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

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

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

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

**Message from Amma's Life for the Modern World**

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

**Lessons from the Ramayana**

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

**Lessons from the Mahabharata**

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

**Lessons from the Upanishads**

Introduction to the Upanishads: Sruti versus Smriti - Overview of the four Vedas and the ten Principal Upanishads - The central problems of the Upanishads – The relevant problems of modern times, social relevance etc.

**Message of the Bhagavad Gita**


**Life and Message of Swami Vivekananda**

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

**Life and Teachings of Spiritual Masters India**

Sri Rama, Sri Krishna, Sri Buddha, Adi Shankaracharya, Sri Ramakrishna Paramahamsa, Swami Vivekananda, Sri Ramana Maharshi, Mata Amritanandamayi Devi.

**Insights into Indian Arts and Literature**

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

**Yoga and Meditation**

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

**Kerala Mural Art and Painting**

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

**Course on Organic Farming and Sustainability**

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

**Benefits of Indian Medicinal Systems**

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

**Traditional Fine Arts of India**

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

**Science of Worship in India**

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

**15CHY100 CHEMISTRY 3 0 0 3**

**Unit 1**

**Chemical Bonding**

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

**Unit 2**

**Thermodynamic Parameters**

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

**Kinetics**

Review of molecularity and order of a reaction, rate law expression and rate constant - first, second, third and zero order reactions, pseudo-first order reactions (pseudo-unimolecular reactions) - complex reactions - 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 antioxidants and the mechanism of their stabilization.

Unit 3

TEXTBOOKS:

REFERENCES:
3. Jayadev Sreedhar and Govaniker, “Polymer Chemistry”.

15CHY232 BIOMATERIALS SCIENCE 3 0 0 3

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

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

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

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

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

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

TEXTBOOK:

REFERENCES:

15CHY233 CATALYTIC CHEMISTRY 3 0 0 3

Unit 1
Catalysis: Introduction, Industrial applications. Rates of reactions - equilibrium, energy of activation and the catalyst's role. Elementary reactions in catalytic transformations homogeneous and heterogeneous catalysis.
Catalysis in solutions: Acid-base catalysis - catalysis in the gas phase, catalysis in dilute aqueous solution, catalysis in concentrated strong acid solutions, catalysis by bases, catalysis by metal ions, catalysis by electron transfer, organometallic catalysis, catalysis in Ziegler Natta/Metallocene/Metathesis polymerization.

Unit 2
Catalysis by macromolecules, Phase transfer catalysis.

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

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

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


TEXTBOOKS:

REFERENCES:

15CHY234 CHEMISTRY OF ADVANCED MATERIALS 3 0 0 3

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


TEXTBOOKS:

REFERENCES:

15CHY235 CHEMISTRY OF ENGINEERING MATERIALS 3 0 0 3

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

Unit 2

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

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

Unit 3
Florescence and Phosphorescence - chemiluminescence - photo sensitization.

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

TEXTBOOK:

REFERENCE:

15CHY236 CHEMISTRY OF NANOMATERIALS 3 0 0 3

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

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

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

15CHY237 CHEMISTRY OF TOXICOLOGY 3 0 0 3

Unit 1
Introduction to Toxicology: Definition - scope - history - relationship to other sciences - dose-response relationship - sources of toxic compounds - Classes of Toxicants - broad overview of toxicant classes such as metals, agricultural chemicals, food additives - contaminants, toxins, solvents, drugs, and cosmetics - history, exposure route, and toxicity of the non-essential metals - cadmium, lead, and mercury - Carbon nanostructures: Carbon Clusters: Fullerenes, structure, synthesis, alkali doped C60 - superconductivity in C60, applications of fullerenes. Carbon nanotubes: Classification, properties, synthesis, characterization, and potential applications, growth mechanism of carbon nanotubes.

Other Nanostructures: Quantum Dots: Preparation, properties and applications of Au, CdS and CdSe quantum dots,

Unit 3
Fabrication and applications of conducting polymer nanotubes, TiO2 and metallic nanotubes.

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

TEXTBOOKS:

REFERENCES:
medical treatment of metal poisoning - classes of agricultural chemicals - Toxins - source, including microbial, fungal, algal, plant and animal - examples - Brief discussions - food additives and contaminants – solvents - therapeutic drugs - drugs of abuse - combustion products - cosmetics.

Unit 2
Exposure Classes, Toxics in Air, Water, Soil, Domestic and Settings: Occupational Air, water and soil as primary media for human exposure to various classes of chemical toxics 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 toxics - route of exposure and permissible levels - specific examples of concern.

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


TEXTBOOK:
REFERENCES:

15CHY238 COLLOIDAL AND INTERFACIAL CHEMISTRY 3 0 0 3

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

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

15CHY239 COMPUTATIONAL CHEMISTRY AND MOLECULAR MODELLING 3 0 0 3

Unit 1
Introduction: Stability, symmetry, homogeneity and quantization as the requirements of natural changes - Born - Haber cycle – Energetic – kinetics - Principles of spectra.
Computational techniques: Introduction to molecular descriptors, computational chemistry problems involving iterative methods, matrix algebra, Curve fitting.


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

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

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

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

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

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

TEXTBOOKS:

REFERENCES:

15CHY241 ELECTROCHEMICAL ENERGY SYSTEMS AND PROCESSES

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

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

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

Unit 3
Electrochemical Processes: Principle, process description, operating conditions, process sequence and applications of Electroforming – production of waveguide and plated through hole (PTH) printed circuit boards by electrodeposition; Electroless plating of nickel, copper and gold; Electropolishing of metals; Anodizing of aluminium; Electrochemical machining of metals and alloys.

TEXTBOOKS:

REFERENCES:

15CHY242 ENVIRONMENTAL CHEMISTRY 3 0 0 3

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


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

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

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

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

TEXTBOOKS:

REFERENCES:
15CHY243 FUELS AND COMBUSTION 3 0 0 3

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

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


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

Flue gas analysis by chromatography and sensor techniques.

Unit 3

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

TEXTBOOK:

REFERENCES:

15CHY244 GREEN CHEMISTRY AND TECHNOLOGY 3 0 0 3

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

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

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

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

15CHY245 INSTRUMENTAL METHODS OF ANALYSIS 3 0 0 3

Unit 1

Separation Techniques: Brief out line of column, paper and thin layer chromatography - Ion exchange methods - principle and application – HPLC.
Unit 2
Gas chromatography - principle and applications – gel chromatography.


Unit 3

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

TEXTBOOKS:

REFERENCES:

15CHY246 MEDICINAL ORGANIC CHEMISTRY 3 0 0 3

Unit 1

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

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

SYLLABI B. Tech. - Mechanical Engg. 2015 admissions onwards

Medicinal agents from natural products: Natural products as therapeutic agents, medicinal plants, animal products as medicine, isolation methods of alkaloids, terpenes, anti-oxidants.

Unit 3
Medicinal agents: Medicinal agents belonging to steroids, polypeptides, modified nucleic acid bases, sulphonamide and sulpha drugs, antibiotics, antifungal, antiseptics and disinfectants, anaesthetics, antihypertensive drugs, analgesics, histamine and anti-histamine agents.

TEXTBOOKS:

REFERENCES:

15CHY247 MODERN POLYMER COMPOSITES 3 0 0 3

Unit 1

Unit 2
SYLLABI
B. Tech. - Mechanical Engg. 2015 admissions onwards

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

TEXTBOOKS:

REFERENCES

15CHY248 ORGANIC REACTION MECHANISMS 3 0 0 3

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

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

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

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

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


TEXTBOOK:

REFERENCES:

15CHY249 ORGANIC SYNTHESIS AND STEREOCHEMISTRY 3 0 0 3

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

Stereochemistry: 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

TEXTBOOKS:

REFERENCES:

15CHY250 POLYMER MATERIALS AND PROPERTIES 3 0 0 3

Unit 1

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

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

TEXTBOOKS:

REFERENCE BOOKS:

15CHY251 POLYMERS FOR ELECTRONICS 3 0 0 3

Unit 1

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

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

Unit 3

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

TEXTBOOK:

REFERENCES:

15CHY252 SOLID STATE CHEMISTRY 3 0 0 3

Unit 1
Symmetry in Crystal Systems: Types of symmetry, plane, axis and centre of symmetry, crystal systems and symmetry elements. Law of rational indices, miller indices, Weiss indices - plane systems, space lattices, unitcells - unitcell dimension, determination. Space lattice - definition and types Bravais lattice - kinds of bravais lattices, number of atoms in SC, BCC, FCC lattices, void space, Radius ratio rule and application. Crystal defects - types of defects in crystals - stoichiometric...
defect - schottky and frenkel defects - Non-stoichiometric defects - metal excess and metal deficiency defects, influence of defects on the properties of solids.

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


Unit 3

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:
SYLLABI  B. Tech. - Mechanical Engg.  2015 admissions onwards


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

15CSE180 COMPUTER PROGRAMMING LAB. 0 0 2 1

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

REFERENCE:

15CUL101 CULTURAL EDUCATION I 2 0 0 2

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

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

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

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

15CUL111 CULTURAL EDUCATION II 2 0 0 2

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

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

TEXTBOOKS:
Sanatana Dharma - The Eternal Truth (A compilation of Amma’s teachings on Indian Culture)

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

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

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

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

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

Unit 2
Personality Development
What is Personality – Five Dimensions – Pancha Kosas (Physical / Energy / Mental / Intellectual / Bliss); Stress Management & Personality; Self Control & personality;
Fundamental Indian Values & Personality;
Learning Skills (Teachings of Amma)
Art of Relaxed Learning; Art of Listening; Developing ‘Shraddha’ – a basic qualification for obtaining Knowledge;

Communication Skills - An Indian Perspective;

Unit 3
Developing Positive Attitude & Friendliness - (Vedic Perspective);
Achieving Work Excellence (Karma Yoga by Swami Vivekananda & teachings based on Amma);

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

REFERENCE BOOKS:
1. Awaken Children (Dialogues with Sri Mata Amritanandamayi) Volumes 1 to 9
2. Complete works of Swami Vivekananda (Volumes 1 to 9)
3. Mahabharata by M. N Dutt published by Parimal publications – New Delhi (Volumes 1 to 9)
4. Universal message of Bhagavad-Gita (An exposition of Gita in the light of modern thought and Modern needs) by Swami Ranganathananda. (Vols.1 to 3)
7. Art of Man Making - Swami Chinmayananda published by Chinmaya Mission, Bombay
8. Will Power and its Development - Swami Budhananda published by Advaitha Ashram, Kolkatta
10. Yoga In Daily Life - Swami Sivananda – published by Divine Life Society
12. All about Hinduism – Swami Sivananda - Published by Divine Life Society
13. The Mind and its Control by Swami Budhananda published by Advaitha Ashram, Kolkatta
15. Valmiki Ramayana – Four volumes- published by Parimal Publications, Delhi
17. Mind Sound Resonance Technique (MSRT) Published by Swami Vivekananda Yoga Prakashana, Bangalore.
18. Yoga & Memory - Dr H R Nagendra & Dr. Shirley Telles, published by Swami Vivekananda Yoga Prakashana, Bangalore.

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. Vedanta Jyotisha and the first Indian calendars;
5. Shulba Sutras and the foundations of Indian geometry;

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

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

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

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

15CUL233 YOGA PSYCHOLOGY 2002

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

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

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

Patanjali Yoga Sutra – 1

Patanjali Yoga Sutra – 2

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

Patanjali Yoga Sutra – 4

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

Patanjali Yoga Sutra – 6

Patanjali Yoga Sutra – 7

Unit 3
Patanjali Yoga Sutra – 8

Patanjali Yoga Sutra – 9

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

Report review
Conclusion

REFERENCES:
• The course book will be “The four chapters of Freedom” written by Swami Satyananda Saraswati of Bihar School of Yoga, Munger, India.
• “The message of Upanishads” written by Swami Ranganathananda. Published by Bharathiya Vidya Bhavan.
SYLLABI  B. Tech. - Mechanical Engg.  2015 admissions onwards

- Eight Upanishads with the commentary of Sankaracharya, Translated by Swami Gambhirananda, Published by Advaita Ashram, Uttarajal.
- 'Hatha Yoga Pradipika' Swami Muktibodhananda, Yoga Publications Trust, Munger, Bihar, India

15EEE180  WORKSHOP B  0 0 2 1

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

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

15EEE205  ELECTRICAL AND ELECTRONICS ENGINEERING  3 0 2 4

Unit 1
Electrical Engineering
Introduction to Electrical Power System - different sources of electrical energy (conventional / alternate), Ideal Independent Current and Voltage Sources.

Reference Directions and Symbols; Resistance, Inductance and Capacitance, Series parallel combination of R, L and C Components.
Ohm's law, Kirchhoff’s law, Energy and Power, Voltage Divider and Current Divider Rules, Network Analysis by Mesh Currents, Nodal analysis.

Faraday's law of Electromagnetic Induction; Magnetic Circuit Elements; Analysis of magnetic Circuits, Self and Mutual Inductances.
Generation of alternating current, Sinusoidal voltage; Instantaneous, Average and rms values of periodic functions; Peak factor, form factor, Phasor representation of sinusoids, Real and Reactive Power, Power factor

Introduction to Three Phase Systems; Balanced 3-Phase STAR and DELTA connections of Load, Three phase power

Unit 2
Classification and Applications of Electrical Machines
DC Motor, Basic principle of operation, Different types of DC motors, Voltage equation of a motor, significance of back emf, Speed, Torque, Torque-Speed characteristics, Output Power, Efficiency.


Single Phase Transformer - Principle of Operation, Voltage transformation ratio, emf equation, working of single phase auto-transformer, Three Phase Transformer Connections, Star-delta, star-star.

Unit 3
Electronics Engineering
Introduction to semiconductors and doping: Intrinsic and extrinsic semiconductors, PN junction diode characteristics: forward and reverse bias – breakdown – barrier potential Rectifiers: half wave and full wave, Zener diode – design of regulators and Characteristics.

Introduction to BJT: BJT characteristics curves and region of operation, common emitter, common base configurations, MOSFET characteristics.

Introduction to Operational amplifier: inverting and non-inverting amplifier.

Introduction to logic gates: Boolean Algebra Theorems, De Morgan’s theorem. Logic gates, NOT Gate, AND Gate, OR Gate, XOR Gate, NAND Gate, NOR Gate, X-NOR Gate.
Microcontrollers: Introduction to Microcontrollers, 8051, Microcontroller, Architecture
and an example of Microcontroller, based stepper motor control system (only Block Diagram approach).

**TEXTBOOKS:**

**REFERENCES:**
3. S. K. Bhattacharya - 'Basic Electrical and Electronics Engineering' - Pearson - 2012

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.

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.

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

Activities
Case studies & role-plays.

**BOOKS RECOMMENDED:**
15ENG231 INDIAN THOUGHT THROUGH ENGLISH 1 0 2 2

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

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

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

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

REFERENCES:

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

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

Unit 1 Poems

Unit 2 Short Stories

REFERENCES:

15ENG233 TECHNICAL COMMUNICATION 1 0 2 2

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


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

Unit 3 Technical paper writing: Library research skills - documentation style - document editing – proof reading – formatting. Practice in oral communication and Technical presentations

REFERENCES:
the age; to familiarize them with different strategies of reading short stories; to make them familiar with the morals and values held in high esteem by the ideals of Indianess.

Unit 1

Unit 2

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

TEXT:
REFERENCE:

15ENV300 ENVIRONMENTAL SCIENCE AND SUSTAINABILITY 3 0 0 3

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

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

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

TEXTBOOKS / REFERENCES:
SYLLABI  
2015 admissions onwards

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

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

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

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

TEXTBOOK:
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).

TEXTBOOK:
Metro St Michel - Publisher: CLE international

15GER230  GERMAN FOR BEGINNERS I  1 0 2  2

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

Numbers 1-100; Saying the telephone number.

Countries and Languages.

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

Vocabulary: Professions.

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

Numbers till 1000. Saying a year.

Alphabets – spelling a word.
Filling up an application form; In the restaurant – making an order.

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

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

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

Vocabulary: Furniture and currencies.

15GER231 GERMAN FOR BEGINNERS II 1022

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

Grammar: Dative of personal pronouns. Imperative form.

Vocabulary: Consumables and measurements;

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

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

Vocabulary: Leisure activities, weekdays, months and seasons.

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

Grammar: Possessive articles; Divisible and indivisible verbs.

Vocabulary: Family circle; Household articles.

15GER232 PROFICIENCY IN GERMAN LANGUAGE (LOWER) 1022

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) 1022

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 1022

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

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

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

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

Unit 3
Poems – Kabir 1st 8 Dohas, Surdas 1st 1 Pada; Tulsidas 1st 1 Pada; Meera 1st 1 Pada
Unit 4

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

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

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 - Moukhib Abhivyakthi

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

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

Unit 5

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

SYLLABI
2015 admissions onwards

15HUM230
EMOTIONAL INTELLIGENCE

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

Unit 2

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

REFERENCES:

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

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

Unit 2
Selected writings / selections from the complete works of the following authors will be taken up for study in a chronological order:
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.

15HUM232 GLIMPSES OF ETERNAL INDIA 2002

Unit 1

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

Unit 2

India’s contribution to the world: spirituality, philosophy and sciences
Indian Philosophy – the orthodox (Vaidika) and the heterodox (atheistic) schools; Ramayana and Mahabharata; Bhagavad Gita; Saints and sages of India; Ancient Indian medicine: towards an unbiased perspective; Ancient Indian mathematics; Ancient Indian astronomy; Ancient Indian science and technology.

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

Unit 3

Women in Indian society
The role and position of women in Hindu civilization; Gleanings from the Vedas, Bhradarnyaka Upanishad, Saptasati Devi Mahatmyam, Ramayana, Mahabharata; Manusmriti, Kautliya’s Arthasastra and Mirchchhakatikam 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:
15HUM233 Glimpses of Indian Economy and Polity 2002

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 purusarthas; The structure of ancient Indian polity – Rajamandala and Cakravartins – Prajamandala; Socio-economic elements from the two great Epics – Ramayana and Mahabharata – the concept of the ideal King (Sri Rama) and the ideal state (Ramarajya) – Yudhisthira’s ramarajya; 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: 600 B.C. – 1200 A.D.
The rise of Magadha; emergence of new religions – Buddhism and Jainism – and the resultant socio-economic impact; The emergence of the empire – the Mauryan Economy and Kautilya’s Arthasastra; of Politics and trade – the rise of the Mercantile Community; Elements from the age of the Kushanas and the Great Guptas; India’s maritime trade; Dharma at the bedrock of Indian polity – the concept of Dig Vijaya; 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 ruination of Indian economy and business – man-made famines – the signs of renaissance; banking and other business undertakings by the natives (the members of the early Tagore family, the merchants of Surat and Porbandar, 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.
4. Sircar, D. C. Studies in the Political and Administrative Systems in Ancient and Medieval
9. Bajaj, Jitendra & M. D. Sririvasesh, Timeless India, Resurgent India. Chennai: Centre for Policy
Studies.
10. Joshi, Murli Manohar. Science, Sustainability and Indian National Resurgence. Chennai:
Centre for Policy Studies, 2008.
11. Tripathi, Dwijendra. The Oxford History of Indian Business. New Delhi: Oxford University
15. Raychaudhuri, Tapan and Irfan Habib, eds. The Cambridge Economic History of India. Volume
20. Thapar, Romila. The Penguin History of Early India: From the Origins to AD 1300. New Delhi

SYLLABI


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:
2. “Nutrient requirement and Recommended Dietary Allowances for Indians”, published by Indian
Council of Medical Research, ICMR, 2010.

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

15HUM235

INDIAN CLASSICS FOR

1 0 2  2

THE TWENTY-FIRST CENTURY

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

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

Unit 3
Goals of human life - existential problems and their solutions in the light of these
classics etc.
REFERENCE:
The Bhagavad Gita, Commentary by Swami Chinmayananda

15HUM236 INTRODUCTION TO INDIA STUDIES 2002

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

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

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

Unit 2
Modern India: Challenges and Possibilities.

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

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

TEXTBOOK:
Material given by the Faculty

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

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

15HUM237 INTRODUCTION TO SANSKRIT LANGUAGE AND LITERATURE 2002

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

Unit 1

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

Unit 3

Unit 4
Unit 5
Indology Studies – Perspectives and Innovations.

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

**15HUM238 NATIONAL SERVICE SCHEME 2002**

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

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

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

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

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

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


**TEXTBOOKS:**

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 Somasuvta 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:

15HUM242 THE MESSAGE OF BHAGAVAD GITA 2002

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

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

Unit 3


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.

Unit 2

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

REFERENCES:
1. The Message of the Upanishads by Swami Ranganathananda, Bharatiya Vidya Bhavan
2. Eight Upanishads with the commentary of Sankaracharya, Adwaita Ashrama
3. Indian Philosophy by Dr. S. Radhakrishnan, Oxford University Press
4. Essentials of Upanishads by R L Kashyap, SAKSI, Bangalore

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

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

Cookery Practicals - Balanced Diet

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

Practicals - Traditional Foods

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

Practicals - Value added foods

TEXTBOOKS:

REFERENCE BOOKS:

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

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

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

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

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

Students will be given detailed lectures on Calligraphy.

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

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

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, belavaniige 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

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 – Baddhuku Badalisabahudu – Navakarnataka Publication
4. Sanna Kathegalu - Prasaranga, Mysuru University , Mysuru
5. B. M. Shree – Kannadada Buvuta – 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

15KAN111 KANNADA II 1 0 2 2

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

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

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

**B. Tech. - Mechanical Engg.**

**2015 admissions onwards**

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**Unit 3**


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**Unit 4**

Sarva Sollegala turtu Maha Samelana - Beechi
Swarthakkaagi Tyaga - Beechi

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**Unit 5**

Essay writing: Argumentative & Analytical
Précis writing

**REFERENCES:**

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

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**15MAL101**

MALAYALAM I

**OBJECTIVES:**

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

**Unit 1**

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

**Unit 2**


**Unit 3**

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

**Unit 4**

Literary Criticism: Ithihasa studies - Bharatha Paryadanam - Vyasaante Chiri - Kuttikrishna Maranu - Outline of literary Criticism in Malayalam Literature - Introduction to Kutt Krishna Maranu & his outlook towards literature & life.

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**SYLLABI**

**B. Tech. - Mechanical Engg.**

**2015 admissions onwards**

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**Unit 5**

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

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:**


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**15MAL111**

MALAYALAM II

**OBJECTIVES:**

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

**Unit 1**

Ancient poet trio: Kalayanasougandhikam, (kallum marangalun... namukkennarika vrikodara) Kunjan Nambiar - Critical analysis of his poetry - Ancient Drama: Kerala Sakunthalam (Act 1), Kalidasan (Translated by Attor Krishna Pisharody).

**Unit 2**


**Unit 3**

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

**Unit 4**

Part of an autobiography / travelogue: Kannerum Kinavum, V. T. Bhattachirippadu - Socio-cultural literature - historical importance.
SYLLABI  
2015 admissions onwards

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

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

REFERENCES:

15MAT111  
CALCULUS AND MATRIX ALGEBRA  
2 1 0 3

Unit 1  
Calculus

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

Unit 2  

Unit 3  
Matrix Algebra
Review: System of linear equations, linear independence


TEXTBOOKS:

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

Unit 1  

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

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

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


TEXTBOOK:

REFERENCE BOOKS:
SYLLABI  B. Tech. - Mechanical Engg.  2015 admissions onwards

15MAT204  TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS  2 1 0 3

Unit 1

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


Unit 3

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

TEXTBOOK:

REFERENCE BOOKS:

15MAT214  PROBABILITY AND STATISTICS  2 1 0 3

Unit 1


15MAT302  NUMERICAL METHODS  2 0 2 3

Unit 1
Review of Errors: Accuracy and Precision, round-off error and truncation error. (Sec. 2.2-2.4)

Roots of Transcendental and Polynomial Equations: Bisection method, Iteration methods based on first degree equation, Rate of convergence, System of nonlinear equations. (Sec. 4.2, 4.3, 5.1-5.3, 5.5)


Unit 2
Interpolation and Approximation: Lagrange and Newton interpolation for unequal intervals, Finite difference operators, Interpolating polynomials using finite differences. (Sec. 13.1 – 13.4, 13.6)
Unit 3
Review of Ordinary Differential Equations:


Lab. - Implementation of these methods: MATLAB or EXCEL or Free and Open Source Software (FOSS) tools like R-programming and Scilab.

TEXTBOOK:

REFERENCE BOOKS:

15MEC100 ENGINEERING DRAWING - CAD


TEXTBOOK:

REFERENCES:
Dynamics of rigid bodies: General plane motion - translation and rotation of rigid bodies - Chasle’s theorem.

**TEXTBOOKS:**

**REFERENCES:**

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

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

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. **Welding Workshop**
   Study of tools and equipments - Study of various welding methods - Arc welding practice and demonstration of gas welding and cutting.

4. **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

**15MEC201 ENGINEERING THERMODYNAMICS 3 0 0 3**

Unit 1
Introduction and importance of thermodynamics, different approaches in the study of thermodynamics, SI units, basic concepts and definitions – system, surroundings, types of systems, properties. Pressure measurement, thermodynamic equilibrium, quasi static process, cyclic process, and thermodynamic energy interactions - evaluation of work type interaction, heat interaction, energy and forms of energy, history of laws of thermodynamics.

First law for closed system, analysis of closed systems. Concept of Zeroth Law, thermometry, temperature scales.


Unit 2

The inequality of Clausius and thermodynamic Temperature scale, concept of entropy, Entropy change in different processes, principle of increase in entropy for closed systems.

Unit 3
Thermodynamic properties of fluids, Pure Substance, phase-change process of pure substance, P-V-T surface, T-v, p-v and other diagrams, specific internal energy and enthalpy and other properties and steam tables.

Perfect gas, equation of state, specific heats, characterization of thermodynamic processes. Real gas models - Van der waals equation, compressibility chart.

Thermodynamic property relations: Introduction, important mathematical relations, cyclic rule, Maxwell relations, enthalpy, entropy, internal energy and specific heat relations; Clausius-Clapeyron equation, Joule Thomson coefficient and inversion line.
15MEC202  MACHINE DRAWING  2 0 2 3

1. DRAWING STANDARDS
Code of practice for Engineering Drawing, BIS specifications - Welding symbols, riveted joints, keys, fasteners – Reference to handbook for the selection of standard components like bolts, nuts, screws, keys etc.

2. 2-D DRAWINGS

3. CAD PRACTICE (USING APPLICATION PACKAGES)
Drawing, Editing, Dimensioning, Plotting Commands, Layering Concepts, Hatching, Detailing, Assembly, basic principles of GD & T (geometric dimensioning & tolerance).

4. ASSEMBLY DRAWING (MANUAL & USING APPLICATION PACKAGES)
Manual parts drawing and preparation of assembled views given part details for components followed by practicing the same using CAD packages.

5. PREPARATION OF BILL OF MATERIALS AND TOLERANCE DATA

SUGGESTED ASSEMBLIES:
Detailed drawings of following machine parts are given to students to assemble and draw the sectional or plain elevations / plans / and side views with Dimensioning and bill of materials.

Sleeve & Cotter joint, Spigot & Cotter joint, Knuckle joint, Stuffing Box, Screw Jack, Foot step bearing, Universal Coupling, Plummer Block, Swivel Bearing, Simple Eccentric, Machine Vice, Protected type flanged coupling, Connecting Rod, Tail Stock.

SYLLABI  B. Tech. - Mechanical Engg.  2015 admissions onwards

TEXTBOOK:

REFERENCES:

15MEC203  MATERIAL SCIENCE AND METALLURGY  3 0 0 3

Unit 1


Unit 2


Unit 3

Classification of cast iron and steels - properties, microstructures and uses of cast irons, plain carbon, alloy, stainless, heat resistant, tool and die steels. Composition, properties, microstructures and uses of non-ferrous alloys - brass, bronze, aluminium, magnesium, nickel and zinc alloys.
**SYLLABI**  
**B. Tech. - Mechanical Engg.**  
2015 admissions onwards

**TEXTBOOK:**

**REFERENCES:**

**15MEC204**  
MECHANICS OF SOLIDS  
3 0 0 3

**Unit 1**
Simple Stress and Strain

Composite section, Volumetric strain, expression for volumetric strain, Elastic constants, relationship among elastic constants, Thermal stresses (including thermal stresses in compound bars). Strain Energy & Impact loading.

Compound Stresses
Introduction, Stress components on inclined planes, General two-dimensional stress system, Principal planes and stresses and Mohr’s circle of stresses.

**Unit 2**
Torsion of circular shafts
Introduction – Pure torsion-torsion equation of circular shafts, Strength and stiffness, Torsional rigidity and polar modulus, Power transmitted by shaft of solid and hollow circular sections.

Bending moment and shear force in beams
Introduction, Types of beams loadings and supports, Shearing force in beam, Bending moment, Sign convention, Relationship between loading, shear force and bending moment, Shear force and bending moment equations, SFD and BMD with salient values for cantilever beams, simply supported beams and overhanging beams considering point loads, UDL, UVL and Couple. Bending and shear stresses in beams.

**Unit 3**
Deflection of beams
Introduction – Definitions of slope, deflection, Elastic curve-derivation of differential equation of flexure, Sign convention Slope and deflection for standard loading classes using Macaulay’s method for prismatic beams and overhanging beams subjected to point loads, UDL and Couple.

Thick and Thin Cylinders and shells
Analysis of thincylindrical shells and analysis of thick cylindrical shells using Lame’s equation.

Elastic stability of columns
Introduction – Short and long columns, Euler’s theory on columns, Effective length slenderness ration, radius of gyration, buckling load. Assumptions, derivations of Euler’s Buckling load for different end conditions, Limitations of Euler’s theory, Rankine’s formula and problems.

**TEXTBOOKS:**

**REFERENCES:**

**15MEC211**  
FLUID MECHANICS AND MACHINERY  
4 0 0 4

**Unit 1**

Hydrostatic Force on plane surfaces and curved surface.


Eulerian and Lagrangian description of fluids, local and convective acceleration. Flow visualization – streamlines, streak lines, pathlines, time lines, contour and vector plots.
Flow kinematics - vorticity and rotationality.

Unit 2
Reynold's Transport Theorem. Governing equations for mass, linear and angular momentum and energy in the integral form. Applications of these equations. Laminar and turbulent flow regimes.

Bernoulli's equation. Limitations. Applications of Bernoulli’s equation. Hydraulic and energy grade lines.


Flow rate measurement for closed conduits. Venturimeter, Orifcimeter, Pilot tube, rotameter, other electrical and mechanical flow measuring systems.

Unit 3


TEXTBOOK:

REFERENCES:
• To Study various types of gear trains – Simple, Compound, reverted, Epicyclic and Differential.
• To Develop a prototype of a four-bar mechanism
• To Develop a prototype of a Geneva mechanism

**TEXTBOOK:**

**REFERENCES:**

**15MEC213 MANUFACTURING PROCESS I**

**Unit 1**
Metal casting processes: Introduction to Metal casting - Pattern, core and Mould making - Moulding, sand properties and testing - Principles of gating and riser design - Melting furnaces - Casting processes - sand, die, gravity, centrifugal castings, shell mould and Investment casting. Fettling and cleaning of casting - Inspection of casting and Casting defects.

**Unit 2**

**Unit 3**
Metal joining processes: Principles of welding – fusion, resistance and solid state welding – soldering, brazing and adhesive bonding, arc welding, resistance welding, gas welding, thermit welding, ultrasonic welding, electron beam welding, laser beam welding and explosive welding – weld defects and inspection.


**TEXTBOOK:**

**REFERENCES:**
1. Roy A. Lindberg - 'Processes and Materials for Manufacture' - Prentice Hall of India Private limited - 2000
3. Amitab A. Ghosh and Asok Kumar Mall - 'Manufacturing Science' - Affiliated East-West, Press Private Limited - 2010

**15MEC230 AIRCRAFT SYSTEMS AND ENGINEERING**

**Unit 1**

Introduction to Aircrafts: Basic Components of an Aircrafts, Structural Members, Aircraft Axis System, Aircraft Motions, Control Surfaces and High Lift Devices.


**Unit 2**
Electrical and Electronic System. Auxiliary Systems.

SYLLABI  
2015 admissions onwards

Unit 3
Basic Principles of Flight: Significance of Speed of Sound, Air Speed and Ground Speed, Properties of Atmosphere, Bernoulli’s Equation, Forces on the Air Plane, Air Flow Over the Wing Section, Pressure Distribution over a wing Section, Generation of Lift, Drag, Pitching Moments, Types of Drag, Lift Curve, Drag Curve, Lift / Drag Ratio Curve, Factors affecting Lift and Drag, Center of Pressure and it’s Effects. Aerofoil Nomenclature, Types of Aerofoil, Wing Section - Aerodynamic Center, Aspect Ratio, Effects of Lift, Drag, Speed, Air Density on Drag.


TEXTBOOKS:

REFERENCES:

15MEC231  AUTOMOTIVE CHASSIS DESIGN  3 0 0 3

Unit 1
Clutch Design Calculation: Design of single plate clutch, multi plate clutch, design of centrifugal clutch, cone clutch, energy dissipated, torque capacity of clutch, design of clutch components, design details of roller and sprag type of clutches.

Gear Box: Performance of vehicle, total resistance to motion, traction and tractive effort, acceleration, calculation of gear ratio, design of three speed gear box, design of four speed gear boxes.

Unit 2
Vehicle Frame and Suspension: Study of loads, moments and stresses on frame members, computer aided design of frame for passenger and commercial vehicles, computer aided design of leaf springs, coil springs and torsion bar springs.
**SYLLABI**

**B. Tech. - Mechanical Engg.**  
2015 admissions onwards

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**Unit 3**

Future Automobiles: Automobile Air Pollution, Pollution Control Norms, Alternate Power Units for Automobiles - Use of Natural Gas, LPG and Hydrogen in Automobiles as Fuels, Fuel Cells, Electric and Hybrid Vehicles. Indian Traffic Rules.

**TEXTBOOKS:**

**REFERENCES:**

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**15MEC234 DESIGN FOR MANUFACTURE AND ASSEMBLY 3 0 0 3**

**Unit 1**

Design features to facilitate machining: datum features - functional and manufacturing. Component design - machining considerations, redesign for manufacture, examples. Form design of castings and weldments.

**Unit 2**

Interchangeable part manufacture and selective assembly - control of axial play - introducing secondary machining operations, laminated shims - examples.

**Unit 3**
Datum Systems: Degrees of freedom, grouped datum systems - computation of translational and rotational accuracy - geometric analysis and applications.

True Position Theory: Co-ordinate and conventional method of feature location, tolerance and true position tolerance, virtual size concept, floating and fixed
fasteners, projected tolerance zone, assembly with gasket, zero true position tolerance, functional gauges, paper layout gauging - examples.


TEXTBOOKS:

REFERENCES:

15MEC235 FRACTURE MECHANICS 3 0 0 3

Unit 1
Introduction to Fracture Mechanics: Failures in structures - types and causes, historical perspective, fracture mechanics approach to design - energy criterion, stress intensity approach, time dependent crack growth and damage tolerance, effect of material properties on fracture.

Linear Elastic Fracture Mechanics (LFEM): Stress concentration effect of flaws, Griffith energy balance, the energy release rate, instability and resistance curve (R-curve), stress analysis of cracks, relationship between stress intensity factor and energy release rate (K and G), crack tip plasticity, mixed mode crack initiation and propagation.

Unit 2

Fracture mechanism in metals and non-metals: Ductile fracture, cleavage, the ductile-brittle transition, intergranular fracture, fracture in polymeric materials, and fracture in ceramic and ceramic composites.

SYLLABI B. Tech. - Mechanical Engg. 2015 admissions onwards

Unit 3
Applications: Introduction to fracture toughness testing of metals and non-metals for determination of fracture parameters, Application of fracture mechanics concepts in the analysis of fatigue crack growth.

Computational fracture mechanics: Overview of numerical methods for fracture mechanics problems, traditional methods in computational fracture mechanics - point matching and energy methods, the energy domain integral, finite element implementation, design of finite element mesh, linear elastic convergence study, analysis of growing cracks.

TEXTBOOK:

REFERENCES:

15MEC236 MATERIALS SELECTION IN MECHANICAL DESIGN 3 0 0 3

Unit 1
Overview of materials properties - modulus, tensile. Fatigue, creep strengths, toughness, hardness, fracture toughness, damping capacity, thermal, oxidation, corrosion and wear resistances.

Materials property charts. Materials families and classes - metals, ceramics, glasses, polymers, elastomers, composites, foams, natural.

Unit 2
Unit 3
Case studies in materials selection for various applications - oar, table leg, flywheel, kiln walls, passive solar heating, heat exchangers, bearings, springs, pressure vessel.

Principles of process selection and classification - casting, forging, moulding, fabrication, welding, joining, machining, powder processing, composite processing. Illustration of the principles with case studies.

Multiple constraints and objectives - case studies. Design of hybrid materials - case studies.

**TEXTBOOK:**
Ashby M. F. - 'Materials selection in mechanical design' - Butterworth Heinemann - 2010 - 3rd Edition

**REFERENCE:**
ASM Handbook - 'Materials Selection and Design' - 1997
REFERENCES:

15MEC239 MODELING AND SIMULATION
OF ENGINEERING SYSTEMS

Unit 1


Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

15MEC240 OPTIMIZATION TECHNIQUES IN ENGINEERING

Unit 1

Linear programming methods for optimum design: Review of Linear programming methods for optimum design – Post optimality analysis - Application of LPP models in design and manufacturing.

Unit 2
Optimization algorithms for solving unconstrained optimization problems – Gradient based method: Cauchy’s steepest descent method, Newton’s method, Conjugate gradient method.

Optimization algorithms for solving constrained optimization problems – direct methods – penalty function methods – steepest descent method - Engineering applications of constrained and unconstrained algorithms.

Unit 3

TEXTBOOK:

REFERENCES:

15MEC241 PRESSURE VESSEL DESIGN

Unit 1
Introduction to Pressure Vessels, Design Philosophy, Structural Integrity - Failure modes and theories - Working loads and allowable stresses - Fatigue, fracture and buckling.

Stress categorization - Primary, secondary and peak.

Design of Cylindrical Shells - ASME equations - Thin shell equations - Thick shell equations - Buckling of cylindrical shells.
SYLLABI  B. Tech. - Mechanical Engg.  2015 admissions onwards

Unit 2
End Closures - ASME equations for various types of heads – Hemispherical, flat, ellipsoidal, torispherical, and conical heads.

Discontinuity Stresses - Discontinuity stresses - Beams on elastic foundation, Cutouts and Reinforcements – Stress concentrations around a hole – Reinforcements.

Fatigue Assessment - Exemption from fatigue analysis - S-N curves - Design curves - Cumulative damage - Fatigue evaluation.

Unit 3
Bolted Flanges - RF and FF flanges - Gasket loading behavior - Application of ASME equations for flange analysis and bolt design.

Design of Supports - Lug support - Support skirts - Saddle support.

TEXTBOOKS:
2. Chattopadhyaya S. - 'Pressure Vessels - Design and Practice' - CRC Press - 2005

REFERENCES:
1. Brownell and Young - 'Process Equipment Design' - Wiley Publishing Ltd. - 1959

SYLLABI  B. Tech. - Mechanical Engg.  2015 admissions onwards

Unit 3
Solution of Some Special Boundary Value Problems: Simplifications; two-dimensional problems in rectangular and polar coordinates; Airy’s stress function; a few problems like stress concentration around a circular hole and Boussinesq problem.

A few representative three-dimensional problems; torsion and bending of non-circular prismatic bars (Saint-Venant’s solution); membrane analogy, Simple Plate bending.

TEXTBOOKS:

15MEC243  TOOL DESIGN  3 0 0 3

Unit 1

Unit 2

Unit 3
Drawing Dies: Metal flow and factors affecting drawing, blank size calculations, drawing force, single and double acting drawing dies, design and development of drawing dies for different components.

Bending and Forming Dies: Spring back, bend allowance; calculation of development length, bending force calculations types of bending dies. Curling dies.

Forging process and forging dies. (Introductory Treatment)

**TEXTBOOKS:**

**REFERENCE BOOKS:**
2. ‘Production Technology Hand Book’ - HMT - Tata McGraw Hill

15MEC246 AUTOMOTIVE ELECTRONICS 3 0 0 3

Unit 1


Unit 2
Instrumentation systems: Introduction to instrumentation systems - Various sensors used for different parameters sensing - Driver instrumentation systems - vehicle condition monitoring - trip computer different types of visual display.


**TEXTBOOK**
Denton T. - 'Automobile Electrical and Electronic Systems' - Edward Arnold Publications - 2001

**REFERENCES**

15MEC247 COMBUSTION ENGINEERING 3 0 0 3

Unit 1


Unit 2

Unit 3

SYLLABI
B. Tech. - Mechanical Engg. 2015 admissions onwards

TEXTBOOKS:

REFERENCES:

15MEC248 COMPUTATIONAL FLUID DYNAMICS 3 0 0 3

Unit 1


Unit 2


Unit 3

TEXTBOOK:

REFERENCES:

15MEC249 DESIGN OF THERMAL SYSTEMS 3 0 0 3

Unit 1


Unit 2

Unit 3


TEXTBOOKS:

REFERENCES:
1. 'ASHRAE Guide & applications' - ASHRAE, USA -1985
SYLLABI

B. Tech. - Mechanical Engg. 2015 admissions onwards


15MEC250   FLUID POWER DRIVES AND CONTROLS   3 0 0 3

Unit 1


Unit 2
Design of Hydraulic circuits: Selection and sizing of components - calculation of frictional head loss - equivalent length for various components - actuator load calculation - pump sizing.

Unit 3
Pneumatic system fundamentals: FRL, actuators and valves. Logic Circuits - Position - Pressure Sensing, switching, electro-pneumatic systems.


PLC programming – Microprocessors - Principles of Low Cost Automation - Case studies.

TEXTBOOK:

REFERENCES:

15MEC251   FUNDAMENTALS OF NUCLEAR ENGINEERING   3 0 0 3

Unit 1

15MEC252   GAS DYNAMICS AND JET PROPULSION   3 0 0 3

Unit 1

Isentropic Flow: Nozzle and Diffusers, compressors and turbines - Use of Gas tables. Flow through ducts: Flow through constant area ducts with heat transfer (Rayleigh flow) and Friction (Fanno flow) - Variation of flow properties - Use of tables and charts - Generalized gas dynamics.

REFERENCES:

REFERENCES:

TEXTBOOK:
Unit 3


TEXTBOOKS:

REFERENCES:

INTERNAL COMBUSTION ENGINES AND POLLUTION CONTROL

Unit 1


Unit 2

Thermo chemistry: Pollutant formation, Instrumentation to measure pollutants - Pollutant calculation - Effect of air-fuel ratio.
UNIT 3
Petroleum products: LPG Motor spirit, aviation gasoline, kerosene, aviation turbine fuel, white spirit, and solvents, diesel fuel, gas oil, fuel oil, petroleum coke, petroleum waxes, lubricating oil and bitumen. Petrochemicals - Olefines, acetylene, propylene, butadiene, isoprene, aromatics, benzene, xylene etc. Methanol, formaldehyde, chloromethane, ethylene oxide, ethanal amine, acetone, cumene, phenol, styrene, phthalic anhydride.

TEXTBOOKS:

REFERENCE:
N. K. Sinha - 'Petroleum Refining & Petrochemicals'

15MEC255  POWER PLANT ENGINEERING  3 0 0 3

Unit 1
Hydrological data - capacity and type - selection - General layout and types of hydro electric Power Plants.

General layout of diesel power plant and their components - Types of plant layouts - comparison of diesel plant with thermal plant.

Comparison and types of gas turbine power plants and their components, combined gas and steam power plants - Advantages of gas turbine plant over diesel and thermal plants.

Unit 2
General components of Nuclear reactors - types of reactors - location safety and economics of nuclear plants - comparison with thermal power plants.

Steam power plant layout and components - Modern steam generators - types - functions of super heater - Preheater - economizer and air heater.

Unit 3
Fuels and combustion - Fuel preparation and burning, grates, burners draft, combustion calculations, Boiler Trial, Fuel handling systems, Ash handling methods, Gas cleaning methods and dust collection.

Types of condensers - cooling towers - Water treatment methods

TEXTBOOKS:

REFERENCES:

15MEC256  REFRIGERATION AND AIR CONDITIONING  3 0 0 3

Unit 1


Unit 2

Selection and balancing of system components - Graphical method.

Psychrometry: Moist air behaviour - Psychrometric chart - Different Psychrometric process analysis.

Unit 3

TEXTBOOK:

REFERENCES:
SYLLABI

B. Tech. - Mechanical Engg.  2015 admissions onwards

15MEC257  RENEWABLE SOURCES OF ENERGY  3 0 0 3

Unit 1

Wind energy: Principles of wind power, site characteristics. Wind rows diagram, types of wind turbines – construction, working and performance characteristics, synchronization of wind energy with the grid.

Unit 2

Thermal: Pyrolysis, gasification process, variables affecting the process, types of gasifiers, construction and working of gasifiers. Application: Gasification of biomass, process industry waste viz. - paper mill, waste cotton mill, saw mill, etc.

Unit 3
Ocean energy: Tidal: Types of energy harnessing techniques, turbines – construction, working and performance characteristics. Ocean thermal: Open cycle, closed cycle, Components of ocean thermal power plant, working and challenges.

Fuel cells: Principle of working of Hydrogen, Carbon Monoxide, fuel cell etc.

TEXTBOOK:

REFERENCES:

15MEC258  TURBOMACHINERY  3 0 0 3

Unit 1

TEXTBOOKS:

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

15MEC261  ADVANCED CASTING TECHNOLOGY  3 0 0 3

Unit 1
Melt processing techniques for ferrous and non-ferrous alloys such as stainless steels, nickel, titanium alloys. Vacuum melting equipment and practice.

Elementary aspects of pattern and mould design using CAD softwares. Resin-bonded mould and core making processes and machines. Special casting processes and their applications - low pressure die casting, investment casting, squeeze casting, thixo-forming. Illustrations of automotive and aerospace applications.

Unit 2
Gating and riser design - principles of fluid flow, governing equations, heat transfer applied to casting solidification, governing equations, boundary conditions for different casting methods, concept of directional solidification, gating and risers, application of simulation methods. Use of casting software in solving practical problems.

Unit 3
Casting defects and remedies. Inspection methods - visual, penetrant, magnetic, metallurgical, X - ray and Gamma ray radiography and Mechanization and Automation.

TEXTBOOK:

REFERENCE BOOKS:

15MEC262  ADVANCED MANUFACTURING PROCESSES  3 0 0 3

Unit 1
Non-traditional manufacturing processes - chemical machining - electro chemical machining - ultrasonic machining - physical setup, metal removal rate, process parameters, process capabilities, and applications.

Non-traditional manufacturing processes - electrical discharge machining - wire EDM - abrasive flow machining - physical setup, metal removal rate, process parameters, process capabilities, and applications

Unit 2
High-speed machining: high performance machining of components. Application of HSM, improved material removal rate, surface finish and integrity, accuracy, economic considerations.

TEXTBOOK:
Serope Kalpakjian and Steven R. Schmid - 'Manufacturing Engineering and Technology' - Prentice Hall - 2013 - 7th Edition

REFERENCE BOOKS:

15MEC263  ADVANCED MATERIALS AND PROCESSES  3 0 0 3

Unit 3
Modern grinding technologies, high speed and high performance grinding. Hard machining using single point tools.

Laser applications in manufacture: Cutting, welding, surface treatment, automation and in-process sensing.

TEXTBOOK:
Serope Kalpakjian and Steven R. Schmid - 'Manufacturing Engineering and Technology' - Prentice Hall - 2013 - 7th Edition

REFERENCE BOOKS:
SYLLABI  
2015 admissions onwards

REFERENCES:

15MEC264  ADVANCED METROLOGY AND SENSING SYSTEMS

Unit 1  

Unit 2  

Unit 3  
Edge detection techniques, Normalization, Grey scale correlation – Reflectance map concepts; surface roughness and texture characterization - photogrammetry. Application of Machine Vision in inspection - Measurement of length, diameters, Surface roughness - automated visual inspection - 3D and dynamic feature extraction. On-line Quality control: On-line feedback quality control variable characteristics - control with measurement interval, one unit, and multiple units control systems for lot and batch production.

TEXTBOOKS / REFERENCES:

SYLLABI  
2015 admissions onwards

15MEC265  ADVANCED WELDING TECHNOLOGY

Unit 1  
Overview of welding processes and their classification, types of joints, edge preparation, weld symbols, weld nomenclature, bead geometry, power density, heat sources - Gaussian distribution of heat flux, welding techniques - linear and orbital. Arc characteristics. Voltage-current characteristics. Types of welding manipulators and their applications.

Advanced welding processes: submerged arc, TIG, MIG, electro-slag, ultrasonic, electron beam and laser beam welding. Case studies and applications - industrial, automotive and aerospace.

Unit 2  

Solidification behaviour of fusion weld: structural zones, epitaxial growth, weld pool shape and columnar grain structures. Weldability of metals - steels, stainless steels, aluminium, copper, nickel and titanium alloys.

Unit 3  

Welding defects - causes and remedies. Methods of testing weldments - mechanical, pressure and leak testing. Inspection methods - visual, penetrant, magnetic, ultrasonic, x-ray and gamma radiography. Use of imaging techniques for online monitoring.

TEXTBOOKS:

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

15MEC266  CNC MACHINES  3 0 0 3

Unit 1
Introduction: Definition of automation, types of automation, Definition of NC, basic components of NC system, the NC procedure, NC Coordinate system, NC motion control systems, Interpolators – linear, circular and parabolic, applications of numerical control.

Features of CNC Machine Tools
Structure, Spindle design, spindle bearings, spindle drives, feed drives – DC servo motors, stepper motors and AC servo motors, actuation systems – recirculating ball screws and anti-friction guide ways, feed-back devices – optical rotary encoders and linear scales.

CNC Machining center developments, turning center developments, high speed CNC machine tools, automatic tool changers.

Manual Programming
Turning center programming: Axes system, ISO standards for coding, tool function, speed function, feed function, miscellaneous functions, rapid positioning, linear interpolation, circular interpolation, thread cutting, canned cycles

Unit 2
Machining center programming: axes system, tool function, speed function, feed function, miscellaneous functions, rapid positioning, linear interpolation, circular interpolation, tool length compensation, canned cycles for drilling, tapping and boring, cutter radius compensation.

Computer Aided Part Programming
APT language structure, Geometry statements, Motion statements, Post processor & auxiliary statements, MACROs, complete part programming in APT.

Unit 3
CNC Tooling
Turning tool geometry, modular tooling systems for turning, collet chucks, end mill adapters, morse taper adapters, boring heads and tapping heads, milling tooling systems, tool presetting, work holding devices - vices, grid plates, pneumatic and hydraulic clamps.

Assembly Techniques
Guide ways, ball screws and nut, feedback elements, spindle bearings.

SYLLABI  B. Tech. - Mechanical Engg.  2015 admissions onwards

15MEC267  COMPOSITE MATERIALS AND PROCESSING  3 0 0 3

Unit 1
Types of reinforcements, their mechanical properties and functions - ceramics, glass, carbon, boron, silicon carbide, metal, aramid. Forms of reinforcements - particulate, fibre, filaments, whiskers, flakes. Pre-fabricated forms - preforms, prepegs, fabrics, honeycomb.

Type of matrix, its mechanical properties and functions - polymers (thermosets and thermoplastics), metals, ceramics, glass and carbon. Basic principles in the design of composites and selection of matrix and reinforcement. Bonding mechanisms.

Unit 2
Anisotropic Behaviour and relationship between structure-mechanical properties.

Mechanical testing - tensile, compressive, Intra-laminar shear, Inter-laminar shear and fracture.


Unit 3

Metal and ceramic matrix composites - wettability of reinforcement to matrix and bonding, methods of manufacturing reinforcements with intermediate wetting layer.

TEXTBOOKS:

REFERENCES:

15MEC268 METAL FORMING TECHNOLOGY 3 0 0 3

Unit 1

Unit 2


Unit 3
SYLLABI

B. Tech. - Mechanical Engg.  2015 admissions onwards

TEXTBOOKS:

REFERENCES:

15MEC270 MODERN PRACTICES IN PRODUCT DESIGN AND MANUFACTURE

Unit 1
Creativity & Innovation: Aesthetics – Industrial design concepts – capturing customer voice – New product development – QFD.


Unit 2

Unit 3


SYLLABI

B. Tech. - Mechanical Engg.  2015 admissions onwards

TEXTBOOKS:
2. Groover M. and Zimmers - 'CAD-CAM, Computer Aided Design and Manufacturing' - Prentice Hall of India, New Delhi, - 2013

REFERENCES:

15MEC271 NON-DESTRUCTIVE TESTING

Unit 1


Unit 2

Unit 3

TEXTBOOKS:

Schools of Engineering  Amrita Vishwa Vidyapeetham
15MEC272 PRODUCT COST ESTIMATION 3 0 0 3

Unit 1
Cost estimation: Importance and aims of cost estimation - functions of estimation - difference between estimating and costing - importance of preparing realistic estimates - estimating procedure.

Elements of cost, Objectives - elements of costs - ladder of cost - determination of material cost - labour cost - expenses.

Unit 2
Analysis of overhead expenses, Distribution of overhead costs – depreciation - causes of depreciation - methods of calculating depreciation.

Estimation of machining time, Calculation of machining time for lathe operations- estimation of drilling time on drilling machine - estimation of time for shaping, planning, milling and grinding.

Unit 3
Costing for metal forming and fabrication processes, Estimation of cost in welding-estimation in forging shop - cost estimation of foundry work.

TEXTBOOKS:

REFERENCES:

15MEC273 QUALITY CONTROL AND RELIABILITY ENGINEERING 3 0 0 3

Unit 1
Introduction: Review of statistics and probability. Quality related costs, contemporary quality engineering philosophy, Quality systems and international standards and 6 Sigma. Control charts for variables: X-bar and R charts, X-bar and S charts;
15MEC274 SIMULATION MODELING OF MANUFACTURING SYSTEMS

Unit 1

Introduction to Simulation softwares.


Unit 2

Model Building of Discrete systems: Modelling Paradigms - Modelling of Structural elements and Operational elements – Modelling issues – Model Verification and Validation.

Unit 3
Applications of Simulation in Manufacturing – Manufacturing Modelling Techniques – Modelling Material Handling system – Model building exercises using Arena - Case study.

Simulation output analysis: Design of Simulation Experiments: Determination of warm up period, Run length, Number of replications - Statistical analysis of simulation output – Terminating and Non-Terminating Simulations – Comparing alternative system designs – Variance reduction Techniques – Simulation Optimization.

TEXTBOOKS:

REFERENCES:
### Unit 2

**Variable and Cyclic Loads: Fatigue Load, Stress Cycle, Fluctuating loading, Reversed Loading, Repeated Loading, Endurance Strength, Endurance Limit, S-N Curves, Modifying Factors: Size effect, Surface effect, Stress Concentration effects, Goodman and Soderberg relationship; Stresses due to Combined Loading.**

**DESIGN OF SHAFTS:** Design for strength and Rigidity with Steady loading, ASME & BIS codes for Power Transmission shafts, Shafts subjected to Combined Twisting Moment and Bending Moment, Shafts under Fluctuating loads and Combined loads.

**KEYS AND COUPLINGS:** Keys and Splines, Design of keys, Design of Rigid and Flexible couplings.

### Unit 3

**MECHANICAL JOINTS:**

- Welded Joints: Types, Strength of Butt and Fillet welds, Eccentrically loaded Welded Joints
- POWER SCREWS: Types of Screw Threads used for Power Screws, Torque required to Raise and Lower the load, Efficiency and Self-locking, Design of Screw Jack. Design of screws for C-Clamp and machine vice.

**TEXTBOOKS:**


**REFERENCES:**


### 15MEC302 DYNAMICS OF MACHINES 3 0 0 3

**Unit 1**

Static and Dynamic Force Analysis

- Static force analysis of mechanisms - D’ Alembert’s principle - Inertia force and

### Unit 2

**Balancing of rotating masses and Reciprocating masses**

- Static and dynamic balancing - Balancing a single cylinder Engine - Primary and secondary unbalanced forces - Balancing Multi-cylinder Engines - Firing order - Balancing machines.

**Control Mechanisms**

- Governors
  - Types - Centrifugal governors - Gravity controlled and spring controlled centrifugal governors - Characteristics - Effect of friction - Controlling Force - Quality of governors - effect of friction.

**Gyroscope**

- Gyroscopic couple - Gyroscopic stabilization - Gyroscopic effects in Automobiles, Airplanes and Ships

**TEXTBOOKS:**


**REFERENCES:**


### 15MEC303 HEAT POWER ENGINEERING 3 0 0 3

**Unit 1**

Combined first law and second law of open systems, reversible steady flow work, available energy, irreversibility, exergy and second law efficiency.
SYLLABI

B. Tech - Mechanical Engg. 2015 admissions onwards

Vapour power cycles: Simple Rankine Cycle, reheat cycle, regenerative cycles


Steam turbines: Impulse and Reactions turbine, compounding principles.

Unit 2


Unit 3


Air conditioning systems: Psychrometry, Air-conditioning equipment, components and control, cooling load calculations.

TEXTBOOKS:

REFERENCES:

15MEC304
MANUFACTURING PROCESS II
3 0 0 3

Unit 1
Theory of metal cutting: Types of metal cutting processes, Mechanism of chip formation - Forces and temperature in metal cutting, Tool life - Machinability and surface finish: Cutting tool materials and cutting fluids. Tool wear.

Cylindrical Surface Machining: Basics of turning process, lathe and its accessories, operations, process parameters. Machining time calculations.

Drilling Machines: Types, operations, process parameters. Design considerations for drilling operations. Machining time calculations.

Unit 2
Flat and Profile Machining: Milling operations - Milling machines: types, operations, process parameters. Planing and shaping machines -types, operations. Gear machining processes.


Unit 3
CNC Machines: Overview, types, construction, tool and work holding devices, feedback devices, part programming - examples.


TEXTBOOK:

REFERENCES:
SYLLABI  
2015 admissions onwards

15MEC311  DESIGN OF MACHINE ELEMENTS II  3 1 0 4

Unit 1
BEARINGS

Journal bearings (Sliding contact bearing) - Bearing characteristic numbers, Petroff's equation, Sommerfeld number, Mckee's equation, Journal bearings design.

Rolling Contact Bearings - Types, Static & Dynamic load carrying capacity, Reliability, Selection of antifriction bearings for Static & Dynamic conditions, Selection of antifriction bearings for constant and varying loads.

FLEXIBLE TRANSMISSION SYSTEM
Introduction, Classification & Application of flexible power transmission systems, Simple and Compound power drives.

Belt Drives - Flat belt drives, types, belt configuration, velocity ratio, slip, condition for maximum power transmission, length of open and cross belt drives, centrifugal tension, initial tension, selection of belts, flat belt pulleys, fast and loose pulleys, Designation of V-belt, Advantages and Disadvantages of v-belt drives, Selection of V-belt,

Rope Drives - Types, Designation of wire rope, Length of wire rope, factor of safety, Stresses in hoisting wire ropes, Selection of wire ropes, Wire rope Sheaves and Drums.

Chain drives - Introduction, Terms used in chain drives, Classification, Conveyor chains, Power transmitting chains, Roller chains, Factor of Safety for chain drives, Selection of chain drives.

Unit 2
GEARS - Types, Applications and Gear Terminology,

Spur Gears - Law of gearing, conjugate action and interference in gears, Gear tooth profiles, involute profile, Influence of number of teeth and pressure angle, Gear tooth failure modes, beam strength of gear tooth - Lewis equation, Gear materials, Force analysis, Design for strength, Dynamic and wear load.

Helical gears - Applications, Virtual number of teeth on helical gears, Force analysis, Design of helical gears.

TEXTBOOKS:
3. 'Design Data: Data Book of Engineers' by PSG College Kalakathir Achchagam, Coimbatore, 2012.

REFERENCES:

NOTE: Design of some of the above components for practical applications can be emphasized for better understanding and Continuous Evaluation of the Course.

15MEC312  HEAT TRANSFER  3 1 0 4

Unit 1
Unit 2
Convective heat transfer: Newton's law of cooling, Prandtl number, hydrodynamic and thermal boundary layer, forced convection, Nusselt number, empirical relations in forced convection for flat plates, cylinders and spheres. Flow over tubes and bank of tubes; Internal flow and heat transfer: fully developed laminar flow in pipes, turbulent forced convection, free convection, Natural convection: dimensionless numbers, combined natural and forced convection, Phase change heat transfer: Pool boiling, convective boiling, film and drop wise condensation, empirical relations for heat transfer with phase change.

Unit 3

Radiation heat transfer: electromagnetic radiation spectrum, thermal radiation, absorptivity, reflectivity, transmissivity, emissivity, black body, gray body and white body, monochromatic and total emissive power, Planck's law, Stefan-Boltzmann law, Wein's Displacement law, Radiation exchange between surfaces, view factors, greenhouse effect.

TEXTBOOKS:

REFERENCES:
3. Adrian Bejan - 'Heat Transfer' - Wiley India Pvt Ltd. - 2011

15MEC313 INTRODUCTION TO FINITE ELEMENT METHODS 3 0 2 4

Unit 1
Introduction: Equilibrium equations in elasticity subjected to body force, traction forces, stress strain relations for plane stress and plane strain, Boundary conditions, Initial conditions, Euler’s Lagrange’s equations of bar, beams, Principal of a minimum potential energy, principle of virtual work, Rayleigh-Ritz method, Galerkins method, Guass elimination method, Numerical integration.
SYLLABI  B. Tech. - Mechanical Engg.  2015 admissions onwards


REFERENCES:

15MEC314  METROLOGY AND MEASUREMENTS  3 0 0 3

Unit 1
Concept of Metrology: Definition and concept of Metrology - need of Inspection - Generalized measurement system - Units and standards - measuring instruments; sensitivity, stability, range, accuracy and precision, static and dynamic response, repeatability - systematic and random errors - correction; calibration.


Unit 2
Surface Texture and Screw Thread Measurement: Elements of surface texture - Evaluation of surface finish - Peak to valley height - Talysurf, Tominson surface meter - Screw thread terminology - Measurement of various elements of thread; Measurement of thread angle by two wire and Three wire methods; Thread gauges and floating carriage micrometer.

Form Measurements: Measurement of Straightness, Flatness, Parallelism, squarness testing, Roundness testing - Radius Gauge, Wire Gauge, etc.

Signal Representation – Signal conditioners, filters, ADC, DAC

Unit 3
Wheatstone bridge, use of bridge circuits - Displacement measurement - Potentiometer - LVDT, Piezo electric type - Velocity measurement.

SYLLABI  B. Tech. - Mechanical Engg.  2015 admissions onwards

Nature of Vibration, accelerometers.

Strain measurement types, mechanical strain gauge, Electrical strain gauge, selection of strain gauge.

Temperature measurement: Bimetallic thermometer, Platinum resistance thermometers, Thermocouples and Pyrometers – Pressure fundamentals; Elastic transducers, thermal conductivity gauges, Vacuum pressure measurement, Flow measurement - Ultrasonic flow meter - turbine type meters - Hot wire anemometers.

TEXTBOOKS:
1. J. F. W. Gayler, and C. R. Shotbolt - 'Metrology for Engineers' ELBS -1990

REFERENCES:
5. Dr. D. S. Kumar - 'Mechanical Measurements & Control' - Metropolitan Book Co. Private Ltd. - ISBN 81-200 0214-8

15MEC331  ENGINEERING ECONOMIC ANALYSIS  3 0 0 3

Unit 1


Unit 2

Profit and revenue maximization: Optimal input combination. Total revenue maximization.
Unit 3


TEXTBOOK:
Webster T. J. - ‘Managerial Economics- Theory and Practice’ - Elsevier - 2004

REFERENCE BOOKS:

15MEC332 ENTERPRISE MANAGEMENT 3 0 0 3

Unit 1


Unit 2

Unit 3

TEXTBOOKS:

REFERENCES:

15MEC334 INDUSTRIAL ENGINEERING 3 0 0 3

Unit 1
Work System: Elements of work, maintenance of machines, interaction, effect of working conditions and environment, physical and mental fatigue.

Productivity: Productivity, factors affecting production, Measurement of productivity.

Work Study: Definition and scope of work study; Areas of application of work study in industry; Human aspects of work study.

Method Study: Information collection, recording techniques, and processing aids; critical examination; development, installation and maintenance of improved methods.

Unit 2
Motion Economy and Analysis: Principles of motion economy; Motion analysis; Micromotion and Memomotion study; Therbligs and SIMO charts; Normal work area and design of work places; Basic parameters and principles of work design.

Work Measurement: Work measurement techniques; Calculation of standard time, work sampling and predetermined Motion time systems.

Wages and Incentive Schemes: Introduction, wage payment of direct and indirect labour, wage payment plans and incentives, various incentive plans, incentives for indirect labour

Unit 3
Plant Layout: Concept of plant layout, types of layout; factors affecting plant layout, work station design, factors considered in designing a work station.

Material Handling: Introduction and functions of material handling equipment, selection of material handling equipment for different requirements, safety requirements.


TEXTBOOKS:

15MEC335 LEAN MANUFACTURING 3 0 0 3

Unit 1
Introduction to Lean and Factory Simulation: History of Lean and comparison to other methods - The 7 Wastes, their causes and the effects - An overview of Lean Principles / concepts / tools - Stockless Production.


Unit 2
Value Stream Mapping – Current state: Preparation for building a Current State Value Stream Map - Building a Current State Map (principles, concepts, loops, and methodology) - Application to the factory Simulation scenario.

Unit 3

TEXTBOOKS:

REFERENCES:
1. Womack J. P. and Jones D. T. - 'Lean Thinking' - Simon & Schuster, USA - 1996
2. Rother M. and Shook J. - 'Learning to See' - The Lean Enterprise Institute, Brookline, USA - 2003
15MEC336 MANAGERIAL STATISTICS 3 0 0 3

Unit 1
Quantitative methods: Basic terminology in probability, probability rules, conditions of statistical dependence and independence, Bayes Theorem, Discrete Random Variables review of probability distributions, measure of central tendency.

Sampling and sampling distributions: Introduction to sampling, random sampling, design of experiments, introduction to sampling distributions.

Estimation: point estimates, interval estimates and confidence intervals, calculating interval estimates of mean from large samples, using t test, sample size estimation.

Unit 2
Testing hypothesis: Introduction, basic concepts, testing hypothesis, testing when population standard deviation is known and not known, two sample tests.

Chi-square and analysis of variance: introduction, goodness of fit, analysis of variance, inferences about a population variation.

Unit 3
Regression and correlation: Estimation using regression line, correlation analysis, finding multiple regression equation, modelling techniques,

Non parametric methods and time series and forecasting: Sign test for paired data, rank sum test, rank correlation, Kolmogrov – smirnov test, variations in time series, trend analysis, cyclic variation, seasonal variation and irregular variation. Decision theory: Decision tree analysis.

TEXTBOOKS:

REFERENCES:


15MEC337 MARKETING MANAGEMENT 3 0 0 3

Unit 1
Marketing Process: Definition, Marketing process, dynamics, needs, wants and demands, value and satisfaction, marketing concepts, environment, mix. Philosophies, selling versus marketing, organizations, industrial versus consumer marketing, consumer goods, industrial goods, product hierarchy.

Buying Behaviour and Market Segmentation: Major factors influencing buying behaviour, buying decision process, business buying behaviour. Segmenting consumer and business markets, market targeting.

Unit 2
Product Pricing and Marketing Research: Objectives, pricing, decisions and pricing methods, pricing management. Introduction, uses, process of marketing research.

Unit 3
Marketing Planning and Strategy Formulation: Components of marketing plan-strategy formulations and the marketing process, implementations, portfolio analysis, BCG, GEC grids.

Advertising Sales Promotion and Distribution: Characteristics, impact, goals, types, and sales promotions - point of purchase - unique selling proposition. Characteristics, wholesaling, retailing, channel design, logistics, and modern trends in retailing.

TEXTBOOKS:

REFERENCES:
2. Tull D. S. and Hawkins - 'Marketing Research' - Prentice Hall of India – 1997
4. Skinner S. J. - 'Marketing' - All India Publishers and Distributes Ltd. - 1998
### SYLLABI

**B. Tech. - Mechanical Engg.**

#### 15MEC338 
**OPERATIONS MANAGEMENT** **3 0 0 3**

**Unit 1**


**Unit 2**


Quality engineering: TQM, Six sigma concepts - Lean manufacturing, ISO standards.

**Unit 3**

Forecasting: Forecasting system - Judgment methods, Time series methods.


**TEXTBOOKS:**

**REFERENCES:**

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#### 15MEC339 
**PROJECT MANAGEMENT** **3 0 0 3**

**Unit 1**


**TEXTBOOK:**


**REFERENCES:**

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#### 15MEC340 
**SUPPLY CHAIN MANAGEMENT** **3 0 0 3**

**Unit 1**

Introduction: Introduction to SCM - the complexity and key issues in SCM – Location strategy – facility location decisions – single facility and multiple location models.


**Unit 2**

Inventory: Inventory Management and risk pooling - managing inventory in the SC. Value of Information - bullwhip effect - lead time reduction.

Supply Chain Integration: Supply chain integration - distributed strategies - push versus pull systems.


**Unit 3**

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**2015 admissions onwards**

**TEXTBOOK:**

2. Christopher M. - 'Logistics and Supply Chain Management: Strategies for Reducing Cost and Improving Service' – PH - 1999

**REFERENCES:**


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**15MEC341  TOTAL QUALITY MANAGEMENT  3 0 0 3**

**Unit 1**

**Unit 2**
Customer satisfaction - Customer retention - Employee involvement - Performance appraisal - Continuous process improvement - Supplier partnership - Performance measures. Seven tools of quality.

Statistical fundamentals - Control Charts for variables and attributes - Process capability - Concept of six sigma - New seven management tools - Benchmarking.

**Unit 3**
Quality function deployment (QFD) - Taguchi quality loss function - Total Productive Maintenance (TPM) - FMEA.


**TEXTBOOK:**

Besterfiled D. H. - 'Total Quality Management' - Pearson Education Asia - 2005

**REFERENCES:**


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**15MEC381  MANUFACTURING PROCESS LAB.  0 0 2 1**


Study of various processes, tools and equipment’s used in foundry, exercises on mould preparation, foundry sand testing.

**15MEC382  THERMAL SCIENCES LAB.  0 0 2 1**

Experiments to determine flash and fire point, viscosity, calorific values of solid, liquid and gaseous fuels, Carbon content (Carbon residue test).

Study of I.C engines, components and loading devices, Valve timing and port timing diagrams, Performance test, Heat balance sheet on Petrol and Diesel engines, to find Friction power: Morse test or Motoring test.

Study of Refrigeration and Air conditioning system - Performance Tests (COP), Study of Renewable energy systems (like Solar, Wind, Biomass etc.) - Performance tests.

**15MEC383  HEAT TRANSFER AND THERMAL ANALYSIS LAB.  0 0 2 1**

**HEAT TRANSFER**
To determine of thermal conductivity of metal rod and composite wall, heat transfer coefficient in free and forced convection. Performance test on extended surfaces, heat exchangers.Experiment on Transient conduction and radiation heat transfer.

**THERMAL ANALYSIS**
Introduction to the Software package, Analysis of flow through pipes, elbows and nozzles.Analysis of flow over different objects using CFD software.Analysis of conduction, convection and radiation problems using FEM package

**15MEC386  METROLOGY AND MEASUREMENTS LAB.  0 0 2 1**

**METROLOGY LAB**
LINEAR AND ANGULAR MEASUREMENTS: Slip gauges, Micrometers, Verniers, Dial gauges and Surface plates – Comparators: Mechanical, Electrical, Pneumatic and...
Optical comparator. Angular measuring instruments - Sine bar, Angle gauges, Spirit level, Auto collimators.


MEASUREMENTS LAB
Calibration of Pressure Gauge, Thermocouple, LVDT, Load cell. Measurement of load, torque, speed, angular displacement. Study of strain gauge rosettes, determination of modulus of elasticity using strain gauges. Study of stress concentration using photo-elasticity for simple components like plate with a hole under tension or bending, circular disk with circular hole under compression.

15MEC390 / 15MEC490  LIVE-IN-LAB.  3 cr

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

15MEC401  ADVANCED FLUID MECHANICS  3 0 0 3

Unit 1

Unit 2
The boundary layer equations. Displacement thickness. Momentum thickness. Turbulent flat plate boundary layer. Boundary layers with pressure gradients.

15MEC402  CONTROL ENGINEERING  3 0 0 3

Unit 1
Introduction: Concept of automatic controls, open and closed loop systems, concepts of feedback, requirement of an ideal control system.

Modeling of Systems: The control system, Mathematical models of physical systems - Introduction, Differential equations of physical systems – Mathematical Model: Mechanical System (both translation and rotational), Electrical systems (servos, D.C. Motors, A.C. Servomotors), Hydraulic systems (liquid level and fluid power systems), Thermal systems, Integrating devices, Hydraulic servomotor, temperature control system, error detectors.

Block Diagrams: Transfer Functions definition, function, block representation of system elements, reduction of block diagrams, Basic properties and gain formula to block.

Unit 2
System Response: First order and second order system response to step, ramp and sinusoidal inputs, concepts of time constant and its importance in speed of response

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Unit 3

Control system analysis in state space: Introduction to the state concepts, state equation of linear continuous data system. Matrix representation of state equations, controllability and observability, Kalman and Gilberts test

TEXTBOOKS:
1. K. Ogata - 'Modern Control Engineering - Prentice Hall (India) - Pearson Education - 2009 - 5th Edition

REFERENCES:

15MEC403 INDUSTRIAL ROBOTICS 3 0 0 3

Unit 1


Unit 2
Direct Kinematic Model – Mechanical structure and notations - Description of links and joints - Kinematic modeling of manipulator - Denavit-Hartenberg Notation - Kinematic Relationship between adjacent links - Manipulator Transformation Matrix.

Inverse Kinematic Model – Manipulator Workspace – Solvability - Solution techniques - Closed form solution.

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Unit 3

TEXTBOOK:

REFERENCE BOOKS:

15MEC404 MECHANICAL VIBRATIONS 3 0 0 3

Unit 1

Un-damped free vibrations: Single degree of freedom systems. Un-damped free vibration-natural frequency of free vibration, stiffness of spring elements, effect of mass of spring, Compound Pendulum.

Damped free vibrations: Single degree freedom systems, different types of damping, concept of critical damping and its importance, study of response of viscous damped systems for cases of under damping, critical and over damping, Logarithmic decrement.

Unit 2
Forced Vibration: Single degree freedom systems, steady state solution with viscous damping due to harmonic force. Solution by Complex algebra, Reciprocating and rotating unbalance, vibration isolation - transmissibility ratio. Due to harmonic excitation and support motion, Whirling of Shafts - Whirling of shafts with and without air damping, Discussion of speeds above and below critical speeds.

Vibration measuring instruments & Vibration Control: Vibration exciters, vibrometer and accelerometer, free & forced vibration tests, vibration isolation, vibration absorbers.
Unit 3


**TEXTBOOKS:**

**REFERENCES:**

**15MEC411 OPERATIONS RESEARCH 3 0 0 3**

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

Unit 2

Unit 3
Sequencing model - 2 machines n jobs, m machines n jobs-n jobs 2 machines.

Inventory models - deterministic and probabilistic models, Queuing models-poison arrival and exponential service times, single server, multi-server. Simulation: Monte Carlo simulation - simple problems.
The project should be focused on the synthesis of knowledge gained over the past seven semesters and Phase-I of the project. The project should be relevant to Mechanical Engineering which could involve theoretical and/or computational and/or fabrication and/or experimental work. Students are required to submit a report at the end of the semester. Evaluation will be done during the course of the project as well as at the end of the semester by a committee of examiners appointed by the Chairman of the Department.

**15PHY100 PHYSICS 3 0 0 3**

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


**Unit 2 Atomic Structure and Quantum Mechanics**

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

**Unit 3 Statistical Mechanics and Solid State Physics**


**TEXTBOOK:**
torque-free motion - dual-spin spacecraft, satellite maneuvering and attitude control - coning maneuver - Yo-yo despinn mechanism - gyroscopic attitude control, gravity-gradient stabilization.

TEXTBOOKS:

REFERENCE BOOKS:

15PHY233 BIOPHYSICS AND BIOMATERIALS 3 0 0 3

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

Unit 1 Quantum mechanics – Schrodinger’s time dependent and independent equations – Pauli’s exclusion principle – ionization energy – electron affinity – chemical binding – electron negativity and strong bonds - secondary bonds – inter atomic potential or strong bonds and weak bonds – bond energies – spring constants – free energy – internal energy – reaction kinetics.

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.


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 - coles expression for integral, trapezoidal rule, Simpsons’s rule, Gauss quadrature method.


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 Hijroth Jensen, Department of Physics, University of Oslo, 2003 (Available in the Web)

15PHY238  ELECTRICAL ENGINEERING MATERIALS  3 0 0 3

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

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

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

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

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

TEXTBOOK:

REFERENCES:

15PHY239  ELECTROMAGNETIC FIELDS AND WAVES  3 0 0 3

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

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
Used of band theory to explain optoelectronic properties of materials and
optoelectronic devices: LEDs, Solar Cells, Lasers, pin diodes, photodiodes; Magnetic
Poisson’s and Laplace’s equations: The potential field of a point charge, potential
field of a system of charges: conservative property, potential gradient, the dipole.

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

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

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

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

TEXTBOOK:

REFERENCES:
1. David J Griffiths, “Introduction to Electrodynamics”, Prentice-Hall of India, New Delhi, 1999
   (2nd edition).
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.

REFERENCES:

15PHY243  MICROELECTRONIC FABRICATION  3 0 0 3

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

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

Unit 3
Vacuum science: Kinetic theory of gases, gas flow and conductance, vacuum pumps and seals; deposition of thin films: physics of sputtering and evaporation, step coverage and morphology of deposited films, chemical vapor deposition: chemical equilibrium and law of mass action, gas flow and boundary layers, types of CVD, plasma assisted CVD; thermodynamics of epitaxial growth, types molecular beam epitaxy, isolation and contact formation – LOCOS and trench, silicides, metalization 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 confinement and other fusion concepts. Prospects of fusion power.

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

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

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.


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

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

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

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

REFERENCES:

15PHY251  THIN FILM PHYSICS  3 0 0 3

Unit 1

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

Unit 2

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

REFERENCE BOOK:

15PHY333

CONCEPTS OF NANOPHYSICS AND NANOTECHNOLOGY

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

Concept of quantum confinement and phonon confinement
Basic concepts – excitons, effective mass, free electron theory and its features, band structure of solids. Bulk to nanotransition – density of states, potential well

SYLLABI

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Unit 2
Tools for characterization:

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

Unit 3

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

TEXTBOOKS:

15PHY335

MEDICAL PHYSICS

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

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

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

Unit 3

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

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
Stellar astronomy: H-R diagram, color-magnitude diagram - main sequence - stellar evolution – red giants, white dwarfs, neutron stars, black holes - accretion disc -
Schwarzschild radius - stellar masses Saha–Boltzman equation - derivation and interpretation.

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:

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

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
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); Phanerozic (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.
Nonlinear prediction and noise-reduction: linear predictors, state-space prediction, noise reduction, Lyapunov exponents from experimental data, false nearest neighbours. Fractals: Cantor sets, curves, trees, gaskets, sponges, landscapes.

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

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

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

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

TEXTBOOK:

REFERENCES:

15PHY542 OPTOELECTRONIC DEVICES

Unit 1

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

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

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

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

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

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

15SAN11 SANSKRIT II 1 0 2 2

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

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

Unit 2

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

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

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

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

15SSK221 SOFT SKILLS I 1 0 2 2

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

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

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

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

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

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

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

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

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

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

REFERENCES:
3. The BBC and British Council online resources
4. Owl Purdue University online teaching resources 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.

15SSK331 SOFT SKILLS III 1 0 2 2

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

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

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

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

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

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

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

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

REFERENCES:
Unit 2

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

REFERENCES:
3. Canadian Mental Health Association, Ontario “Workplace mental health promotion, A how to guide” www.mhpo.ca/ohaontario.ca/
6. Mental Health Act 1987 (India) www.nhealth.org/india.htm
7. Persons with disabilities Act 1995 (India) socialjustice.nic.in
8. The Factories Act 1948 (India) www.caa.in/Image/19ulabourlawsb.pdf
SYLLABI
B. Tech. - Mechanical Engg. 2015 admissions onwards

Unit 5

Textbooks:
- nä. Vāgamalai, "tamil hōkappāṭikal" nīyō cēcūri putakka veliyāṭakam 1964,2006
- potu martimakki, "vēk̥i̥ni thatil ilakkaṇam" oṭṭōn poṉṟimekkiyakoom, vaṉiṉyār, tiruvaṉṟantarpuram, 2007.

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