**15AES111  INTRODUCTION TO AEROSPACE TECHNOLOGY  3 0 0 3**

**Unit 1**  
Visual Content (video) about Atmospheric Dynamics and its Influence on Flying Machines – History of Aviation (visual content) – Types of Flying Machines, Major Components of an Aircraft, and their Functions (visual content) – Aircraft vs Rotorcraft (visual content) – Basic Instruments for Flying (visual content) – Physical Properties and Structure of the Atmosphere: Temperature, Pressure and Altitude Relationships.

**Unit 2**  

**Unit 3**  

**TEXTBOOK:**  

**REFERENCES:**  

**15AES201  MECHANICS OF FLUIDS  3 1 0 4**

**Unit 1**  

**15AES202  INTRODUCTION TO THERMODYNAMICS  2 1 0 3**

**Unit 2**  

**Unit 3**  

**TEXTBOOK:**  
SYLLABI
B. Tech. - Aerospace Engg. 2015 admissions onwards


TEXTBOOKS:

REFERENCE:

15AES203 MECHANICS OF MATERIALS 2 1 0 3

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

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


15AES204 MATERIALS FOR AVIATION AND SPACE 3 0 0 3

Unit 1
Atomic structure, bonding and crystal structure in materials. Imperfections in crystalline solids and their role in influencing materials properties. Mechanical properties: Stress and strain curves for brittle and ductile alloys, elastic, plastic, anelastic, visco-elastic behavior, ductility, resilience, toughness of metals, strengthening mechanisms, grain boundary hardening, solution hardening and work hardening.

Unit 2
Metals and Alloys: Microstructure, properties and applications of ferrous and non-ferrous materials in aviation and space. Solid solutions, solubility limit, phase rule, binary phase diagrams, intermediate phases, intermetallic compounds, recrystallization and grain growth.

Ceramics: Structure, properties and applications of traditional and advanced ceramics for re-entry of space vehicles.

Unit 3
Polymers: Classification of engineering and high performance polymers, additives for engineering and high performance polymers, elastomers. Smart materials and superconductivity, nanomaterials, superalloys. Materials characterization techniques such as, scanning electron microscopy, transmission electron microscopy, atomic force microscopy, differential scanning calorimetry and X-Ray photo electron spectroscopy.

TEXTBOOK:

REFERENCES:

Schools of Engineering Amrita Vishwa Vidyapeetham S 3

Schools of Engineering Amrita Vishwa Vidyapeetham S 4
**SYLLABI**

**B. Tech. - Aerospace Engg.**

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**15AES211**

**AERODYNAMICS I**

**3 0 0 3**

**Unit 1**

Importance of Aerodynamics – Classification and Practical Objectives – Aerodynamic Forces – Moments and their Non-dimensionalization – Airfoil Nomenclature – Airfoil Characteristics.

**Unit 2**


**Unit 3**


**TEXTBOOK:**


**REFERENCES:**


**15AES212**

**COMPRESSIBLE FLUID FLOW**

**2 1 0 3**

**Unit 1**


**Unit 2**


**Unit 3**


**TEXTBOOKS:**


**REFERENCES:**


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**15AES213**

**AEROSPACE STRUCTURES I**

**3 0 0 3**

**Unit 1**

Stress at a point, stress transformations, principal stresses, normal and shear strains, strain transformations, principal strains, Mohr’s circle, bi-axial and tri-axial stresses, generalized Hooke’s law, plane stress and plane strain, analysis of thin and thick walled pressure vessels.

**Unit 2**

Types of riveted, bolted, and welded joints, merits and demerits of various joints, study of failure behavior and simple design of joints, strain and potential energies, strain energy density, gradually applied loads and suddenly applied loads, Castigliano’s theorem I and Castigliano’s theorem II, Maxwell-Betti’s theorem, unit load method and its applications, principle of virtual work, principle of virtual displacement and principle of virtual force.

**Unit 3**

Buckling of columns, Euler’s formula, effective length, load versus deflection plot, load eccentricity, imperfections, South-well plot, beam columns, maximum principle stress theory, maximum principle strain theory, maximum strain energy theory, maximum shear stress (Tresca) theory, and maximum distortion (von-Mises) theory, loads on an aircraft, characteristics of aircraft structures, basic structural members in aircraft structures and their functions.

**TEXTBOOK:**


**REFERENCES:**

15AES214 INTRODUCTION TO CONTROL THEORY  2 1 0 3

Unit 1

Unit 2

Unit 3

TEXTBOOKS:

REFERENCE:

15AES281 MEASUREMENT AND INSTRUMENTATION LAB.  0 0 2 1

Calibration exercises on general purpose test (GPT) equipment such as Oscilloscope, signal generator, and pressure gauges.

Measurement experiments: Displacement using LVDT, velocity using Pitot tube and anemometer, force using Proving ring and load cell, torque using strain gauges, speed using strobscope and magnetic pickup, and temperature using thermocouple.

Mini Projects: Interdisciplinary in content based on application of course work completed by the student.

15AES285 MECHANICS OF FLUIDS LAB.  0 0 2 1


15AES286 MATERIALS TESTING LAB.  0 0 2 1

Tension test on metals, hardness test on metals using the Rockwell and Brinell tests, impact tests on metals using the Charpy and Izod equipments, double shear tests, helical spring tests, static bending and compression tests on wood and deflection test to verify the Maxwell reciprocal theorem.

In addition to the conventional tests, students are assigned to open lab projects that involve experimental studies including fabrication and setting up unconventional testing methods to understand the basic concepts of strength of materials.

15AES301 AERODYNAMICS II  2 1 0 3

Unit 1
Classical Thin Airfoil Theory for Symmetric and Cambered Airfoils: Lift and Moment Coefficients, Center of Pressure, Predicting Zero Lift Angle of Attack, Flapped Airfoils, Effects of Thickness.

Unit 2

Unit 3

TEXTBOOK:

REFERENCE:

15AES302 AEROSPACE PROPULSION  2 1 0 3

Unit 1
SYLLABI
B. Tech. - Aerospace Engg. 2015 admissions onwards

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

15AES303 AEROSPACE STRUCTURES II 3 0 0 3

Unit 1
Introduction to theory of elasticity: equilibrium equations, boundary conditions, constitutive relations, plane stress and plane strain conditions, stress and displacement formulations, strain compatibility relation, governing equations, inverse and semi-inverse methods, Airy’s stress function, Torsion in non-circular bars, Prandtl stress function, St. Venant warping function, membrane analogy, torsion in narrow rectangular section.

Unit 2
Euler-Bernoulli and Timoshenko beam theories, bi-directional bending, bending and transverse shear stresses, bending stresses in narrow rectangular section, general symmetric sections, and thin-walled sections, flexural shear flows (FSF), FSF in thin-walled open sections, shear center in open sections.

Unit 3
Torsional shear flows (TSF) in thin-walled open sections, TSF in thin-walled closed sections (single and multiple cells) and warping in open and closed thin-walled sections, FSF in thin-walled closed sections (single and multi-cells) and shear center in closed sections, buckling of non-symmetrical sections and buckling of thin-walled sections.

TEXTBOOK:
Unit 2
Coordinate systems, convergence criteria, 1D Elements: Axial elements basic formulations, formations of shape functions, problems using 1D elements, Beam (bending) element: formulations and formation of shape function and problems – 2D elements: Plane stress and Plane strain element formulation, shape function development, problems using 2D elements - axi-symmetric elements - iso-parametric formulation of elements.

Unit 3
3D element formulations - Introduction to FE formulation of Plate bending and shell elements - Numerical integration - Solution techniques of the numerical equations - Introduction to FE software - FE modeling of aircraft and spacecraft components - Application of boundary conditions and loadings on FE models - Analysis of subcomponents like wings, fuselage, motor casing, etc.

TEXTBOOK:

REFERENCES:

15AES312 FLIGHT MECHANICS 2 1 0 3

Unit 1

Unit 2

15AES332 FUNDAMENTALS OF HEAT TRANSFER 3 0 0 3

Unit 1

Unit 2

Unit 3

TEXTBOOK:
SYLLABI  B. Tech. - Aerospace Engg.  2015 admissions onwards

REFERENCES:

15AES342 EXPERIMENTAL AERODYNAMICS  3 0 0 3

Unit 1

Unit 2

Unit 3
Quantitative Characterization: Drag Measurements, Static Probes, Pressure Sensitive Paints (PSP), Velocity Measurements, Pitot-Static Probe, Thermocouple, Thermal Anemometers (Hot Wire and Film Sensors), Laser Velocimetry (LDA), Particle Image Velocimetry (PIV).

TEXTBOOK:

REFERENCES:

15AES352 VIBRATION ANALYSIS  3 0 0 3

Unit 1
Introduction to vibration, undamped vibration, natural frequency, damped vibration, viscous damped system, under, over and critically damped system, logarithmic decrement, Coulomb damping, response to initial condition, response to simple harmonic motion, rotating unbalance, base excitation, whirling of shafts, vibration measuring instruments, response to periodic motion.

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

15AES353 COMPOSITE MATERIALS AND MECHANICS  3 0 0 3

Unit 1
Introduction to Composites: Concept of Composite materials, Classification of Composites, Various types of composites, Classification-based on Matrix Material: Organic Matrix Composites (Polymer matrix composites (PMC) / Carbon Matrix Composites or Carbon-Carbon Composites, Advantages of Composites materials. Reinforcements and Matrices for various types of composites Fibers / Reinforcement Materials, Role and Selection of reinforcement materials, Types of fibers, Mechanical properties of fibers,

Unit 2
Functions of Matrix, Desired Properties of Thermosets and Thermoplastics, Metal matrix, Ceramic matrix, Carbon Matrix, Glass Matrix etc. Laminated composites, Lamina and Laminate Lay-up, Ply-orientation definition, Manufacturing processes. Testing of Composites:Mechanical testing of composites, Tensile testing, Compressive testing.

Unit 3
Determination of longitudinal and transverse strengths of lamina, mechanics of short fiber composites, stress-strain relationships of anisotropic lamina with arbitrary orientations, analysis of laminated composites, types of laminates, stress-strain variation in laminates using classical lamination theory, thermal stresses in laminates, different types of failure criteria, introduction to inter-laminar stresses in composites.
SYLLABI
B. Tech. - Aerospace Engg. 2015 admissions onwards

TEXTBOOK:

REFERENCES:

15AES372 MANUFACTURING PROCESSES 3 0 0 3

Unit 1
Introduction to casting, rolling, forging, extrusion, drawing and sheet metal working-types of defects and remedies.

Unit 2
Introduction to welding and their types, Welding defects: causes and remedies. Rivet and it types. Definition and concept – production of metal powders - characteristics of metal powders - compaction - sintering – design consideration - process capability - applications.

Unit 3

Rapid Prototyping & Its types, CNC and Types of CNC’s.

TEXTBOOK:

REFERENCES:

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

15AES373 ADVANCED AVIONICS 3 0 0 3
(Prerequisite - 15AES304AVIONICS or equivalent)

Unit 1

Unit 2

Unit 3

TEXTBOOKS:

REFERENCES:

15AES381 AERO-STRUCTURES LAB. 0 0 2 1

Determination of principal axis in unsymmetrical bending of beams, experiment on constant strength beam, determination of shear centre location for open and closed sections, testing of beam with combined loading, measurement of vibrations of beams, Wagner beam – Tension field beam experiments, determination of stresses in thin wall cylinder and finding the buckling strength of column using the South well plot test.

In addition to the conventional tests, students are assigned to open lab projects that involve experimental studies including fabrication and setting up unconventional testing methods to understand the basic concepts of thin walled member behavior.
15AES382 AVIONICS LAB. 0 0 2 1

Control System Exercises using MATLAB / Kits: Open Loop and Closed Loop Responses for Position, Velocity and Temperature Control Systems.

Mini Projects: Related to Avionics

15AES383 PROPULSION LAB. 0 0 2 1

Euler’s Turbomachine Equation – Classification of Turbomachines – Velocity Triangles for Turbines and Compressors – Axial Flow Machines.


TEXTBOOK:

15AES384 LOW-SPEED AERODYNAMICS LAB. 0 0 2 1


15AES385 INNOVATIONS LAB. 0 0 2 1


15AES390 / 15AES490 LIVE-IN-LAB. 3 cr

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

15AES401 COMPUTATIONAL FLUID DYNAMICS FOR AEROSPACE 2 1 0 3

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:
SYLLABUS  B. Tech. - Aerospace Engg.  2015 admissions onwards

15AES402  AERO-DESIGN  2 2 2 5

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

15AES403  FLIGHT DYNAMICS AND CONTROL  3 0 0 3

(Please note: This course has a prerequisite of AES212 COMPRESSED FLUID FLOW or equivalent)

Unit 1

Unit 2

TEXTBOOKS:
15AES432 AIR BREATHING ENGINES 3 0 0 3

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

15AES440 TURBULENT FLOWS 3 0 0 3

Unit 1

Unit 2

TEXTBOOK:

REFERENCES:

15AES441 ADVANCED COMPUTATIONAL FLUID DYNAMICS 3 0 0 3

Unit 1

Unit 2

Unit 3

TEXTBOOKS:

REFERENCES:
15AES442  HYPERSONIC FLOW THEORY  3 0 0 3

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCE:

15AES450  SURFACE ENGINEERING, COATING AND JOINING TECHNOLOGIES  3 0 0 3

Unit 1

Unit 2
Surface engineering by energy beams: General classification, scope and principles, types and intensity / energy deposition profile. Surface engineering by energy beams: Laser assisted microstructure modification – surface melting, hardening, shocking and similar processes. Surface engineering by spray techniques: Plasma coating (principle and scope of application). Characterization of surface microstructure and properties.

TEXTBOOK:

REFERENCES:

15AES452  ENGINEERING FRACTURE MECHANICS  3 0 0 3

Unit 1
Introduction to fracture mechanics (FM), historical development of FM-Linear and elasto-plastic fracture mechanics introduction, modes of loading, crack growth on fracture mechanics, brittle failure and ductile failure concept study. Study on energy release rate, review of theory of elasticity, Airy’s stress theory on 2D models. Double cantilever beam energy release rate (ERR) definition, Energy release rate derivation on different geometries, ERR based on displacement of crack faces mechanisms, Necessary and sufficient condition of FM and stable and unstable FM.

Unit 2

Unit 3
Energy release rate by J-integral approach, relation study between K and G. Study of surface cracks, stress intensity factor study on finite body Evaluation of SIF by experimental and numerical approaches and also using strain gauges. Fracture toughness tests – plane strain test, Compact tension test, three-point bending test, C-specimen test, Chevron notch test.
SYLLABI
B. Tech. - Aerospace Engg. 2015 admissions onwards

TEXTBOOK:

REFERENCES:

15AES453 AERO-ELASTICITY 3 0 0 3

Unit 1
Free vibration analysis of basic structural members with different boundary conditions, analytical and approximate solutions, response of basic structural members to periodic and non-periodic forces, mode synthesis, approximate solutions.

Unit 2
Static aero-elasticity, divergence of a typical airfoil section, aileron reversal, divergence of one dimensional structures: straight and swept wings, aileron reversal of one dimensional straight wing.

Unit 3
Aeroelastic flutter, stability characteristics, aeroelastic analysis of a typical airfoil section: single degree and two degree freedom, classical flutter analysis, classical unsteady aerodynamic theory, engineering solution for flutter, U-g and p-k methods, response to gust loads.

TEXTBOOK:

REFERENCES:

15AES454 ADVANCED COMPOSITE STRUCTURES 3 0 0 3

Unit 1
Concept of aviation and space environments. Ionizing and non ionizing radiation at Low Earth Orbit (LEO) and Geo Synchronous Earth Orbit (GEO). Charged plasma and atomic oxygen in space. Different thermosetting and thermoplastic polymers and their applications as structural and semi structural components for aviation and spacecraft.

TEXTBOOK:

REFERENCES:

15AES460 SPACE FLIGHT MECHANICS 3 0 0 3

Unit 1

Unit 2

Unit 3
Time-of Flight and Eccentric Anomalies for Elliptic, Parabolic And Hyperbolic Orbits – Kepler’s Problem and Solution Algorithm – Gauss Problem: General Methods of
Solution – Intercept and Rendezvous with Examples – Ballistic Missile Trajectories:
Effect of Earth Rotation – Interplanetary Trajectories: Spheres of Influence and the
Patched Conic Approximation, Synodic Periods – Satellite Attitude Dynamics: Torque
Free Motion, Stability of Torque Free Motion, Spin Stabilization, Gyroscopic Attitude
Control, Gravity Gradient Attitude Control.

TEXTBOOKS:
1. Roger R Bate, Donald D Mueller, Jerry E White and William W Saylor, “Fundamentals of

REFERENCES:

15AES461 PRINCIPLES OF AIRPORT MANAGEMENT 3 0 0 3

Unit 1 Introduction
History of Aviation - Development of Air transportation in India - Major players in Airline
Industry - Swot analysis in Airline Industry - Market potential of Indian Airline Industry
- Current challenges in Airline Industry - Completion in Airline Industry - IATA & ICAO.

Airport management:
Airport planning - Operational area and Terminal planning, design, and operation -
Airport operations - Airport functions - Organization structure of Airline and Airports
sectors - Airport authorities - Global and Indian scenario of Airport management –
DGCA – AAI.

Unit 2 Air transport services:
International trends - Emerging Indian scenario – PPP - Public Private Participation
in Indian Airports - Environmental regulations - Private participation in International
developments - Environment regulations - Regulatory issues - Meteorological
services for Aviation - Airport fees, rates, and charges.

Airline operations:
Airline Terminal Management - Flight Information Counter / Reservation and Ticketing
- Check In/Issue of Boarding pass - Customs and Immigration formalities - Co-
ordination - Security Clearance - Baggage and Handling of Unaccompanied minors
and Disabled Passengers - Handling of Stretcher Passengers and Human Remains
- Handling of CIP, VIP & VVIP - Co-ordination of Supporting Agencies / Departments.

TEXTBOOKS:

15AES462 HELICOPTER THEORY 3 0 0 3

Unit 1
Historical development, configurations of helicopters, rotor system, flight control
and mechanism, hovering theory, momentum theory for hover and vertical flight,
blade element theory for hover and vertical flight, combined blade element momentum
(BEM) theory.

Unit 2
Momentum theory for forward flight, various non-uniform inflow models, blade
element theory for forward flight, non-dimensional hub forces and moments,
estimation of power for forward flight.

Unit 3
Idealization of rotor blades, flap-lag and torsional dynamics of the blade, rotor
blade flapping motion: A simple model, helicopter trim analysis.

TEXTBOOK:

REFERENCES:

15AES470 STATE SPACE TECHNIQUES 3 0 0 3

Unit 1
Concepts of Matrix Algebra and Vector Spaces (revision) – Solution of Simultaneous
Equation for Squares – Under-Determined and Over-Determined Systems –
Concepts of Basis Vector Transformations; Similarity and Adjoint Transformation –
Eigen Values and Eigen Vectors:Canonical Forms, Jordon Forms, Characteristic
Equations, Analytical Functions of Square Matrices, Cayley–Hamilton Theorem.
Unit 2
Concepts of State, State-Space and State-Vector – Mathematical Modes in the State Space Form – State Equation and High-Order Differential Equations – State Space Form for Aerospace Systems, for e.g., Dynamic Behavior of Aircraft, Missile, Satellites, INS., etc. – Solution of Homogenous State Equations.

Unit 3

TEXTBOOKS:

15AES471 MULTIDISCIPLINARY DESIGN OPTIMIZATION 3 0 0 3

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

15AES481 UAV LAB. 0 0 2 1

Flight testing using a 3.5 Kg UAV or simulator, to determine following:
- Glide performance;
- Climb rate;
- Range and endurance;
- Turn rate;
- Short period and Phugoid mode;
- Roll subsidence.

15AES495 PROJECT PHASE I 2 cr

Various project titles based on areas covered up to 7th semester are allotted to batches of 3 to 4 students.

Preliminary studies and investigations on the allotted topic.

15AES499 PROJECT PHASE II 10 cr

To achieve objectives and to carry out detailed investigation towards the outcome of each allotted project.

15AVP201 / AMRITA VALUES PROGRAMME I / 1 0 0 1
15AVP211 AMRITA VALUES PROGRAMME II 1 0 0 1

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

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

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

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

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

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

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

Lessons from the Upanishads
Introduction to the Upanishads: Sruti versus Smrti - Overview of the four Vedas and the ten Principal Upanishads - The central problems of the Upanishads – The Upanishads and Indian Culture – Relevance of Upanishads for modern times – A few Upanishad Personalities: Nachiketas, SatyakamaJabala, Aruni, Shvetaketu.

Message of the Bhagavad Gita

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

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

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

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

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

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

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

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

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

15CHY100 CHEMISTRY 3 0 0 3

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

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

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

15CHY231 ADVANCED POLYMER CHEMISTRY 3 0 0 3

Unit 1
Newer Polymers and Polymerizations: Polymeric Liquid Crystals - Inorganic and
Organometallic polymers - Synthesis and reactions of Phosphorus - Nitrogen
polymers - Boron - Silicone polymers. Cyclisation versus Linear Polymerization -
Molecular weight control in linear polymerization - Molecular weight distribution in
linear polymerization - Molecular weight distributions in nonlinear polymerization -
Multichain Polymerization - Metallocene Polymerization.
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**B. Tech. - Aerospace Engg.** 2015 admissions onwards

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

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

Unit 3

**TEXTBOOKS:**

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

**BIOMATERIALS SCIENCE** 3 0 0 3

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

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

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

**CATALYTIC CHEMISTRY** 3 0 0 3

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:**
SYLLABI

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


TEXTBOOKS:

REFERENCES:

15CHY234 CHEMISTRY OF ADVANCED MATERIALS  3 0 0 3

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


Unit 2

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

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

TEXTBOOKS:

REFERENCES:

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-Dramer law - Stark-Einstein’s law) - Quantum efficiency - photochemical decomposition of HI and HBr - and Quantum yield.
Unit 3
Florescence and Phosphorescence - chemiluminescence - photo sensitization.

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

TEXTBOOK:

REFERENCE:

15CHY236 CHEMISTRY OF NANOMATERIALS 3 0 0 3

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

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

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

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

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

Unit 3
Fabrication and applications of conducting polymer nanotubes, TiO2 and metallic nanotubes.
of soil and water pollutants - sources, exposure routes and potential adverse health effects - Classes of occupational toxicants - route of exposure and permissible levels - specific examples of concern.

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


TEXTBOOK:

REFERENCES:

15CHY238 COLLOIDAL AND INTERFACIAL CHEMISTRY 3 0 0 3

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


Unit 2
Interfaces between Condensed Phases - Wetting, The interfaces between condensed phases in two-component systems, Adsorption at interfaces between condensed phases.
Introduction to Quantum mechanics - Schrodinger equation - Position and momentum - MO formation - Operators and the Hamiltonian operator - The quantum oscillator - Oscillator Eigen value problems - Quantum numbers - labeling of atomic electrons.

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

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

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

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

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

TEXTBOOKS:

REFERENCES:

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.

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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, role 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, flare gas, blast furnace gas, biomass gas, refinery gas, LPG - manufacture, cleaning, purification and analysis. Fuels for spark ignition engines, knocking and octave 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

REFERENCES:

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.

Electroanalytical techniques: Potentiometry - Potentiometric titration - determination of equivalence point - acid base, complexometric, redox and precipitation titrations
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Unit 3

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

TEXTBOOKS:

REFERENCES:

15CHY247 MODERN POLYMER COMPOSITES 3 0 0 3

Unit 1

Unit 2

Unit 3
Composite precursors: SMCs, DMCs, BMCs prepeg 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**

**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 - Favorikii 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 carbocyclic acid derivatives - electrophilic aromatic substitution - carbenes and benzynes - Baeyer-Viliger reactions - Dienone-phenol rearrangement - pinacol rearrangement.

**TEXTBOOK:**

**REFERENCES:**

**15CHY249 ORGANIC SYNTHESIS AND STEREOCHEMISTRY**

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

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

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

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

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

**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, PET, PBT, PTFE, High performance polymer - PES, PEI, PEEK, conducting polymer.

**Unit 3**

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

**TEXTBOOKS:**


**REFERENCE BOOKS:**


**15CHY251 POLYMERS FOR ELECTRONICS 3 0 0 3**

**Unit 1**


**Unit 2**

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

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

**Unit 3**


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

**TEXTBOOK:**


**REFERENCES:**


**15CHY252 SOLID STATE CHEMISTRY 3 0 0 3**

**Unit 1**

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

**Unit 2**

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


**Unit 3**


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

**REFERENCES:**


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**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.


**REFERENCES:**

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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

TEXTBOOK:

REFERENCES:

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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

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

Unit 3
7. Introduction to the Bhagavad Gita
8. Bhagavad Gita – Action without Desire

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

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

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

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

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

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

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

Experiencing life through its Various Stages
Ashrama Dharma; Attitude towards life through its various stages (Teachings of Amma);
Unit 2
Personality Development
What is Personality – Five Dimensions – Pancha Kosas (Physical / Energy / Mental / Intellectual / Bliss); Stress Management & Personality; Self Control & personality; Fundamental Indian Values & Personality;

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

Communication Skills - An Indian Perspective;

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

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

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

REFERENCE BOOKS:
1. Awaken Children (Dialogues with Sri Mata Amritanandamayi) Volumes 1 to 9
2. Complete works of Swami Vivekananda (Volumes 1 to 9)
3. Mahabharata by M.N Dutt published by Parimal publications – New Delhi (Volumes 1 to 9)
4. Universal message of Bhagavad-Gita (An exposition of Gita in the light of modern thought and Modern needs) by Swami Ranganathananda. (Volumes1 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
15. Valmiki Ramayana – Four volumes- published by Parimal Publications, Delhi

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17. Mind Sound Resonance Technique (MSRT) Published by Swami Vivekananda Yoga Prakashana, Bangalore.
18. Yoga & Memory - Dr H R Nagendra & Dr. Shirley Telles, published by Swami Vivekananda Yoga Prakashana, Bangalore.

15CUL231 EXCELLENCE IN DAILY LIFE 2 0 0 2

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

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

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

REFERENCES:
The Bhaja Govindam and the Bhagavad Gita.

15CUL232 EXPLORING SCIENCE AND TECHNOLOGY 2 0 0 2 IN ANCIENT INDIA

OBJECTIVES: This course offers a journey of exploration through the early developments in India of astronomy, mathematics, technologies and perspectives of the physical world. With the help of many case studies, the students will be equipped to understand concepts as well as well as actual techniques.

Unit 1
1. General introduction: principles followed and sources;
2. Astronomy & mathematics from the Neolithic to the Indus civilization;
3. Astronomy & mathematics in Vedic literature;
4. Vedanga Jyotish and the first Indian calendars;
5. Shulba Sutras and the foundations of Indian geometry;

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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.

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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.
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15EEE180  WORKSHOP B  0 0 2  1

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

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

15ENG111  COMMUNICATIVE ENGLISH  2 0 2 3

OBJECTIVES: To make the students communicate their thoughts, opinions, and ideas freely and naturally; to make them understand the different styles in communication; to make the

Students understand the aesthetics of reading and writing; to bring in a spirit of enquiry; to motivate critical thinking and analysis; to help them ruminate on human values.

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

Unit 2
Writing: Prewriting techniques - Kinds of paragraphs - basics of continuous writing.
Grammar & Usage: Parts of Speech, Tenses, Concord, Phrasal Verbs, Modal Auxiliaries, Modifiers (Workbook) - Any two pieces from the text.

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

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

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

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

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

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

1. Language through Practice: Compilation by Amrita University for internal circulation

15ENG230  BUSINESS COMMUNICATION  1 0 2 2

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

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<table>
<thead>
<tr>
<th>Unit 1</th>
<th>Business Vocabulary - Writing: Drafting Notices, Agenda, and Minutes - Reading: Business news, Business articles.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit 2</td>
<td>Writing: Style and vocabulary - Business Memorandum, letters, Press Releases, reports – proposals – Speaking: Conversational practice, telephonic conversations, addressing a gathering, conducting meetings.</td>
</tr>
<tr>
<td>Unit 3</td>
<td>Active Listening: Pronunciation – information gathering and reporting - Speaking: Cross-Cultural Issues, Group Dynamics, negotiation&amp; persuasion techniques.</td>
</tr>
</tbody>
</table>

**Activities**
- Case studies & role-plays.

**BOOKS RECOMMENDED:**

### SYLLABI

**INDIAN THOUGHT THROUGH ENGLISH**

**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.

<table>
<thead>
<tr>
<th>Unit 1 Poems</th>
<th>Rabindranath Tagore's Gitanjali (1-10); Nizzim Ezekiel's Enterprise; A.K. Ramanujam's Small-Scale Reflections on a Great House.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit 2 Prose</td>
<td>Khushwant Singh's The Portrait of a Lady; Jhumpa Lahiri's Short Story - Interpreter of Maladies.</td>
</tr>
<tr>
<td>Unit 3 Drama and Speech</td>
<td>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).</td>
</tr>
</tbody>
</table>

### 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.


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

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

REFERENCES:

15ENG234  INDIAN SHORT STORIES IN ENGLISH      1 0 2  2

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

Unit 1

Unit 2

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

TEXT:

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

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

TEXTBOOKS / REFERENCES:

15FRE230 PROFIENCY 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.

15FRE231 PROFIENCY IN FRENCH LANGUAGE (HIGHER) 1 0 2 2

Unit 1 The first room of a student
A party to celebrate the 1st room; Description of a room; Furniture; Locate objects: prepositions (devant, derrière, dans…); Read advertisement; Appreciation (I like, I prefer.).
Grammar - Perfect past tense with avoir; Possessive adjectives (mon, ton, son…); Demonstrative adjectives (ce, cet, cette); Yes (oui, si).

Unit 2 Small jobs
Conversation on the phone; Give Time indications; Answer a job offer; Describe a job; Suggest a meeting time.
Grammar - Perfect past tense with être and avoir (continuation); Possessive adjectives (notre, votre, leur); Prepositions (à, pour, avec …); Pronoun as direct object (le, la, l’, les).

Unit 3 University Restaurant
Inquiry; Express an opinion; Ask questions (continuation); Food, meals, taste, preferences; Nutrition, diet, choose a menu or diet, Expression of quantities (beaucoup, peu).
Grammar - Partitif (expressing quantity) (du, de la, pas de…); Comparison (plus …que, moins…que, autant …que); Interrogation (continuation), inversion, Est-ce que, qu’est-ce que?.

TEXTBOOK:
Metro St Michel - Publisher: CLE International

15GER230 GERMAN FOR BEGINNERS I 1 0 2 2

Unit 1
Greetings; Introducing one-self (formal and informal context), saying their name, origin, living place, occupation.
Numbers 1-100; Saying the telephone number.
Countries and Languages.
Grammar: Structure – W - Questions and Yes/No questions and statements, personal pronouns, verb conjugations. Articles.

Vocabulary: Professions.

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

Numbers till 1000. Saying a year.
Alphabets – spelling a word.

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

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

Vocabulary: Food items

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

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

Vocabulary: Furniture and currencies.

15GER231    GERMAN FOR BEGINNERS II    1 0 2  2

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

Grammar: Dative of personal pronouns. Imperative form.

Vocabulary: Consumables and measurements;

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

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

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

Vocabulary: Professions.

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

Grammar: Possessive articles; Divisible and indivisible verbs.

Vocabulary: Family circle; Household articles.

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

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

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

Some useful websites will be given.

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

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

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

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

Some German culture. Films.

15HIN101    HINDI I    1 0 2  2

OBJECTIVES: To teach Hindi for effective communication in different spheres of life - Social context, Education, governance, Media, Business, Profession and Mass communication.
Unit 1
Introduction to Hindi Language, National Language, Official Language, link Language etc. Introduction to Hindi language, Devanagari script and Hindi alphabet.

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

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

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

Unit 4

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

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

15HIN111 HINDI II 1 0 2 2

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

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

Unit 2
Communicative Hindi - Moukhik Abhivyakthi

15HUM230 EMOTIONAL INTELLIGENCE 2 0 0 2

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

Unit 2

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

REFERENCES:
15HUM231 GLIMPSES INTO THE INDIAN MIND: 2002
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; Dharmapal; Raja Rao; V.S. Naipaul.

Conclusion.

REFERENCES:
1. Tilak, Bal Gangadhar. The Orion / Arctic Home in the Vedas.
2. Tagore, Rabindranath. The History of Bharatavarsha / On Nationalism / Greater India.
8. Nehru, Jawaharlal. The Quest from Discovery of India.
the saga of socio-political movements; Problems facing the nation today; Globalization and Indian Economy; Bharatarvastra today and the way ahead: Regeneration of Indian National Resources.

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

REFERENCES:
17. Aurobindo, Sri. The Indian Renaissance / India's Rebirth / On Nationalism.
25. Danino, Michel. The Invasion That Never Was.
Vijayanagara samrajya and maritime trade – the story of Indian supremacy in the Indian Ocean region; Aspects of Mughal administration and economy; The Maratha and other provincial economies.

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

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

Conclusion

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

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; 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

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15HUM234 HEALTH AND LIFE STYLE 1 0 2 2

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

Practicals - Therapeutic Diets

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

Practicals - Ethnic Foods

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

Practical - Cooking without Fire or Wire-healthy Snacks
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TEXTBOOKS:
B. Srilakshmi, "Dietetics", New age international (P) ltd, publishers, 2010.

REFERENCE BOOKS:
WHO Report on Adolescent Health: 2010

15HUM235 INDIAN CLASSICS FOR THE TWENTY-FIRST CENTURY

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

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

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

REFERENCE:
The Bhagavad Gita, Commentary by Swami Chinmayananda

15HUM236 INTRODUCTION TO INDIA STUDIES

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

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

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

Unit 2
Modern India: Challenges and Possibilities.

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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. Hiriyananna, MLBD.
5 An Advanced History of India, R. C. Majumdar et al, Macmillan.
6 India Since 1526, V. D. Mahajan, S. Chand & Company
7 The Indian Renaissance, Sri Aurobindo.
8 India's Rebirth, Sri Aurobindo.
9 On Nationalism, Sri Aurobindo.
12 Universal Message of the Bhagavad Gita, Swami Ranganathananda, Advaita Ashrama.
13 Awaken Children: Conversations with Mata Amritanandamayi
14 Indian Aesthetics, V. S. Seturaman, Macmillan.
15 Indian Philosophy of Beauty, T. P. Ramachandran, University of Madras, Chennai.
16 Web of Indian Thought, Sister Nivedita
17 Essays on Indian Nationalism, Anand Kumaraswamy
18 Comparative Aesthetics, Volume 2, Kanti Chandra Pandey, Chowkhamba, Varanasi
19 The Invasion That Never Was, Michel Danino
20 Samskara, U. R. Ananthamurthy, OUP.
21 Hayavadana, Girish Karnard, OUP.
22 Naga-Mandala, Girish Karnard, OUP.

15HUM237 INTRODUCTION TO SANSKRIT LANGUAGE AND LITERATURE

OBJECTIVES: To familiarize students with Sanskrit language; to introduce students to various knowledge traditions in Sanskrit; to help students appreciate and imbibe India’s ancient culture and values.
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**Unit 1**  
Sanskrit Language – Vakya Vyavahara - Introduction to Sanskrit language  
- Devanagari script and Sanskrit alphabet - Vowels and Consonants – Pronunciation  

**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

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**15HUM238 NATIONAL SERVICE SCHEME 2 0 0 2**

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

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

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**15HUM239 PSYCHOLOGY FOR EFFECTIVE LIVING 2 0 0 2**

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

**Unit 2**  
The Nature and Coping of Stress  

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

REFERENCE BOOKS:

15HUM240 PSYCHOLOGY FOR ENGINEERS 2002

Unit 1
Psychology of Adolescents: Adolescence and its characteristics.

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

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

TEXTBOOKS:

REFERENCE BOOKS:

15HUM241 SCIENCE AND SOCIETY - AN INDIAN PERSPECTIVE 2002

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

Unit 2
Indian sciences
Introduction; Ancient Indian medicine: towards an unbiased perspective; Indian approach to logic; The methodology of Indian mathematics; Revision of the traditional Indian planetary model by Nilakantha Somasutvan in circa 1500 AD

REFERENCES:
18. The Cultural Heritage of India. Kolkata: Ramakrishna Mission Institute of Culture.
15HUM242 THE MESSAGE OF BHA GWAD GITA 2 0 0 2

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

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


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

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

Unit 3


REFERENCES:

15HUM243 THE MESSAGE OF THE UPA NISHADS 2 0 0 2

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

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

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

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

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

Cookery Practicals - Balanced Diet

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

Practicals - Traditional Foods

Unit 3 Introduction to Food Biotechnology
Future foods - Organic foods and genetically modified foods, Fortification of foods value addition of foods, 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.

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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, belavangaya kiiru parichaya
Paaribhaashhika padagalu
Vocabulary Building

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

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

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

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

REFERENCES:
1. H. S. Krishna Swami Iyangar – Adalitha Kannada – Chetana Publication, Mysuru
2. A. N. Murthy Rao – Aleyuva Mana – Kuvempu Kannada Adyayana Samste
3. Nemi Chandra – Badhuku Badalisabahudu – Navakarnataka Publication
4. Sanna Kathegalu - Prasaranga, Mysuru University, Mysuru
5. B. M. Shree – Kannada Adavu – 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
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15KAN111 KANNADA II 1 0 2 2

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

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

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

Unit 3

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

Unit 5
Essay writing: Argumentative & Analytical
Précis writing

REFERENCES:
1. H. S. Krishnaswami Iyanger – Adalitha Kannada – Chetan Publication, Mysuru
2. Dr. G. S. Shivarudrappa – Samagra Kavya. - Kamadhenu Pustaka Bhavana
4. K. S. Nissar Ahmed – 75 Bhaavageetegalu – Taatparya
5. Dr. Da. Ra. Bendre – Saayo Aata – Shri Maa Publication

15MAL101 MALAYALAM I 1 0 2 2

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

Unit 1
Ancient poet trio: Adhyatmaramayanam, Lakshmana Swanthanam (valsa soumitre... mungikidakayal), Ezuthachan - Medieval period classics – Jnanappana (kalaminnu... vilasangilingane), Poonthanam.

Unit 2

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

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

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

REFERENCES:

15MAL111 MALAYALAM II 1 0 2 2

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

**Unit 2**

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

**Unit 4**
Part of an autobiography / travelogue: Kannerum Kinavum, V. T. Bhattathirippadu - Socio-cultural literature - historical importance.

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

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

**REFERENCES:**

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**SYLLABI**

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

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**Unit 2**

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


**TEXTBOOKS:**

**REFERENCE BOOKS:**

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**15MAT121 VECTOR CALCULUS AND ORDINARY DIFFERENTIAL EQUATIONS**

**Unit 1**

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

**Unit 2**
Surface Integral: Surfaces for Surface Integrals, Surface Integrals, Triple Integrals – Gauss Divergence Theorem, Stoke’s Theorem. (Sections: 10.5, 10.6, 10.7, 10.9) First Order Differential Equations: First Order ODE, Exact Differential Equations and Integrating Factors (Sections 1.1and 1.4).
### Unit 3
Second Order Differential Equations: Homogeneous and non-homogeneous linear differential equations of second order (Review), Modelling; Free Oscillations,

Euler-Cauchy Equations, Solution by Undetermined Coefficients, Solution by the Method of Variation of Parameters (Sections 2.1, 2.2, 2.4, 2.5, 2.6, 2.7, 2.10).


**TEXTBOOK:**

**REFERENCE BOOKS:**

### 15MAT202
**LINEAR ALGEBRA**

**Unit 1**

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

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

**TEXTBOOK:**

**REFERENCES:**

### 15MAT204
**TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS**

**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:**

### 15MAT211
**CALCULUS OF VARIATIONS AND NUMERICAL METHODS**

**Unit 1**
Calculus of Variations: Maxima and minima - The simplest case - Illustrative examples - Natural boundary conditions and transition conditions – Concept of functional with simple example – Variation of a functional (only necessary conditions) - Simple variational problem - Euler equation - The more general case of variational problems - Constraints and Lagrange multipliers - Variable end points.

**REFERENCES:**
1. Calculus of Variations: Maxima and minima - The simplest case - Illustrative examples - Natural boundary conditions and transition conditions – Concept of functional with simple example – Variation of a functional (only necessary conditions) - Simple variational problem - Euler equation - The more general case of variational problems - Constraints and Lagrange multipliers - Variable end points.
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Unit 2
Sturm-Liouville problems - Hamilton's principle - Lagrange's equations - Generalized dynamical entities - Constraints in dynamical systems - Applications in dynamics of particles, vibrating string, vibrating membranes, theory of elasticity - The variational problem of a vibrating elastic plate – Direct methods in calculus of variations - The Rayleigh-Ritz and finite difference methods. (Book-1)

Unit 3

TEXTBOOK:

REFERENCE BOOK:

15MEC100 ENGINEERING DRAWING - CAD 2 0 2 3


TEXTBOOK:

REFERENCES:

Schools of Engineering Amrita Vishwa Vidyapeetham S 99

SYLLABI

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15MEC102 ENGINEERING MECHANICS 3 0 0 3

Unit 1
Principles of Statics: Introduction to vector approach - free body diagrams - forces in plane - forces in space - concurrent forces - resolution of forces-equilibrium of particle. Statics of rigid bodies in two dimension: Moment of a force about a point - moment of a couple - equivalent force - couple system. Rigid body equilibrium: Beams - support reactions.

Unit 2

Centroid of lines, areas - composite areas. Second Moment of area - polar moment of inertia - mass moment of inertia - radius of gyration.

Unit 3
Dynamics of particles: Kinematics of particles-rectilinear motion - relative motion - position, velocity and acceleration calculations in cylindrical coordinates. 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 subassembly.

Schools of Engineering Amrita Vishwa Vidyapeetham S 100
2. Pneumatics and PLC Workshop
Study of pneumatic elements - Design and assembly of simple circuits using basic pneumatic elements - Design and Assembly of simple circuits using Electro-pneumatics.
Study of PLC and its applications - Simple programming using ladder diagrams.

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

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

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

REFERENCE:
Concerned Workshop Manual

15PHY100 PHYSICS 3 0 0 3

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


Unit 2 Atomic Structure and Quantum Mechanics

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

TEXTBOOK:

REFERENCE BOOK:
"Principles of Physics" by Halliday, Resnick and Walker, 9th edition

15PHY181 PHYSICS LAB. 0 0 2 1
Young's Modulus – Non Uniform Bending
Newton’s Rings
Laser - Determination of Wavelength and Particle Size Determination
Spectrometer
Carey Foster's Bridge
Rigidity Modulus - Tensional Pendulum
Viscosity of Liquid by Stokes's method
Ultrasonic Interferometer
Hysteresis – B H curve

15PHY230 ADVANCED CLASSICAL DYNAMICS 3 0 0 3

Unit 1 Introduction to Lagrangian dynamics
Survey of principles, mechanics of particles, mechanics of system of particles, constraints, D'Alembert's principle and Lagrange's equation, simple applications of the Lagrangian formulation, variational principles and Lagrange's equations, Hamilton's principles, derivation of Lagrange's equations from Hamilton's principle, conservation theorems and symmetry properties.

Unit 2 Central field problem
Two body central force problem, reduction to the equivalent one body problem, Kepler problem, inverse square law of force, motion in time in Kepler's problem, scattering in central force field, transformation of the scattering to laboratory system, Rutherford scattering, the three body problem.
SYLLABI  B. Tech. - Aerospace Engg.  2015 admissions onwards

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

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

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

TEXTBOOKS:

REFERENCE BOOKS:

15PHY233  BIOPHYSICS AND BIOMATERIALS  3 0 0 3

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

Unit 1

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

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

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


Unit 3

TEXTBOOKS AND REFERENCES:
SYLLABI

B. Tech. - Aerospace Engg. 2015 admissions onwards

Unit 3

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

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

REFERENCES:
Suresh Chandra, “Computer Applications in Physics”, Narosa Publishing House, New Delhi
M 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 it’s consequences, density of carriers in intrinsic semiconductors, conductivity of intrinsic semiconductors, carrier densities in n type semiconductors, n type semiconductors, Hall effect and carrier density.

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

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

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

TEXTBOOK:

SYLLABI

B. Tech. - Aerospace Engg. 2015 admissions onwards

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.

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

15PHY240  ELECTRONIC MATERIALS SCIENCE  3 0 0 3

Unit 1
Types of bonding in solids, Crystallography and crystalline defects: Crystallography,
Directions and planes, Crystalline defects, line defects, Planar defects, Volume
defects; Binary and Ternary Phase Diagrams: Lever rule and phase rule, Eutectic,
peritectic and Eutectoid systems, Applications of Phase diagrams; Basic Quantum
Physics - atomic structure, Use of band theory and occupation statistics to explain
existence and basic properties of metals and nonmetals. Working of Semiconductor
Devices using band diagrams and their electrical characteristics: pn junctions,
BJT, MOSFET.

Unit 2
Use of band theory to explain optoelectronic properties of materials and
optoelectronic devices: LEDs, Solar Cells, Lasers, pin diodes, photodiodes; Magnetic
properties and Superconductivity: Magnetic moments and Magnetic Permeability,
types of magnetism, saturation magnetization, magnetic domains, soft and hard
magnetic materials, superconductivity and its origin, Giant Magneto Resistance,
Josephson effect, Energy band diagrams and Magnetism, Applications of magnetic
materials- Magnetic recording materials, etc.

Unit 3
Optical Properties of Materials: Reflection, Refraction, Dispersion, Refractive Index,
Snells Law, Light Absorption and Emission, Light Scattering, Luminescence,
Polarization, Anisotropy, Birefringerence; Dielectric Properties of Materials:
Polarization and Permittivity, Mechanisms of polarization, dielectric properties -
dielectric constant, dielectric loss, dielectric strength and breakdown, Piezoelectricity,
Ferroelectricity, and Pyroelectricity, Dielectric Materials

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.

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

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

Laser surface treatment: Introduction to laser surface hardening, laser surface
melting, laser surface alloying, laser surface cladding, laser cleaning. Laser ablation:
mechanisms (photothermal, photophysical and photochemical), mask projection
techniques, laser micro and nano structuring.

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

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

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

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

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

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

REFERENCES:
3. J. F. Ready, D. F. Farson. LIA Handbook of Laser Materials Processing Laser Institute of
6. W. W. Duley, UV lasers: effects and applications in materials science, Cambridge University,
7. J. Dutta Majumdar, and I. Manna, Laser Material Processing, Sadhana, Vol. 28, Year: 2003,
495-562.
15PHY243 MICROELECTRONIC FABRICATION

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, metallization with Al and Cu; process Integration: CMOS, bipolar process flow.

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

REFERENCES:

15PHY245 NUCLEAR ENERGY: PRINCIPLES AND APPLICATIONS

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 fission 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

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).
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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.


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

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

Unit 3
Types of LASERS
Solid state LASER: (i) Ruby LASER – principle, construction, working and application. (ii) Neodymium (Nd) LASERS, gas LASER: (i) He-Ne LASER - principle, construction, working and application. (i) CO2 LASER - principle, construction, working and application.

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

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

Applications of LASERS in other fields:

REFERENCES:
SYLLABI
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15PHY250  QUANTUM PHYSICS AND APPLICATIONS  3 0 0 3

Unit 1

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

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

Unit 3

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

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

REFERENCES:

15PHY251  THIN FILM PHYSICS  3 0 0 3

Unit 1

SYLLABI
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15PHY331  ASTRONOMY  3 0 0 3

Unit 1
Astronomy, an Observational Science: Introduction - Indian and Western Astronomy – Aryabhata - Tycho Brahe's observations of the heavens - The laws of planetary motion - Measuring the astronomical unit - Isaac Newton and his Universal Law of Gravity - Derivation of Kepler's third law - The Sun - The formation of the solar system - Overall properties of the Sun - The Sun's total energy output - Black body radiation and the sun's surface temperature - The Fraunhofer lines in the solar spectrum and the composition of the sun - Nuclear fusion - The proton–proton cycle - The solar neutrino problem - The solar atmosphere: photosphere,

TEXTBOOK:

REFERENCES:

15PHY331  ASTRONOMY  3 0 0 3

Unit 1
Astronomy, an Observational Science: Introduction - Indian and Western Astronomy – Aryabhata - Tycho Brahe's observations of the heavens - The laws of planetary motion - Measuring the astronomical unit - Isaac Newton and his Universal Law of Gravity - Derivation of Kepler's third law - The Sun - The formation of the solar system - Overall properties of the Sun - The Sun's total energy output - Black body radiation and the sun's surface temperature - The Fraunhofer lines in the solar spectrum and the composition of the sun - Nuclear fusion - The proton–proton cycle - The solar neutrino problem - The solar atmosphere: photosphere,

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

Unit 3

TEXTBOOK:
Introduction to Astronomy and Cosmology, Ian Morison, Wiley (UK), 2008
REFERENCE BOOK:
**15PHY335**  
**MEDICAL PHYSICS**  
**3 0 0 3**

**Unit 1**

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


**Unit 2**

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

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

**Unit 3**

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


**TEXTBOOK:**


**REFERENCE BOOKS**

2. 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.

**TEXTBOOKS:**


**REFERENCES:**

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

15PHY532  ASTROPHYSICS  3 0 0 3

Unit 1
Historical introduction: Old Indian and western - astronomy - Aryabhatta, Tycho Brahe, Copernicus, Galileo - Olbers paradox - solar system – satellites, planets, comets, meteorites, asteroids.

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

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

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

Unit 2

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

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


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

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

15PHY535  EARTH’S ATMOSPHERE  3 0 0 3

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

Unit 2

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

Unit 4
Hurricanes (cyclones, typhoons): tropical weather; anatomy, formation, dissipation and naming of hurricanes. Air pollution: a brief history, types and sources, factors that affect air pollution, the urban environment, acid deposition. Global climate: climatic classification; global pattern of climate.

Unit 5
Climate change: possible causes; carbon dioxide, the greenhouse effect, and recent global warming. Light, colour, and atmospheric optics: white and colours, white clouds and scattered light; blue skies and hazy days, red suns and blue moons; twinkling, twilight, and the green flash; the mirage; halos, sundogs, and sun pillars; rainbows; coronas and cloud iridescence.
15PHY536 EARTH'S STRUCTURE AND EVOLUTION 3 0 0 3

Unit 1
Introduction: geologic time; earth as a system, the rock cycle, early evolution, internal structure & face of earth, dynamic earth. Matter and minerals: atoms, isotopes and radioactive decay; physical properties & groups of minerals; silicates, important nonsilicate minerals, resources. Igneous rocks: magma, igneous processes, compositions & textures; naming igneous rocks; origin and evolution of magma, intrusive igneous activity, mineral resources and igneous processes.

Unit 2
Volcanoes and volcanic hazards: materials extruded, structures and eruptive styles, composite cones and other volcanic landforms, plate tectonics and volcanic activity. Weathering and soils: earth's external processes; mechanical & chemical weathering, rates; soils, controls of formation, profile, classification, human impact, erosion, weathering and ore deposits. Sedimentary rocks: the importance and origins of sedimentary rocks; detrital & chemical sedimentary rocks, coal, converting sediment into sedimentary rock; classification & structures, nonmetallic mineral & energy resources. Metamorphism and metamorphic rocks: metamorphic textures, common metamorphic rocks, metamorphic environments & zones.

Unit 3

Unit 4
Shorelines: coastal zone, waves & erosion, sand movement, shoreline features & stabilization; erosion problems along U.S. coasts, hurricanes, coastal classification.

15PHY540 NON-LINEAR DYNAMICS 3 0 0 3

Unit 1
Introduction: examples of dynamical systems, driven damped pendulum, ball on oscillating floor, dripping faucet, chaotic electrical circuits.

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

Non-chaotic multidimensional flows: the logistic differential equation, driven damped harmonic oscillator, Van der Pol equation, numerical solution of differential equations.
Dynamical systems theory: two-dimensional equilibrium and their stability, saddle points, are contraction and expansion, non-chaotic three-dimensional attractors, stability of two-dimensional maps, chaotic dissipative flows.

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

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

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

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

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

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

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

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

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

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

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

TEXTBOOK:

REFERENCES:
SYLLABI

B. Tech. - Aerospace Engg.  2015 admissions onwards


15SAN101  SANSKRIT I  1 0 2  2

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

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

Unit 2
Verbs - Singular, Dual and plural – First person, Second person, Third person.

Tenses – Past, Present and Future – Atmanepadi and Parasmaipadi - karthariprayoga

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

Unit 4
Selected slokas from Valmiki Ramayana, 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 Ill, R.S. Vadyar and Sons, Kalpathi, Palakkad
3. Prakriya Bhashyam written and published by Fr. John Kunnappally

15SAN111  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
Ktvavatu Pratyaya, Upasargas, Ktvanta, Tumunnanta, Lyabanta.

Three Lakaras – brief introduction, Lot lakara.

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

Unit 4
Introduction to classical literature, classification of Kavyas, classification of Dramas - The five Mahakavyas, selected slokas from devotional kavyas- Bhagavad Gita – chapter -II verse 47, chapter - IV verse 7, chapter - VI verse 5, chapter - VIII verse 6, chapter -XVI verse 21, Kalidasa’s Sakuntala act IV –verse 4, Isavasyopanishat 1st Mantra, Mahabharatha 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. Namalinganusananam by Amarasimha published by Travancore Sanskrit series
SOFT SKILLS I

15SSK221

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

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

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

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

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

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

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

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

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

SOFT SKILLS II

15SSK321


Telephone etiquette: activities during the conversation, conclude the call, to take a message. Body Language: Components, undesirable body language, desirable body language. Adapting to corporate life: Dealing with people.

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

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

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

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

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

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

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

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

**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.

Schools of Engineering Amrita Vishwa Vidyapeetham S 129
Unit 2
CSR Practices & Policies - CSR practices in domestic and international area; Role and contributions of voluntary organizations to CSR initiatives. Policies; Preparation of CSR policy and process of policy formulation; Government expectations, roles and responsibilities. Role of implementation agency in Section 135 of the Companies Act, 2013. Effective CSR implementation.

Unit 3
Project Management in CSR initiatives - Project and programme; Monitoring and evaluation of CSR Interventions. Reporting - CSR Documentation and report writing. Reporting framework, format and procedure.

REFERENCES:

15SWK231 WORKPLACE MENTAL HEALTH 2002

Unit 1

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

REFERENCES:
3. Canadian Mental Health Association, Ontario “Workplace mental health promotion, A how to guide”wmhp.cmhaontario.ca/
6. Mental Health Act 1987 (India) www.mhact1987.in
7. Mental Health Act 1987 (India) www.mhact1987.in
8. The Factories Act 1948 (India) www.mhact1987.in

15TAM101 TAMIL I 2002

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

Unit 1
Sangam literature: Kaṟuntokai (2, 6,8,40 pāṭalkal) – puganāṟṟṟṟu (71,112,184,192 pāṭalkal) – tiruṟṟṟṟṟṟṟṟṟṟṟறṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟṟ tamil literature and ancient literature, art and music.
SYLLABI  
2015 admissions onwards

Unit 2
Epic literature: cīḷappatiṟkāram maturaik kāṭṟum (valakkūgikākāti 50-55)
Śrīvallīkāram: tirupāvai(3,4) – īḻvārum (maṇivaiṭṭiyum)
Medieval Literature: bāratiygar kaiṟṟuṇ pāṭṟu (ēṉ vilaiyattu pillai) – bāratiygaru
kuṭṭampiḷḷukku (tāṟṟiṟ tāḷḷiṟu).

Unit 3
Novel: Jeyakānṭaṉ “kīṟī pīṟṟam”
Essay: Āṟṟaṇ “ē tāḻuta tamiḻkāme”

Unit 4
Tirunāṉṟa campantar – tirunāvukkaracar – cunatar – māṟiktaka vēcakar – āṟṟal –
tirunāḷar – kulacakara ālvār – cīṟtālaic cēṭṭaṟār toṭṟṟaṟṇa ceytikaru, mēṟkōḷkar māṟṟum
ceṭṭuṟṟu peyarkaṟu.

Unit 5
Tamil Grammar: Col vakaṟkaḷ - vēṟṟumai urupukal - vailvāṟum mikumāṟum
mikāṟyār - cānti(putṭarce) - ilakkaṟkaiṟkkēṟppu.
Practical skills. Listening, speaking, writing and reading.

Textbooks:
- Āṟṟaṇ “ē tāḻuta tamiḻkāme” nakurṟṟan paṟṟikēṟṟaṟṟu.
- Cēṭṭaṟṟaṟṟa cupramōṟṟiyāṟṟa “nalla kaiṟṟutkaiṟkāṟum māṟum mūṟṟum kaiṟṟum”
  mōḷḷai potippokkum, 7008
- Nāṟ Pēṟṟavāṟṟa “pōṟṟutterṟu rēṟkēṟkaṟkār” tāṟṟiṟṟum putṭakēṟṟum, 1978, 7001
- Pōṟṟum māṟumāṟṟa “āṟṟu tamiḻ ilakkaṟṟam” pōṟṟu paṟṟiṟṟi kūṟṟiṟ, vaiṭṭ Beirut,
- paṟṟiṟṟkēṟṟi kōṟkēṟ “kaiṟṟutkaiṟkāṟum uraiyam” cēṭṭa potippokkum, 2010.
- Paṟṟiṟṟkēṟṟi peṟṟumāṟṟu sriyaiṟṟu paṟṟipokkum, 2010

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SYLLABI  
2015 admissions onwards

15TAM111  
Tamil I  
2002

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

Unit 1
The history of Tamil literature: Nāṟṟupetṟṟu pāṟṟaṟṟaal, kataikkaḷ, pāḷamolikkaḷ
- cirṟkaiṟkār māṟum vairaiyam.
- cirṟkaiṟkaiṟkār. Kaliṟṟkaituṟṟa pāṟṟaṟṟa (pōṟṟiṟṟiaṟṟu) - mukkōḷkaiṟ pāḷṟu 35.
- Kāṟppiṟkaiṟkār: Cīḷappatiṟkāram - māṟumkēṟṟalai nāṟṟiṟyīṟal ayuṟṟum aṁṟṟum aṁṟṟum
  āṟṟiṟṟi kāṟppiṟkaiṟkaiṟkār toṭṟṟaṟṇa ceytikaru.

Unit 2
tīṟṟiṟṟi ilakkaṟṟum māṟum vairaiyam - pāṟṟumkēṟṟaṟṟakku nūṟkal toṭṟṟaṟṇa pīṟa
ceṭṭaṟṟu - tirukkoṟṟa (aṟṟu, aṟṟuṟṟ, kalvi, eḻukkam, aṟṟu, vēṟṟumai, kēḷvi, āṟṟum, pēṟṟayaṟṟiṟkēṟṟaṟṟa,
  vēṟṟuṟṟuṟṟu peṟṟa atikarattu uḷḷa ceytikaru.
- Aṟṟumkēṟṟi: Ulakanāṟṟi (1-5) – ēṟṟi (1,3,6). - Cittarkaḷ: Kaṟuṟ聯絡 cittar pāṟṟaṟṟa
  (aṟṟantak kalippu -1,4,6,7,8), măṟṟum akappu cittar pāṟṟaṟṟa(1-5).

Unit 3
tāṟṟum ilakkaṟṟam: Vēṟṟikka vakaṟkaḷ - tāṟṟum cēṭṭtīṟī cīṟtiiṟī tāṟṟuṟṟu
- tōṟṟum ilakkaṟṟam: Nēṟṟakēṟṟi aṟṟumkēṟṟi

Unit 4
tāṟṟum ilakkaṟṟam: Tamil toṭṟr口腔 cumatūya toṭṟṟum: Pāṟṟatiyarr, pāṟṟatiyarr,
  paṟṟukōṟṟi kalakkumuttum, eṟṟatā, cēṭṭtā, cīṟtī, mēṟṟa, aṟṟum kalamā,
  paṟṟumkēṟṟi kalakkumuttum, mēṟṟumkēṟṟis, aṟṟiṟṟi, paritumkēṟṟ kalamā,
  mēṟṟumkēṟṟi kalakkumuttum.

Unit 5
tāṟṟum moḻi ayṟṟi kaiṟṟi pāṟṟaṟṟum. - Karuṟṟu paritmēṟṟum - vēṟṟum pāṟṟaṟṟum
  moḻiyarppu - pēċcu - nāṟṟum pāṟṟaṟṟum - cirṟkaiṟkai, kaiṟṟa, putṟṟum pāṟṟaṟṟum.

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Textbooks:

- M. Varatharajan, "Tamil Ilakkiya Varcha" Cauhitya Kalviyam 1964, 2006