in India.

15CHY100 CHEMISTRY 3 0 0 3

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

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

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

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

Photochemistry
Photochemistry, laws of photochemistry - Stark-Einstein law, Beer-Lamberts law, quantum efficiency-determination, photochemical processes - Jablonsky diagram, internal conversion, inter-system crossing, fluorescence, phosphorescence, chemiluminescence and photo sensitization, photo polymerization.
REFERENCE BOOKS
Physical chemistry, Puri and Sharma
Inorganic chemistry, Puri and Sharma

15CHY181 CHEMISTRY LAB. 0 0 2 1
1. Acid base titration (double titration)
2. Complexometric titration (double titration)
3. Redox (permanganometry) titration (double titration)
4. Conductometric titration
5. Potentiometric titration
6. Ester hydrolysis

15CHY231 ADVANCED POLYMER CHEMISTRY 3 0 0 3

Unit 1

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

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

Unit 3
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 concentrated strong acid solutions, catalysis by bases, catalysis by metal ions, catalysis by electron transfer, organometallic catalysis, catalysis in Ziegler Natta/Metalloocene/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:
Unit 1
Chemical materials in Electronics and Electrical Engineering: Structural correlation to behavior of conducting polymers, Semi-conducting polymers - properties of organic polymers containing metal groups such as poly ferrocene - optical fibers - definition, principle and structure - characteristics of optical fibre - photo resist optical fibre - advantages of optical fibre - liquid crystalline - peizo and pyroelectric polymers - magnetic materials, hard and soft magnets - sensors (voltametric).

Nanomaterials: Nanotubes and Nanowires, Carbon nanotubes, single walled and multiwalled, aligned carbon nanotubes, doping with boron - applications - Nanostructured polymers.

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.


TEXTBOOK:

REFERENCES:

SYLLABI  
B. Tech - Computer Science & Engg.  
2015 admissions onwards


15CHY237 CHEMISTRY OF TOXICOLOGY  
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 contaminates - 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


15CHY238 COLLOIDAL AND INTERFACIAL CHEMISTRY

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:
SYLLABI
B. Tech - Computer Science & Engg.  2015 admissions onwards


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 - Hoffmann’s EHT method - Chemical applications such as bond length, bond energy, charge density, dipole moment, Resonance energy.

Unit 3
Self consistent fields: Elements of secular matrix - Variational calculations - Semi empirical methods - PPP self consistent field calculation - Slater determinants -

SYLLABI
B. Tech - Computer Science & Engg.  2015 admissions onwards

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 - 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:
and measurements of water pollutants - organic loadings, phosphates and nitrogen compounds - monitoring of water quality - water test kits, various analytical methods (brief outline only).

**TEXTBOOKS:**

**REFERENCES:**

**15CHY243 FUELS AND COMBUSTION 3 0 0 3**

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

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


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

Flue gas analysis by chromatography and sensor techniques.

**Unit 3**

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

**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.
SYLLABI  B. Tech - Computer Science & Engg.  2015 admissions onwards

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

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

15CHY245  INSTRUMENTAL METHODS OF ANALYSIS  3 0 0 3

Unit 1

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

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


Unit 3

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

REFERENCES:

15CHY249 ORGANIC SYNTHESIS AND STEREOCHEMISTRY 3 0 0 3

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

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

Unit 2
Atropisomerism - isomerism of biphenyls - allenes and spiranes - ansa compounds - Geometrical isomerism, E, Z Isomerism. Asymmetric synthesis.

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

Unit 3
Asymmetric synthesis: Stereo selective - Stereo specific - Regioselective and Regio specific reactions. Principle of protection of alcohol, amine, carboxyl and carbonyl groups - Functional group inter conversions - Disconnection approach - Reversal of polarity - reagents in synthesis.

TEXTBOOKS:

15CHY250 POLYMER MATERIALS AND PROPERTIES 3 0 0 3

Unit 1

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

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

TEXTBOOKS:

REFERENCE BOOKS:

15CHY251 POLYMERS FOR ELECTRONICS 3 0 0 3

Unit 1

Unit 2
Photoconductive polymers: Charge carriers, charge injectors, charge transport, charge trapping. Polymers for optical data storage - principles of optical storage, polymers in recording layer.
Nonlinear optics: NLO properties and NLO effects, wave guide devices, polymer optical fibers - through plane modulators.

Unit 3

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

TEXTBOOK:

REFERENCES:

15CHY252 SOLID STATE CHEMISTRY 3 0 0 3

Unit 1

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


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:

15CHY331 BATTERIES AND FUEL CELLS 3 0 0 3

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

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

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

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


TEXTBOOKS:

REFERENCES:

15CHY332   CORROSION SCIENCE   3 0 0 3

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

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

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

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

Corrosion Inhibitors: Passivators - Vapour phase inhibitor.

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


TEXTBOOKS:

REFERENCES:

15CSE100   COMPUTATIONAL THINKING AND PROBLEM SOLVING   3 0 2 4

Unit 1

Unit 2

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

TEXTBOOKS:
2. R. G. Dromey, “How to solve it by Computer”, PHI, 2008
15CSE102  COMPUTER PROGRAMMING  3 0 0 3

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

Unit 2

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

TEXTBOOK:

REFERENCES:

15CSE111  COMPUTER SCIENCE ESSENTIALS  3 0 0 3

Unit 1

TEXTBOOK:

REFERENCES:

15CSE180  COMPUTER PROGRAMMING LAB.  0 0 2 1

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

REFERENCE:

15CSE201  DATA STRUCTURES AND ALGORITHMS  3 1 0 4

Unit 1

Unit 2
Trees: Tree Definition and Properties – Tree ADT - Basic tree traversals - Binary tree - Data structure for representing trees – Linked Structure for Binary Tree –
SYLLABI

B. Tech. - Computer Science & Engg.  2015 admissions onwards


Unit 3

TEXTBOOKS:

REFERENCES:

15CSE202  OBJECT - ORIENTED PROGRAMMING  3 0 0 3

Unit 1
Introduction to object oriented software design, Comparison of programming methodologies, Object Basics, Java Environment, Classes and Object, Data Members, Access Specifiers, Arrays within a Class, Array of Objects, Constructors, Default Constructors, Destructors, Static Members, Constant Members, Object Oriented Design with UML, Class, object diagrams and sequence diagrams.

Unit 2
Overview of Streams, Bytes vs. Characters, File Object, Binary Input and Output, Reading and Writing Objects, Method Overriding, Polymorphism, Inheritance, Interfaces and Abstract Classes, Packages, Use case diagrams and activity diagrams.

Unit 3
Introduction to Threads, Creating Threads, Thread States, Runnable Threads, Coordinating Threads, Interrupting Threads, Runnable Interface Applets: Applet

SYLLABI

B. Tech. - Computer Science & Engg.  2015 admissions onwards

Architecture - Parameters to Applet - Embedding Applets in Web page, Component diagrams and Deployment diagrams.

TEXTBOOK:

REFERENCES:

15CSE211  DESIGN AND ANALYSIS OF ALGORITHMS  3 1 0 4

(Pre-requisite: 15CSE201 Data Structures and Algorithms)

Unit 1

Unit 2

Unit 3

TEXTBOOK:
SYLLABI
B. Tech - Computer Science & Engg. 2015 admissions onwards

REFERENCES:

15CSE212 INTRODUCTION TO EMBEDDED SYSTEMS

Unit 1

Introduction to 80486, Pentium, and Core Architectures.

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

SYLLABI
B. Tech - Computer Science & Engg. 2015 admissions onwards


15CSE213 OPERATING SYSTEMS

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

15CSE281 DATA STRUCTURES LAB.

Object Oriented Programming, Using Arrays and Array Lists, Linked list: Implementation using Arrays, Application of Linked Lists, Stacks: Array implementation, Linked Implementation, and Applications, Queues: Array implementation, Linked Implementation and Applications, Using linear data structures in Recursion,
Scheduling, and other practical applications, Implementing Priority Queues and using existing implementation for applications, Binary search tree and Application, Graph ADT, Traversal, Modelling Problems using Graphs, Minimum Spanning Trees, Hash Table and Dictionary Applications.

**15CSE282 ** OBJECT - ORIENTED PROGRAMMING LAB.  0 0 2 1

Input / Output statements, Manipulators, Structures, Classes, Objects, Static members and functions, Constructors and destructors, Constructor overloading, Function overloading, Forms of inheritance, Exception handling, Interfaces, Multithreading, Thread Synchronization, Applets.

**15CSE285 ** EMBEDDED SYSTEMS LAB.  0 0 2 1

Intel 8086 Assembly program for Arithmetic and Logical Operations, Intel 8086 Procedures and Macros. ARM Assembly program for Arithmetic and Logical Operations, ARM Assembly program for Multi-byte Operations, ARM Assembly program for Control Manipulation, ARM Assembly program for String Manipulation, ARM Assembly program for Thumb Instructions, Embedded C Programming using Keil Simulator - Simple C Programs, Port Programming, Peripheral Interfacing – Keypad, Motor, LED.

**15CSE286 ** OPERATING SYSTEMS LAB.  0 0 2 1


Case Study / project: Mobile OS: Android, iOS – NachOS / Minix / Linux Kernel: study of any one module

**15CSE301 ** COMPUTER ORGANIZATION AND ARCHITECTURE  3 0 0 3

Unit 1
SYLLABI  B. Tech - Computer Science & Engg.  2015 admissions onwards

B. Tech - Computer Science & Engg.

15CSE303  THEORY OF COMPUTATION  3 0 0 3

Unit 1
Automata and Languages: Chomsky hierarchy of languages, Introduction Finite Automata - Regular Expressions - Nondeterministic Finite Automata - equivalence of NFAs and DFAs – Minimization of DFA.

Unit 2
Regular Expressions - Non-Regular Languages - Pumping Lemma for regular languages.

Unit 3

TEXTBOOK:

REFERENCES:
Networks, Inside a Router, The Internet Protocol (IP) - Forwarding and Addressing in the Internet, Routing Algorithms, Routing in the Internet, Broadcast and Multicast Routing.

Unit 3

TEXTBOOK:

REFERENCES:

15CSE313 SOFTWARE ENGINEERING 2 0 2 3

Unit 1

Unit 2

Unit 3

REFERENCES:
**15CSE331 ADVANCED ALGORITHMS AND ANALYSIS  3 0 0 3**

**Unit 1**
Algorithm Analysis - Methodologies for Analyzing Algorithms, Asymptotic growth rates, Amortized Analysis. Number Theory: Preliminaries, FLT, Euclid’s algorithm (extended). Totient function, Sieve for primes, Inverse modulo n, Modular exponentiation. Applications of graph algorithms: Topological sort, Strongly Connected Components, Bi-connected Components, Bridges, Articulation points. All Pair Shortest Paths, Single Source Shortest Paths. Computational Geometry: Convex Hull, closest pair of points in 2D, the triangle with smallest perimeter in 2D, Determining whether a set of line segments have one or more intersections.

**Unit 2**
Applications of Divide-and-Conquer, Greedy techniques and Dynamic Programming - Knapsack, Median finding, Scheduling algorithms, Party planning, bitonic TSP etc.. String matching algorithms: KMP, Rabin Karp, Aho-Corasick, 2D queries, efficient algorithms for longest palindrome, Longest Common Substring.

**Unit 3**

**TEXTBOOK:**

**REFERENCES:**

**15CSE332 ADVANCED COMPUTER ARCHITECTURE  3 0 0 3**

**Unit 1**
Instruction Level Parallelism: ILP – Concepts and challenges - Hardware and software approaches – Dynamic scheduling – Speculation - Compiler techniques for exposing ILP– Branch prediction. VLIW & EPIC – Advanced compiler support –

**15CSE333 ADVANCED DATABASE MANAGEMENT SYSTEMS  2 0 2 3**

**Unit 1**

**Unit 2**
Information Retrieval Systems, Databases – Multidimensional Indexes - Data Cubes, Grid Files, R-trees.
Unit 3

TEXTBOOK:

REFERENCES:

15CSE334
BIG DATA ANALYTICS 3 0 0 3

Unit 1

Unit 2

Unit 3
Hadoop Eco systems: Hive – Architecture - data type - File format – HQL – SerDe - User defined functions - Pig: Features – Anatomy - Pig on Hadoop - Pig Philosophy - Pig Latin overview - Data types - Running pig - Execution modes of Pig - HDFS commands - Relational operators – Eval Functions - Complex data type - Piggy Bank - User defined Functions - Parameter substitution - Diagnostic operator.


TEXTBOOK:

REFERENCES:

15CSE335
BIOINFORMATICS 3 0 0 3

Unit 1

Unit 2

Unit 3

TEXTBOOK:
15CSE336

BIOMETRICS

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

15CSE337

CLOUD COMPUTING AND SERVICES

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

15CSE338

COMPUTATIONAL INTELLIGENCE

Unit 1

Unit 2

Unit 3
Fuzzy Logic: Fuzzy sets, properties, membership functions, fuzzy operations. Fuzzy logic and fuzzy inference and applications, Evolutionary Computation - constituent algorithms, Swarm intelligence algorithms - Overview of other bio-
inspired algorithms - Hybrid approaches (neural networks, fuzzy logic, genetic algorithms etc.)

**TEXTBOOKS:**

**REFERENCES:**

**15CSE339 COMPUTER SYSTEMS ENGINEERING 3 0 0 3**

**Unit 1**
Introduction to systems - Complexity in computer systems - Abstractions and naming - Modularity with client / server - Operating system structure - Clients and servers within a computer - Virtualizing processors: threads – Performance.

**Unit 2**
Introduction to networks - Layering and link layer - Network layer, routing - End-to-end layer - Congestion control - Distributed naming - Reliability - Atomicity concepts - Recoverability – Isolation

**Unit 3**

**TEXTBOOKS:**

**REFERENCES:**

**SYLLABI B. Tech - Computer Science & Engg. 2015 admissions onwards**

**15CSE340 COMPUTER VISION 3 0 0 3**

**Unit 1**

**Unit 2**

**Unit 3**
Recognition - object detection, face recognition, instance recognition, category recognition, Stereo Correspondence – Epipolar geometry, correspondence, 3D reconstruction.

**TEXTBOOK:**

**REFERENCES:**

**15CSE341 CRYPTOGRAPHY 3 0 0 3**

**Unit 1**

**Unit 2**
## Unit 3


**TEXTBOOK:**

**REFERENCES:**

### 15CSE342 DATA COMPRESSION 3 0 0 3

#### Unit 1

#### Unit 2

#### Unit 3

**TEXTBOOK:**

**REFERENCES:**

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## Unit 1
Introduction to Design Patterns: Significance – Software Design and patterns – Model – View - Controller.

#### Unit 2
Observer Pattern - Decorator Pattern - Factory Pattern - Singleton Pattern - Command Pattern - Adapter and Facade Patterns - Template


#### Unit 3

**TEXTBOOK:**

**REFERENCES:**

### 15CSE344 DIGITAL WATERMARKING 3 0 0 3

#### Unit 1

#### Unit 2

#### Unit 3

**TEXTBOOK:**

**REFERENCES:**
15CSE345 DISTRIBUTED EMBEDDED SYSTEMS 3 0 0 3

Unit 1
Parallels between the large-scale (Internet-based) and small-scale networked distributed embedded system domains.

Unit 2
Topics in distributed embedded systems: real-time systems, models, communication and scheduling, design and validation, implementation, performance, power and cost, embedded network protocols.

Unit 3
Basics of embedded system security, distributed cyber physical systems that includes integration of protocols, middleware services, and tools into a common architecture with layered, reusable, secure, fault-isolating components, project case studies for distributed embedded systems.

TEXTBOOK:

REFERENCES:

15CSE346 EMBEDDED PROGRAMMING 2 0 2 3

Unit 1
Basics of Embedded Systems – Definition, Characteristics, Challenges, Embedded Programming Concepts: Role of Infinite loop – Compiling, Linking and locating,

TEXTBOOK:

REFERENCES:

15CSE347 ENTERPRISE ARCHITECTURE 3 0 0 3

Unit 1
Enterprise architecture (EA) principles and purpose; modelling approaches for EA definition and communication; key enterprise architecture approaches, standards, and frameworks; best practice for development of enterprise architecture, analysis of alternative models for enterprise architectures; best practice approaches and models for documenting enterprise architectures.
Unit 2
Evaluation of alternative enterprise architecture approaches, identification and evaluation of gaps and opportunities in different enterprise architecture models and processes; models of different aspects of the enterprise architecture processes and artefacts, and architectures at different levels, including conceptual and technical.

Unit 3

TEXTBOOKS:

REFERENCES:

15CSE348 HUMAN COMPUTER INTERFACE 2 0 2 3

Unit 1

Unit 2
Interfaces: Types - Natural User Interfaces, Data Gathering: Key Issues - Data Recording – Interviews – Questionnaires – Observation - Choosing and Combining Technique. Data Analysis, Interpretation and Presentation: Qualitative and Quantitative – Simple Analysis – Tools -Theoretical Frameworks - Presenting the Findings.

Unit 3
15CSE350 INFORMATION RETRIEVAL 3 0 0 3

Unit 1

Unit 2

Unit 3
Web search basics – Web crawling and indexes – Link analysis.

TEXTBOOK:

REFERENCES:

15CSE351 INFORMATION SECURITY 3 0 0 3

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

15CSE352 INTELLIGENT SYSTEMS 3 0 0 3

Unit 1
Introduction to agents – Structure of intelligent agents, Problem solving agents – Formulating problems – Overview of uninfomed searching strategies, informed search methods, Game playing as search.

Unit 2

Unit 3
Agents acting under uncertainty - probability notation - Bayes rule, Probabilistic reasoning - Belief networks – Utility theory - Decision network - Value of information learning agents – Learning from Observations – Knowledge in Learning, Case studies on applications of AI.

TEXTBOOK:

REFERENCES:

15CSE353 INTRODUCTION TO INTELLECTUAL PROPERTY RIGHTS 3 0 0 3

Unit 1
Introduction to IPR - Overview & Importance, IPR in India and IPR abroad; Patents - their definition, granting, infringement, searching & filing, utility Models an introduction; Copyrights - their definition, granting, infringement, searching & filing, distinction between related and copy rights.
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Unit 2
Trademarks - role in commerce, importance, protection, registration, domain names; Industrial Designs - Design Patents, scope, protection, filing infringement, difference between Designs & Patents.

Unit 3
Geographical indications, international protection; Plant varieties; breeder's rights, protection; biotechnology & research and rights managements; licensing, commercialisation; legal issues, enforcement; Case studies in IPR.

TEXTBOOK:

15CSE355 MODELLING AND SIMULATION 3 0 0 3

Unit 1

Unit 2

Unit 3

REFERENCES:

15CSE356 MULTIMEDIA DATABASES 2 0 2 3

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

15CSE357 NAND2TETRIS: BUILDING COMPUTERS 2023 FROM FIRST PRINCIPLES

Unit 1

Unit 2
Computer Architecture: Integrating Chip-sets – Building an Assembler – Virtual Machine I: Implementing a VM to translate from VM language into assembly language – Virtual Machine II: Complete VM implementation as the back-end component of Compiler.

Unit 3
High Level Language: Introduction to Jack a high-level object-based language – Compiler I: Building a Syntax analyzer for Jack – Compiler II: Morphing syntax analyzer into a full-scale compiler – Operating System: Design and Implementation of some classical arithmetic and geometric algorithms needed for OS implementation.

TEXTBOOK:

REFERENCES:

15CSE358 NATURAL LANGUAGE PROCESSING 3003

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

15CSE259 OS FOR SMART DEVICES (ANDROID AND IOS) 2023

Unit 1
iOS: Top down view of iOS – System Start-up Procedure iBoot – Processes - Threads – virtual memory - File Systems – Security Architecture - Internal API used by the system - BSD and Mach- Dissecting the kernel, XNU, into its sub components: Mach, the BSD Layer, and I/o kit - Inner workings of device drivers. Objective C – Swift Programming - Xcode, Cocoa Touch API, memory management, user input and gesture recognition, data persistence including Core Data, SQLite, NSUserDefaults and Plists. Working with audio, video and the accelerometer. Simple Applications development.

Unit 2
Android: Introduction - Introduction to the Linux kernel - Compiling and booting the Linux kernel - Understanding the Android Internals - Understanding the Android Build System - Customizing Android for a specific hardware - Building and booting Android.

Android changes to the Linux kernel - Android boot-loaders - Booting Android - Using ADB - Android file-system. Android build system - Adding a new module and
Unit 3
Android framework for applications - Introduction to application development - 
Android packages - Advice and resources - Application ecosystem - web 
technologies in Mobile OS - Hardware accelerated graphics through OpenGL ES - 
ANDROID support for all the common wireless mechanisms: GSM, CDMA, UMTS, 
LTE, Bluetooth, WiFi, NFC.

Case Study: Extending the Android framework for ARM-based hardware.

TEXTBOOKS:

REFERENCES:
   2013.
2. Earlence Fernandes, “Instant Android Systems Development How To”, PACKT Publishing, 
   2013.

15CSE360 PARALLEL AND DISTRIBUTED COMPUTING 3 0 0 3

Unit 1
Compilers - Scientific Algorithms – History - State-of-Art and Perspective - Things 
that are not Traditional Supercomputers. Parallel Computing - PDC models working 
mechanism - scalability of PDC architectures – applications, performance metrics 
and Amdahl’s Law.

Unit 2
Models and Algorithms - PRAM algorithms, Process-level parallelism, data-level 
parallelism, Problem partitioning, divide-and-conquer, Distributed algorithms – 
Algorithm design techniques - filters / client, server, heartbeat, probe / echo, token 
passing, replicated servers Communication - Interconnection network design, 
Topological and parametric models of interconnection networks; routing mechanisms; 
flow control mechanisms, communication protocols, Communication primitives - 
Point-to-point communication primitives; group communication patterns; broadcast 
in distributed systems, CSP, MPI; Synchronization - Locks, monitors, barriers; 
deadlock; hardware primitives and implementation issues; clock synchronization, 
distributed mutual exclusion; distribute deadlock detection.

TEXTBOOK:
Wilkinson B and Allen M, “Parallel Programming Techniques and Applications using Networked 

REFERENCES:
SYLLABI
B. Tech - Computer Science & Engg.  
2015 admissions onwards

15CSE362  PERVASIVE COMPUTING  3 0 0 3

Unit 1
Basics: Some Computer Science Issues in Ubiquitous Computing, Pervasive Computing:

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

15CSE363  PRINCIPLES OF DIGITAL IMAGE PROCESSING  3 0 0 3

Unit 1

TEXTBOOK:
REFERENCES:

15CSE364  REAL–TIME COMPUTING SYSTEMS  3 0 0 3

Unit 1

Unit 2
Unit 3

TEXTBOOK:

REFERENCES:

15CSE365 SCIENTIFIC COMPUTING 3 0 0 3

Unit 1
Systems of Linear Algebraic equations: Introduction, Gauss Elimination Method, LU decomposition, Symmetric and banned coefficient Matrices, Pivoting, Matrix Inversion, Iterative Methods, Other methods.

Unit 2
Interpolation and Curve Fitting: Polynomial Interpolation, Least square fit, Other methods; Roots of equations: Search Methods, Method of Bisection, Roots of Equations, Brent’s method, Newton Raphson Method, Systems of Equations, Zeros of Polynomials

Unit 3
Numerical Differentiation: Finite Difference approximations; Numerical Integration; Initial Value Problems; Two-Point Boundary Value Problems; Symmetric Matrix Eigen value problems; Introduction to Optimization.

TEXTBOOK:

15CSE366 SEMANTIC WEB 3 0 0 3

Unit 1
The semantic web vision - introduction to semantic web technologies - a layered approach, Describing web resources - RDF data model, RDF syntax, RDF Schema, Querying the semantic web - SPARQL infrastructure, matching patterns, Filters, organizing the results, querying the schema, adding information with SPARQL update.

TEXTBOOK:

REFERENCES:
TEXTBOOK:

REFERENCES:

15CSE368 SOFTWARE QUALITY ASSURANCE 3 0 0 3

Unit 1

Unit 2
Software Measurement and Metrics - Walkthroughs and Inspections - ISO 9001 - What is ISO 9001 - What CMMI - Introduction to CMMI is for development - Process Area Components - Understanding Capability Levels - Introduction to People CMM.

Unit 3

TEXTBOOK:

REFERENCES:

Unit 3

TEXTBOOK:

REFERENCES:

15CSE371 WIRELESS AND MOBILE COMPUTING 3 0 0 3

Unit 1

Unit 2


Unit 3

TEXTBOOK:

REFERENCES:
Unit 3

TEXTBOOK:

REFERENCES:

15CSE373 NET CENTRIC PROGRAMMING 2 0 2 3

Unit 1

Unit 2

Unit 3
Middleware Architecture: CORBA, MULE, ACTIVE MQ.

TEXTBOOKS:
15CSE401 / 15CSE490  LIVE-IN-LAB.  3 cr

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

15CSE401  MACHINE LEARNING AND DATA MINING  3 0 0 3

Unit 1

Unit 2
Introduction to data mining - challenges and tasks, measures of similarity and dissimilarity, Classification - Rule based classifier, Nearest - neighbour classifiers - Bayesian classifiers - decision trees; support vector machines, Class imbalance problem performance evaluation of the classifier, comparison of different classifiers.

Unit 3

TEXTBOOKS:

REFERENCES:

15CSE402  STRUCTURE AND INTERPRETATION OF COMPUTER PROGRAMS  3 1 0 4

Unit 1
Introduction to LISP and Scheme – Building abstractions with procedures: Elements of programming procedures and processes they generate – Formulating abstracts with higher-order procedures.

Unit 2
Building abstractions with data: Introduction to data abstraction – Hierarchical data and the closure property – Symbolic data – Multiple representations for abstract data – Systems with generic operations.

Unit 3
Modularity, object and state: Assignment and local state – Environment model of evaluation – Modeling with mutable data – Concurrency – Streams

TEXTBOOK:

REFERENCES:

15CSE411  SOFTWARE PROJECT MANAGEMENT  3 0 0 3

Unit 1

Unit 2
Activity planning - project schedules - sequencing and scheduling projects - Network planning models - AON and AOA - identifying critical activities - crashing and fast tracking, Risk management: Categories, Risk planning, management and control -
Evaluating risks to the schedule, PERT. Resource allocation - identifying resource requirements - scheduling resources - creating critical paths - publishing schedule - cost schedules - sequence schedule.

Unit 3
Monitoring and control – Visualizing progress, Earned value analysis – Managing people and organizing teams – organizational structures - Planning for small projects.

Case Study: PMBOK. Agile Development.

TEXTBOOK:

REFERENCES:

15CSE430 PROJECT BASED ELECTIVE

Project based electives introduced to help students merge the theoretical and practical aspects of computer science and learn the subject through live projects. They enable the students to get hands-on experience in the latest trends in computer science. The expected outcome is a minor project on a problem identified.

15CSE481 MACHINE LEARNING AND DATA MINING LAB.

This should be a Case Study involving classification including document classification or clustering including graph clustering with applications like recommendation systems, advertising on the web, using ML tools.

15CSE495 PROJECT PHASE I

More credits for practical application of Computer Science and help students innovate. Support for publications, patenting and entrepreneurship through such efforts.

Identifying the domain, literature survey, problem definition, design, and partial implementation.

15CSE499 PROJECT PHASE II

More credits for practical application of Computer Science and help students innovate. Support for publications, patenting and entrepreneurship through such efforts.

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

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;

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

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

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
10. Yoga in Daily Life - Swami Sivananda – published by Divine Life Society
12. All about Hinduism – Swami Sivananda - Published by Divine Life Society
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 Telkes, 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.
3. To work towards excellence, one must know where he is. Our present state... An introspective analysis. Our faculties within.

Unit 2
4. The play of the mind. Emotions – convert weakness into strength.
5. The indispensable role of the intellect. How to achieve and apply clear thinking?
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6 The quagmire of thought. The doctrine of Karma – Law of Deservance.
7 Increase Productivity, reduce stress, work patterning.

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

REFERENCES:
The Bhaja Govindam and the Bhagavad Gita.

15CUL232  EXPLORING SCIENCE AND TECHNOLOGY  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;

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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 Abhyasa and Vairagya - Foundation of Abhyasa - Foundation of Vairagya.

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 - Pratyaharah - Mastery
over the senses.

Report review

Conclusion

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

15ECE202 DIGITAL CIRCUITS AND SYSTEMS 3 1 0 4

Unit 1
Introduction to logic families: ECL – TTL - Tri state logic. Implementation technology:
Transistor switches - NMOS logic gates - CMOS logic gates - Negative logic
systems. Introduction to logic circuits: Variables and functions, inversion- Truth
tables- Logic gates and Networks - Boolean algebra - Synthesis using gates -

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
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15EEE111  FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Unit 1

Unit 2
Reactance and Impedance; Response in RLC circuits to sinusoidal voltage; Real and Reactive Power, Power factor; Complex Power and Power Triangle - Introduction to Three Phase Systems; Balanced 3-Phase STAR and DELTA connections of Load, Three phase power - Measuring Instruments for AC and DC quantities; Instruments to measure Voltage, Current, Power and Energy - Electromagnetic Induction; Magnetic Circuit Elements; Self and Mutual Inductances - Classification and Applications of Electrical Machines; Torque, Output Power and Efficiency. 3-Phase Induction Motor - Principle of operation, Slip, Torque-speed relation; Single Phase and Three Phase Transformers - Principle of Operation, turns ratio and Connections.

Unit 3

TEXTBOOK:

REFERENCES:

15EEE180  WORKSHOP B

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

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

15ENG111  COMMUNICATIVE ENGLISH

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

Prose:
i. Higher Mathematics by R. K. Narayan

Short Stories:
i. Best Investment I Ever Made by A. J. Cronin

ii. Death of an Indian by Krishna Charan Das

15ENG230 BUSINESS COMMUNICATION

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.
15ENG232  INSIGHTS INTO LIFE THROUGH 1022
ENGLISH LITERATURE

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

Unit 2 Short Stories

Unit 3 Prose

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

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

15ENG233  TECHNICAL COMMUNICATION 1022

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


Unit 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.

15ENG234  INDIAN SHORT STORIES IN ENGLISH 1022

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


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

TEXT:

REFERENCE:

15ENV300  ENVIRONMENTAL SCIENCE AND SUSTAINABILITY 3003

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

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

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

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

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

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

Unit 3

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

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

TEXTBOOKS / REFERENCES:

15FRE230 PROFICIENCY IN FRENCH LANGUAGE (LOWER) 1022

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

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

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

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

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

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

TEXTBOOK:
Metro St Michel - Publisher: CLE international
15FRE231  PROFICIENCY IN FRENCH LANGUAGE (HIGHER)  1 0 2 2

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

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

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

Grammar - Perfect past tense with être and avoir (continuation); Possessive adjectives (notre, votre, leur); Prepositions (à, pour, avec...); Pronoun as direct object (le, la, l', les).

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

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

TEXTBOOK:
Metro St Michel - Publisher: CLE International

15GER230  GERMAN FOR BEGINNERS I  1 0 2 2

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

Numbers 1-100; Saying the telephone number.

Countries and Languages.

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

Vocabulary: Professions.

15GER231  GERMAN FOR BEGINNERS II  1 0 2 2

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.
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Grammar: Possessive articles; Divisible and indivisible verbs.

Vocabulary: Family circle; Household articles.

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

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

Some useful websites will be given.

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

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

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

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

Some German culture. Films.

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

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

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

**15HIN111  HINDI II  1 0 2  2**

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

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

**Unit 2**
Communicative Hindi - Moukhik Abhivyakthi

**Unit 3**
Audio-Visual Media in Hindi – Movies like Tare Zameen par, Paa, Black etc., appreciation and evaluation. News reading and presentations in Radio and TV channels in Hindi.
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Unit 4
Gadya Manjusha – Budhapa, Kheesa, Sadachar ka Thavis

Unit 5

BOOKS:
2. Gadya Manjusha: Editor: Govind, Jawahar Pustakalay, Mathura

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

Unit 3
Selected writings / selections from the complete works of the following authors will be taken up for study in a chronological order:
Swami Vivekananda; Sri Aurobindo; Ananda K. Coomaraswamy; Sister Nivedita; Mahatma Gandhi; Jawaharlal Nehru; B.R. Ambedkar; Sri Chandrasekharendra Saraswati, the Paramacharya of Kanchi; Dharampal; Raja Rao; V.S. Naipaul.

Conclusion.

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

SYLLABI  B. Tech - Computer Science & Engg.  2015 admissions onwards

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:

SYLLABI  B. Tech - Computer Science & Engg.  2015 admissions onwards

Unit 1
Introduction
A peep into India’s glorious past
Ancient India – the vedas, the vedic society and the Sanatana Dharma – rajasamandala 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 Arhasastra – Chandragupta Maurya and the rise of the Mauryan

15HUM230  EMOTIONAL INTELLIGENCE  2002

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

Unit 2

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

REFERENCES:

15HUM231  GLIMPSES INTO THE INDIAN MIND: 2002

Unit 1
Introduction
A peep into India’s glorious past
Ancient India – the vedas, the vedic society and the Sanatana Dharma – rajasamandala 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 Arhasastra – Chandragupta Maurya and the rise of the Mauryan

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 – rajasamandala 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 Arhasastra – 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 wreaked on Indian culture and civilization; Macaulay and the start of the distortion of Indian education and history; Indian economy – before and after colonization: a brief survey; The emergence of modern India.

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

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

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

REFERENCES:
GLIMPSES OF INDIAN ECONOMY AND POLITY  2 0 0 2

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

Ancient India – up to 600 B.C.
Early India – the vedic society – the varnashramadharma – socio-political structure of the various institutions based on the four purusartha; The structure of ancient Indian polity – Rajamandala and Mahabhara; 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 gopati to bhupati; The mahajanapadas and the emergence of the srenis – states and cities of the Indo-Gangetic plain.

Unit 2
Classical India: 600B.C. – 1200 A.D.
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 Kautila’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, Rashtrakutas and Cholas

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

Unit 3
Modern India: 1720 - 1947
the Indian market and economy before the arrival of the European traders;Colonisation and British supremacy (dismantling of everything that was ‘traditional’ or ‘Indian’) – British attitude towards Indian trade, commerce and economy and the resultant ruin 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.

15HUM234 HEALTH AND LIFE STYLE

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

Practicals - Therapeutic Diets

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

Practicals - Ethnic Foods

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

Practical - Cooking without Fire or Wire-healthy Snacks

TEXTBOOKS:

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

15HUM235 INDIAN CLASSICS FOR THE TWENTY-FIRST CENTURY

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

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

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

REFERENCE:
The Bhagavad Gita, Commentary by Swami Chinmayananda

15HUM236 INTRODUCTION TO INDIA STUDIES

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

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

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

Unit 2 Modern India: Challenges and Possibilities.

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

Unit 3 Modern Indian Writing in English: Trends in Contemporary Indian Literature in English.
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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, Adwaita Ashrama publication.
3. Invitations to Indian Philosophy, T. M. P. Mahadevan, University of Madras, Chennai.
4. Outlines of Indian Philosophy, M. Hiriyanam, 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. Selections from The Cultural Heritage of India, 6 volumes, Ramakrishna Mission Institute of Culture (Kolkata) publication.
10. Invitations to Indian Philosophy, T. M. P. Mahadevan, University of Madras, Chennai.
12. Selections from The Cultural Heritage of India, 6 volumes, Ramakrishna Mission Institute of Culture (Kolkata) publication.
14. Invitations to Indian Philosophy, T. M. P. Mahadevan, University of Madras, Chennai.
15. An Advanced History of India, R. C. Majumdar et al, Macmillan.
16. Selections from The Cultural Heritage of India, 6 volumes, Ramakrishna Mission Institute of Culture (Kolkata) publication.
18. Invitations to Indian Philosophy, T. M. P. Mahadevan, University of Madras, Chennai.
19. An Advanced History of India, R. C. Majumdar et al, Macmillan.
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22. Invitations to Indian Philosophy, T. M. P. Mahadevan, University of Madras, Chennai.
24. Selections from The Cultural Heritage of India, 6 volumes, Ramakrishna Mission Institute of Culture (Kolkata) publication.
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78. Invitations to Indian Philosophy, T. M. P. Mahadevan, University of Madras, Chennai.
79. An Advanced History of India, R. C. Majumdar et al, Macmillan.
80. Selections from The Cultural Heritage of India, 6 volumes, Ramakrishna Mission Institute of Culture (Kolkata) publication.
81. Select...
Youth and Yoga: History, philosophy and concept of Yoga, Myths and misconceptions about Yoga, Different Yoga traditions and their impacts, Yoga as a preventive and curative method, Yoga as a tool for healthy life style

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


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

Project Work / Practical

15HUM239 PSYCHOLOGY FOR EFFECTIVE LIVING 2002

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

Unit 2 The Nature and Coping of Stress

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

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

REFERENCE BOOKS:

15HUM240 PSYCHOLOGY FOR ENGINEERS 2002

Unit 1
Psychology of Adolescents: Adolescence and its characteristics.

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

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

TEXTBOOKS:

REFERENCE BOOKS:

15HUM241 SCIENCE AND SOCIETY – AN INDIAN PERSPECTIVE 2002

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

Unit 2
Indian 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 2 0 0 2

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

GanapatraVibhaga Yoga: Dynamics of the Three Gunas: Tamas, Rajas, Sattva – Going Beyond the Three Gunas – Description of a Gunatheetha.

TEXTBOOKS / REFERENCES:

15HUM243 THE MESSAGE OF THE UPAISHADS 2 0 0 2

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

Unit 1
An Introduction to the Principal Upanishads and the Bhagavad Gita - Inquiry into the mystery of nature - Sruti versus Smrti - Sanatana Dharma: its uniqueness - The Upanishads and Indian Culture - Upanishads and Modern Science.
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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 Jaba, Svetaketu, Nachiketas, Upakosala, Chakrayana Ushasti, Railva, Kapila and Janaka. Important verses from Upanishads - Discussion of Sage Pippalada’s answers to the six questions in Prasнопаншир.

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

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

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

Cookery Practicals - Balanced Diet

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

Practicals - Traditional Foods

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

Practicals - Value added foods

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TEXTBOOKS:

REFERENCE BOOKS:

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

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

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

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

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

Students will be given detailed lectures on Calligraphy.

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

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

15KAN101 KANNADA I 1 0 2 2

OBJECTIVES: To enable the students to acquire basic skills in functional language; to develop independent reading skills and reading for appreciating literary works; to analyse language in context to gain an understanding of vocabulary, spelling, punctuation and speech.
Unit 1
Adalitha Kannada: bhashe, swaroopa, belavaniyega kiru parichaya
Paaribhaashika padagalu
Vocabulary Building

Unit 2
Prabhandha – Vyaaghra Geethe - A. N. Murthy Rao
Prabhandha – Baredidi…baredidi, Baduku mugiyuvudilla allige…- Nemi Chandra
Paragraph writing – Development: comparison, definition, cause & effect
Essay – Descriptive & Narrative

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

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

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

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

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

Unit 2
Nanna Hanate - Dr. G. S. Shivarudrappa
Mankuthimmana Kaggada Ayda bhagagalu – D. V. Gundappa (Padya Sanikhye 5, 20, 22, 23, 25, 44, 344, 345, 346, 601)
Elia Marethiruvaga - K. S. Nissaar Ahmed
Saviraru Nadigalu – S Siddalingaya

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 – Chetana Publication, Mysuru
2. Dr. G. S. Shivarudrappa – Samagra Kavya. - Kamadhenu Pustaka Bhavana
4. K. S. Nissar Ahmed – 75 Bhaavageetegalu – Sapna book house
5. Dr. Da. Ra. Bendre – Saayo Aata – Shri Maata Publication

15MAL101 MALAYALAM I 1 0 2 2

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

Unit 1
Ancient poet trio: Adhystmaramayanam, Lakshmana Swanthanam (valsa soumitre… mungikidakayal), Ezuthachan - Medieval period classics – Jnanappana (kalaminnu… vilasangalingane), Poonthanam
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Unit 2

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

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

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

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

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Unit 2

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

Unit 4
Part of an autobiography / travelogue: Kannerum Kinavum, V. T. Bhattachiripadu - 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. 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:

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


**TEXTBOOKS:**

**REFERENCE BOOKS:**
15MAT213            PROBABILITY AND RANDOM PROCESSES            3 1 0  4

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

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

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

Unit 3

TEXTBOOKS:

REFERENCE BOOKS:

15MAT301            LINEAR ALGEBRA, QUEUING THEORY AND OPTIMIZATION            3 1 0  4

Unit 1
Introduction to Linear Algebra: Review of matrices and linear systems of equations.

Vector spaces and subspaces, linear independence, basis and dimensions, linear transformations, orthogonality, Orthogonal basis, Gram Schmidt Process, least-square applications.

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Unit 2

Unit 3

TEXTBOOKS:

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

15PHY100 PHYSICS 3 0 0 3

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


Unit 2 Atomic Structure and Quantum Mechanics

15PHY181 PHYSICS LAB. 0 0 2 1

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

15PHY230 ADVANCED CLASSICAL DYNAMICS 3 0 0 3

Unit 1
Introduction to Lagrangian dynamics
Survey of principles, mechanics of particles, mechanics of system of particles, constraints, D’Alembert’s principle and Lagrange’s equation, simple applications of the Lagrangian formulation, variational principles and Lagrange’s equations, Hamilton’s principles, derivation of Lagrange’s equations from Hamilton’s principle, conservation theorems and symmetry properties.
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**Unit 2**  
Central field problem  
Two body central force problem, reduction to the equivalent one body problem, Kepler problem, inverse square law of force, motion in time in Kepler's problem, scattering in central force field, transformation of the scattering to laboratory system, Rutherford scattering, the three body problem.

Rotational kinematics and dynamics  
Kinematics of rigid body motion, orthogonal transformation, Euler's theorem on the motion of a rigid body.

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

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

**TEXTBOOKS:**

**REFERENCE BOOKS:**

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

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

**Unit 1**  

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

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


**Unit 3**  

**TEXTBOOKS AND REFERENCES:**

**15PHY234 INTRODUCTION TO COMPUTATIONAL PHYSICS  3 0 0 3**

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

Integration: Newton - cotes expression for integral, trapezoidal rule, Simpsons’s rule, Gauss quadrature method.
Unit 2


Unit 3

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

TEXTBOOK:
Rubin H Landau & Manuel Jose Paez Mejia, “Computational Physics”, John Wiley & Sons

REFERENCES:
Suresh Chandra, “Computer Applications in Physics”, Narosa Publishing House, New Delhi
M Hjøroth Jensen, Department of Physics, University of Oslo, 2003 (Available in the Web)

15PHY238 ELECTRICAL ENGINEERING MATERIALS 3 0 0 3

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

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

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

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

15PHY241  LASERS IN MATERIAL PROCESSING  3 0 0 3

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

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


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

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

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

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

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

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

REFERENCES:
**15PHY243 MICROELECTRONIC FABRICATION 3 0 0 3**

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

**Unit 2**
Physics of ion implantation: Coulombic scattering and projected range, nuclear and electronic stopping, channeling, implantation damage removal, dopant activation by rapid thermal annealing; principles of optical lithography – optics and diffraction, light sources and spatial coherence, physics of pattern transfer, 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

**REFERENCES:**

**15PHY245 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 confinements 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

**15PHY247 PHOTOVOLTAICS 3 0 0 3**

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

Unit 2


Unit 3

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

TEXTBOOK:

REFERENCES:

15PHY248 PHYSICS OF LASERS AND APPLICATIONS 3 0 0 3

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


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

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

Unit 3
Types of LASERS

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

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15PHY250 QUANTUM PHYSICS AND APPLICATIONS 3 0 0 3

Unit 1

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

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

Unit 3

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

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

REFERENCES:

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15PHY251 THIN FILM PHYSICS 3 0 0 3

Unit 1

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

Unit 2

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

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

Mechanical behaviors: stress, adhesion, hardness, stiffness.

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

TEXTBOOK:

REFERENCES:
**15PHY331 ASTRONOMY 3 0 0 3**

**Unit 1**

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

**Unit 3**

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

**REFERENCE BOOK:**

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**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 cardiology – resolution – speckle - ultrasound imaging - therapeutic use of ultrasound - use in diagnostics of cardiac problems.


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

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

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


**TEXTBOOK:**

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

**15PHY338  PHYSICS OF SEMICONDUCTOR DEVICES  3 0 0 3**

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


**Unit 2**

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

**Unit 3**


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

**TEXTBOOKS:**

REFERENCES:

15PHY532 ASTROPHYSICS 3 0 0 3

Unit 1

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

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

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

Unit 2

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

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


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

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

15PHY535 EARTH’S ATMOSPHERE 3 0 0 3

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

Unit 2

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

Unit 4
Hurricanes (cyclones, typhoons): tropical weather; anatomy, formation, dissipation and naming of hurricanes. Air pollution: a brief history, types and sources, factors that affect air pollution, the urban environment, acid deposition. Global climate: climatic classification; global pattern of climate.
Unit 5
Climate change: possible causes; carbon dioxide, the greenhouse effect, and recent global warming. Light, colour, and atmospheric optics: white and colours, white clouds and scattered light; blue skies and hazy days, red suns and blue moons; twinkling, twilight, and the green flash; the mirage; halos, sundogs, and sun pillars; rainbows; coronas and cloud iridescence.

TEXTBOOK:

REFERENCE:

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

Unit 1
Introduction: geologic time; earth as a system, the rock cycle, early evolution, internal structure & face of earth, dynamic earth. Matter and minerals: atoms, isotopes and radioactive decay; physical properties & groups of minerals; silicates, important 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:

15PHY540 NONLINEAR DYNAMICS 3 0 0 3

Unit 1
Introduction: examples of dynamical systems, driven damped pendulum, ball on oscillating floor, dripping faucet, chaotic electrical circuits. One-dimensional maps; the logistic map, bifurcations in the logistic map, fixed points and their stability, other one-dimensional maps.
Non-chaotic multidimensional flows: the logistic differential equation, driven damped harmonic oscillator, Van der Pol equation, numerical solution of differential equations.

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

Unit 2
Lyapunov exponents: for one- and two-dimensional maps and flows, for three-dimensional flows, numerical calculation of largest Lyapunov exponent, Lyapunov exponent spectrum and general characteristics, Kaplan-Yorke dimension, numerical precautions.

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

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:
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, Sapthakaraks.

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

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

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

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

ESSENTIAL READING:
1. Praveshaha; Publisher: Samskrita bharati, Aksharam, 8th cross, 2nd phase, girinagar, Bangalore - 560 085
2. Sanskrit Reader I, II and III, R. S. Vadhyar and Sons, Kalpathi, Palakkad
3. Prakriya Bhashyam written and published by Fr. John Kunnappally
4. Sanskrit Primer by Edward Delavan Perry, published by Ginn and Company Boston
5. Sabdamanjanji, R. S. Vadyar and Sons, Kalpathi, Palakkad
6. Namalinganusasanam by Amarasishta published by Travancore Sanskrit series
7. Subhashita Ratna Bhandakara by Kashinath Sharma, published by Nirmayasagar Press
in the professional world. Importance of positive attitude, self motivation and continuous knowledge upgradation.

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

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

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

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

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

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

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

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

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

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

15SSK321  SOFT SKILLS II  1 0 2 2


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

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

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

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

Data sufficiency: Concepts and problem solving.

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

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

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

# REFERENCES:

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

### SOFT SKILLS III

<table>
<thead>
<tr>
<th>Code</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>15SSK331</td>
<td>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.</td>
</tr>
</tbody>
</table>

### CORPORATE SOCIAL RESPONSIBILITY

<table>
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<tr>
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<th>Subject</th>
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</thead>
<tbody>
<tr>
<td>15WK230</td>
<td>Corporate Social Responsibility (CSR) in the Indian context, corporate strategy, CSR and Indian corporate structure. CSR in the Companies Act 2013 (Section 135); Rules under Section 13; CSR committees, CSR policy, CSR expenditure CSR reporting.</td>
</tr>
</tbody>
</table>

### Problem Solving Level IV:

- Geometry
- Trigonometry
- Heights and distances
- Coordinate geometry
- Mensuration
SYLLABI
B. Tech - Computer Science & Engg.  2015 admissions onwards

REFERENCES:

15SWK231 WORKPLACE MENTAL HEALTH  2 0 0 2

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.

SYLLABI
B. Tech - Computer Science & Engg.  2015 admissions onwards

REFERENCES:
2. Canadian Mental Health Association, Ontario “Workplace mental health promotion, A how to guide” www.cmhaontario.ca
4. Mental Health Act 1987 (India) www.tnhealth.org/mha.htm
5. Persons with disabilities Act 1995 (India) socialjustice.nic.in
6. The Factories Act 1948 (India) www.caaa.in/image/19ulabourlawshb.pdf

15TAM101 TAMIL I  2 0 0 2

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

Unit 1
Sangam literature : Kuṟuntokai; (2, 6,8,40 pāṟaḻkai) – puganāṉṟu (74,112,184,192 pāṟaḻkai) – tiṇkkṟṟṟ (iṟṟiṟṟi, amaicchu)

Unit 2
Epic literature: cīlappatikākaram maturai kāṟṟam (valakkūṟkkaṟkai 50-55) Spiritual Literature: tiruppūṟai(3,4) – tīṟṟam (māciiṟṟiṟṟiṟam) Medieval Literature: bāṟṟiṟyara kaṟṟaiṉ pāṟṟṟu (eṉ vilaiyṟṟu pīṟṟḷai) – bāṟṟṟutucchṟ kūṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṛṁ
Unit 4
Tamil Grammar: Col vakaikal - veṟṟumai urupukal - valiṉam ikumikaiñam

Practical skills: Listening, speaking, writing and reading

Textbooks:

- Ĉakīṭakarṇuc cupramoḻigai “nalla kustjontokai mulamurunayum”
  nallai patippakam, 2008.
- Poṇ maṭhāmōr “aadai tamkai ilakkaṇam aḻpoṇ pāḻkappuṟṟ kuriṟṟu, vahiyiṟṛ.
- Puliyēṟr kēciṇa “patamūṭṭuṇu” srīcēṭṭokai patippakam, 2010

1STAM111  TAMIL I  2002

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

Unit 1
The history of Tamil literature: Nāṟṟupatég pāḻṭalkal, katakkal, pāḻmaṇkai -

Syllabi

SYLLABI  B. Tech - Computer Science & Engg.  2015 admissions onwards

Unit 2

tiṟṟai ilakkiyamum ntiṟṟilakkiyamum - paṭṭaṟṉṟekktir korakkatu nūṭal pāḻṟṟaṉa pṍṟṟa
ceytiṟṟu - tirukkuṟṟu (āṟṟu, paṭṭu, kalvi, olakkaṇ, naṭṭu, vāymary, kēḷvi, ceṇṇṟṟi,
periyāṟṟaṟṟuttirkkaiṟṟu, vilippuṟṟavu peṟṟṟa atikāṟṟatiṟṟu ulḷa ceytiṟṟu.

Aṉṟṟalkal: Ulakantiti (1-5) - ilāti (1,3,6).
- Cittarkal: Kaṭūveṟṟi cittar pāḻṭalkal (aḻjantak kalippu -1,4,6,7,8, māṟṟum akappēy cittar pāḻṭalkal (1-5).

Unit 3

tamil ilakkattum. Vāṭṭkai vakaikal - taurvēṟṟi pīṟṟaviṟṟi - nōṭṭkurr u ayakkkurr

Unit 4
tamilka arṭiṟṟarkalu tamil torṭum camutāya torṛṟum: Pāṟṟiyār, pāṟṟatīṟṟeṟṟu,
pāḻukkōṟṟi kalīrāṟṟacumrum, curāṟṟu, cuṟṟāṟu, cūpū, mēṟṟa, āṟṟu pukkumṟu,
nā. Pīccāmūṟṟi, akiṟṟu, kalki, ji. Yū. Pōp, vīṟṟamūṟṟuvaṟṟu, aṟṟiṟṟa, parittirīṟṟu kalaiṇaṛr,
māṟṟuṇmaṇaṟṟiṟṟu.

Unit 5
tamil moḷi āyvīr kaṟṇiṟṟu pāṟṟaṉīṟṟu. - Karṟuttu parimāṇṟṟum - vilāṟṟama
mōdiṟṟaṟṟiṟṟu – pēcču - nāṭakam paṭṭippuṟṟu - cīṟukaiṟṟu, kāḷai, paṭtiruṟṟu paṭṭippuṟṟu.

Textbooks:

- Mu Varāṟṟaṟṟu (“tamil ilakkiya varumāṟṟu”) cīṟṟuva ṅtuiṟṟai pōḻḷikāṭṭam, 2012
- nā. Vīṟṟamūṟṟalai “paṭṭarvaṟṟam, pāḻmaṇkaiṟṟam” nīṟṟu ceṇṇṟṟi
  puttakaiṟṟaṟṟum, 1080.2008
- nā. Vīṟṟamūṟṟalai, “tamilvar nāṭṭappāḻṭalkal” nīṟṟu ceṇṇṟṟi puttakaiṟṟaṟṟam
  1964.2006
- poṇ maṭhāmaṟṟu “āṇṟṟu tamal ilakkam ”āṇṟṟu pāḻkappuṟṟ kuriṟṟu, vahiyiṟṛ.

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