SYLLABI

CHY100  CHEMISTRY  3 0 0 3

Unit 1


Unit 2

Chemistry of corrosion and its control: Chemical and electro chemical corrosion – Pilling Bed worth ratio – forms of corrosion.

Unit 3


TEXTBOOKS:

SYLLABI

CHY181  CHEMISTRY LAB.  0 0 3 1

1. Estimation of Hardness of sample water.
2. Estimation of alkalinity of sample water.
4. Estimation of HCl and CH₃COOH by conductometric titration.
5. Estimation of Fe²⁺ by potentiometric titration.
6. Phase diagram of two component system.
7. Determination of Corrosion rate and Inhibitor efficiency by weight loss method.
10. Adsorption by Activated charcoal method.

Any 9 experiments of the above list)

Experiments for Demonstration
11. Desalination by Reverse osmosis.
13. Spectrophotometric analysis of trace element (Fe) in water.

CHY250  CATALYTIC CHEMISTRY  3 0 0 3

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

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

Unit 2
Catalysis by macromolecules, Phase transfer catalysis.

Catalysis by Enzymes: Introduction - kinetics of enzyme catalyzed reaction, catalysis through enzyme, organic catalysis, metalloenzyme catalysis, supported

enzymes. Industrial applications of enzyme catalyst.

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

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

**Catalysis in Molecular scale cavities:** Structures of crystalline solids, structure of Zeolites, catalysis by Zeolites, catalysis by Zeolites containing metal complexes and clusters. Catalysis on surfaces – surface catalysis, catalysis on metal surfaces.

**TEXTBOOKS:**

**REFERENCES:**

### CHY251 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).

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

**Unit 2**

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

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

**TEXTBOOK:**

**REFERENCE:**

### CHY252 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.

**Chemistry of Carbon nanotubes:** Introduction, carbon nanotubes - fabrication, structure, electrical properties - vibrational properties - mechanical properties - applications of carbon nanotubes.

**Unit 2**

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

**Photochemistry in Electronics:** Laws of absorption - quantum efficiency and quantum yield - florescence and phosphorescence – photosensitization.

**High energy materials:** Preparation, properties and application of ammonium
nitrates (AN), NH\(_4\)NO\(_3\), ammonium perchlorate (AP), NH\(_4\)ClO\(_4\), ammonium dinitramide (AND), NH\(_4\)N(NO\(_2\))\(_2\), hydrazinium nitroformate (HNF), N\(_2\)H\(_5\)C(NO\(_2\))\(_3\), etc.

**TEXTBOOKS:**

**REFERENCES:**

**SYLLABUS**

**B. Tech. - Elctronics & Commu. Engg.**

### Unit 1

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

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

### Unit 3

**TEXTBOOKS:**
Toxicants - broad overview of toxicant classes such as metals, agricultural chemicals, food additives - contaminants, toxins, solvents, drugs, and cosmetics - history, exposure route, and toxicity of the non-essential metals - cadmium, lead, and mercury - medical treatment of metal poisoning - classes of agricultural chemicals - Toxins - source, including microbial, fungal, algal, plant and animal - examples - Brief discussions - food additives and contaminants - solvents - therapeutic drugs - drugs of abuse - combustion products - cosmetics.

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

Unit 3

TEXTBOOK:

REFERENCES:

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

TEXTBOOKS:

REFERENCES:

**CHY257 BIOMATERIALS SCIENCE 3 0 0 3**

**Unit 1**
**Introduction:** Bulk properties, Surface properties and characterization - polymers, silicone biomaterials, medical fibres and bionetextiles - Smart polymers - biorevable and bioerodible materials - natural materials, metals and ceramics - physical/chemical surface modification.

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

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

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

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

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

**TEXTBOOK:**

**REFERENCES:**

**CHY258 ENVIRONMENTAL CHEMISTRY 3 0 0 3**

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

**Water and water pollution (hydrosphere):** Physical and chemical properties of water - microbiological processes - carbon, nitrogen cycles - Water pollution - polluting agents - indices of pollution, heavy metal pollution and toxicity - BOD and COD determination - suspended solids - determination of other ions by photometric methods - Chemistry of anaerobic process, use of Effective Microorganisms.

**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:**
CHY259 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.
Electro analytical techniques: Potentiometry - Potentiometric titration - determination of equivalence point - acid base, complexometric, redox and precipitation titrations - merits and demerits. Voltammetry - Cyclic voltammetry - basic principle and application - Polarography - introduction - theoretical principles - migration current - residual current - half wave potential - instrumentation - analytical applications.

Unit 3
Thermal and Diffraction techniques: Principles and applications of DTG - DTA - DSC - X-ray - Electron Diffraction Studies - SEM, TEM.

TEXTBOOKS:

REFERENCES:

Unit 3

TEXTBOOK:

REFERENCES:
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-Villiger reactions - Dienone-phenol rearrangement - pinacol rearrangement.

Unit 3
Radical and radical ions: Formation of radicals, radical chain processes, radical addition, reaction with and without cyclisation - fragmentation reaction - rearrangement of radicals - Sn1 reaction - radical ions - Birch reduction - Hofmann-Löffler-Freytag reaction - Barton reaction - McMurry reaction.


TEXTBOOK:

REFERENCES:

CHY264 GREEN CHEMISTRY AND TECHNOLOGY 3 0 0 3

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

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

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

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

CHY270 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.

SYLLABI


SYLLABI


CHY271 ELECTROCHEMICAL ENERGY SYSTEMS AND PROCESSES 3 0 0 3

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

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

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

Unit 3

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

REFERENCES:

CHY272 COMPUTATIONAL CHEMISTRY AND MOLECULAR MODELLING 3 0 0 3

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

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


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

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

Huckel’s MO theory: Approximate and exact solution of Schrodinger equation - Expectation value of energy - Huckel’s theory and the LCAO approximation - 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:
SYLLABI  
2010 admissions onwards


REFERENCES:

CSE100  COMPUTER PROGRAMMING  3 0 0 3

Unit 1
Introduction to problem solving - algorithm development, flowcharting. C fundamentals, data types, variables, constants, enumerations, operators, bitwise operators, expressions, type cast, data input and output statements - formatted & unformatted, control structures - if, if else, switch, while, for, loop, continue, break, goto. Arrays - defining an array, processing an array, multidimensional arrays.

Unit 2
Strings, string handling functions. User defined functions - defining a function, function prototypes, calling a function, passing arguments to a function, recursion. Variable scope - auto, extern, static, register. Pointers - declarations, call by reference, functions returning pointer, pointer arithmetic. Pointer to pointer, pointers and arrays - pointer to array, array of pointers, dynamic memory allocation - malloc(), calloc(), free().

Unit 3

TEXTBOOK:

REFERENCES:

CSE180  COMPUTER PROGRAMMING LAB.  0 0 3 1
1. Programs using various input/output statements (scanf, printf, getchar, gets, puts, putchar)
2. Programs using bitwise operators and enumerated data types
3. Programs using control structures (if, if else, switch, & loops)
4. Programs using numeric one dimensional array
5. Programs using numeric multidimensional array
6. Programs using strings & string handling functions
7. Functions using static, external and auto variables
8. Programs using recursive functions
9. Programs using call by reference and pointer arithmetic
10. Pointer to array & array of pointers using dynamic memory allocation
11. Structures – arrays, structure within structure
12. Array of structures, unions
13. Programs using text files
14. Programs using binary files
15. Programs using random access of files
16. Programs using command line arguments

CSE350  INTRODUCTION TO COMPUTER ORGANIZATION AND ARCHITECTURE  3 0 0 3

Unit 1
Introduction to computers and processor design: introduction to computer, Von Neumann architecture, generation of computer, instruction set-Instruction types, addressing modes, fixed-point arithmetic - addition, subtraction, multiplication, ALU design.

Unit 2
Control design: introduction, hardwired control, microprogrammed control, microprogrammed computers. Memory organization: memory technology, virtual memory, high speed memories – performance measures.
Unit 3
System organization: introduction, bus-control, programmed I/O, DMA and interrupts, IO processors.

TEXTBOOK:

REFERENCES:

CSE360 INTRODUCTION TO DATA STRUCTURES AND ALGORITHMS
(Pre-requisite: CSE100)

Unit 1
Linear data structures: time and space complexity, stacks and queues – implementation and applications. Linked lists – singly linked lists, doubly linked lists, circular lists and application of linked lists. Non-linear data structures: trees - representation and traversals, binary trees, binary search trees - operations, graphs – representation and traversals - BFS, DFS.

Unit 2

Unit 3
Storage management and garbage collection: fixed block storage allocation, first fit storage allocation, storage release, buddy systems, garbage collection - compaction. Algorithm design techniques: greedy algorithms, divide and conquer method, dynamic programming, backtracking.

TEXTBOOKS:

REFERENCES:
Unit 3
Introduction to Yoga; Nature and Indian Culture; Values from Indian History; Life and work of Great Seers of India (1)

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

CUL102 CULTURAL EDUCATION II 2 0 0 2

Unit 1
Bhagavad Gita and Life Management; Historicity of Ramayana and Mahabharata; Overview of Patanjali’s Yoga Sutras;

Unit 2
Highlights of Indian Mythology; Indian Society: Its Strengths and Weaknesses; Role & Position of Women in Indian Society;

Unit 3
Indian Models of Economy, Business and Management; Health and Lifestyle related issues; Conservation of cultural heritage; Life and work of Great Seers of India (2)

TEXTBOOKS:
1. The Glory of India (in-house publication)
2. Sanatana Dharma (A compilation of Amma’s teachings on Indian Culture)

CUL151 ACHIEVING EXCELLENCE IN LIFE - AN INDIAN PERSPECTIVE 1 0 2 2

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

Unit 1
Goals of Life – Purusharthas
What are Purusharthas (Dharma, Artha, Kama, Moksha); Their relevance to Personal life; Family life; Social life; & Professional life; Followed by a Goal setting workshop;
Yogic way of Achieving Life Goals – (Stress Free & Focused Life)
Introduction to Yoga and main schools of Yoga; Yogic style of Life & Time Management (Work Shop);

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. (Volumes 1 to 3)
7. Art of Man Making - Swami Chinmayananda published by Chinmaya Mission, Bombay
10. Yoga In Daily Life - Swami Sivananda – published by Divine Llife Society
12. All about Hinduism – Swami Sivananda - Published by Divine Life Society
15. Valmiki Ramayana – Four volumes- published by Parimal Publications, Delhi
17. Mind Sound Resonance Technique (MSRT) published by Swami Vivekananda Yoga Prakashana, Bangalore.
18. Yoga & Memory - Dr H R Nagendra & Dr. Shirley Telles, published by Swami Vivekananda Yoga Prakashana, Bangalore.

CUL152 EXPLORING SCIENCE AND TECHNOLOGY IN ANCIENT INDIA

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

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

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

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

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

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

CUL153 EXCELLENCE IN DAILY LIFE

Unit 1
1. The anatomy of ‘Excellence’. What is ‘excellence'? Is it judged by external factors like wealth?


CUL154 YOGA PSYCHOLOGY

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

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

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

Patanjali Yoga Sutra – 1

Patanjali Yoga Sutra – 2

Unit 2
Patanjali Yoga Sutra – 3

Two formulae - Necessity of Abhyasah and Vairagyah - Foundation of Abhyasah - Foundation of Vairagyah.

**Patanjali Yoga Sutra – 4**


**Patanjali Yoga Sutra – 5**

Main obstacles in the path of Yoga - other obstructions - removal of obstacles by one – pointliness; 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.

**REFERENCES:**

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

**ECE100  ELECTRONICS ENGINEERING  3 0 0 3**

**Objective:** To understand the working of basic electronic devices such as diodes, BJTs and FETs; Introduce the student to the operation and design of fundamental building blocks of electronic systems like power supplies, amplifiers and oscillators; Develop skills to analyze specifications of simple electronic circuits and carry out their design.

**Unit 1**

**Physics of conductors and semiconductors:** conductors, semiconductors, silicon crystals, intrinsic semiconductors, two types of flow, doping a semiconductor, two types of extrinsic semiconductors, unbiased diode, forward bias, reverse bias, breakdown, barrier potential and temperature, reverse biased diode, diode approximations.

**Rectifiers and diodes:** half wave, full wave and Bridge rectifiers. Filters, choke input filter, capacitor input filter, PIV and surge current, Zener diode, loaded Zener regulator, LED, photo diodes, Schottky diode, Varactor diode.

**Unit 2**

**Basics of amplifiers:** Introduction to BJT and FET, BJT characteristic curves and regions of operation, emitter and voltage divider bias of BJT, BJT as a switch, LED drivers, JFET characteristics, JFET biasing in Ohmic and active regions, transconductance, JFET amplifiers, depletion mode and enhancement mode MOSFET, CMOS.

**Unit 3**

**Operational amplifiers and linear ICs:** differential amplifier, introduction to Opamps, inverting and non-inverting amplifier, comparators, instrumentation amplifier, summing amplifier, voltage follower.

**Oscillators:** Theory of sinusoidal oscillations, Wein Bridge oscillator, Colpitts oscillator, Quartz Crystal oscillator, introduction to 555 Timer, astable and monostable operation.

**TEXTBOOK:**


**REFERENCES:**


**ECE210  DIGITAL SYSTEMS  3 1 0 4**

(Pre-requisite: ECE100)

**Unit 1**

**Introduction to logic circuits, logic families:** Variables and functions, inversion, truth tables, logic gates and networks, Boolean algebra, synthesis using AND, OR, NOT, NAND and NOR gates. Design examples. Introduction to logic families such as ECL, TTL.
Implementation technology: Transistor switches, NMOS logic gates, CMOS logic gates, Negative logic system, tri-state logic.

Optimized implementation of logic functions: Karnaugh map, strategy for minimization, minimization of product of sums forms, incompletely specified functions, multiple-output circuits multilevel synthesis, analysis of multilevel circuits, cubical representation, a tabular method for minimization.

Number representation and arithmetic circuits: Addition of unsigned numbers, signed numbers, fast adders.

Unit 2
Combination circuit building blocks: Multiplexers, decoders, encoders, code converters, arithmetic comparison circuits.

Flip-flops, registers, counters: Basic latch, gated SR latch, gated latch, master slave and edge triggered D flip-flops, T flip-flop, JK flip-flop, registers, counters, reset synchronization, other types of counters.

Synchronous sequential circuits: Basic design steps, state assignment problem, mealy state model, serial adders example, state minimization.

Unit 3
Asynchronous sequential circuits: Asynchronous behavior, analysis of asynchronous circuits, synthesis of asynchronous circuits, state reduction, state assignment, hazards.

TEXTBOOK:

REFERENCES:

ECE211 ELECTRONIC CIRCUITS I 3 0 1 4
(Pre-requisite: ECE100)

Unit 1
Diode and its applications: Review of diode characteristics, diode models, physics of diode operation, design of clipper and clamper circuits, voltage multiplier circuits.

MOS field effect transistors: Introduction, device structures and physical operation, IV characteristics, brief analysis as an amplifier and as a switch. Biasing, small signal operation models, single stage MOS amplifiers, MOSFET capacitances and high frequency model.

Unit 2
BJT: Introduction – device structures and physical operation, IV characteristics, BJT as an amplifier and as a switch, brief idea of dc analysis, biasing circuits, single stage BJT amplifiers, BJT internal capacitances and high frequency model.

Unit 3
Integrated circuit amplifiers: Current sources, current mirrors and current steering circuits, high frequency response basics, CS and CE amplifiers with active loads, high frequency response of CS and CE amplifiers, common gate and common base amplifiers with active loads, Cascode amplifiers, source and emitter follower, CE and CS amplifiers with emitter(source) degeneration, transistor pairings.

Power amplifiers: Analysis and comparison of power amplifiers.

TEXTBOOKS:

REFERENCES:

ECE220 SIGNALS AND SYSTEMS 3 1 0 4

Unit 1
Introduction: Integrated approach for continuous-, discrete-time cases.
Signals: Classification of signals, continuous - discrete time; even/odd signals, periodic/nonperiodic signals, deterministic/random signals, energy/power signals; Basic operations on signals: Basic (continuous/discrete) signals - unit step, unit impulse, sinusoidal and complex exponential signals etc.

Systems (continuous/discrete): Representation, classification - linear/nonlinear, causal/noncausal, time invariant/time variant, with/without memory; BIBO stability, feedback system. LTI system – response of LTI system, convolution, properties (continuous/discrete); LTI systems – differential/difference equation representation and solution.
Unit 2
Fourier analysis of continuous time signals and systems: Fourier series for periodic signals; Fourier transform - properties of continuous time FT; Frequency response of continuous time LTI systems.
Fourier analysis of discrete time signals and systems: Discrete time Fourier series - discrete time Fourier transform - properties of DTFT; Frequency response of discrete time LTI systems.
Laplace transform analysis of systems: ROC, inverse LT, unilateral LT, solving differential equation with initial conditions.

Unit 3
Sampling: Sampling theorem, reconstruction of signal, aliasing, sampling of discrete time signals; Introduction to DFT.
z-Transform: Definition, ROC, inverse z-transform, properties, transform analysis of LTI Systems.
Interrelationship amongst different representation and transforms.

TEXTBOOK:

REFERENCES:

ECE221 DIGITAL SIGNAL PROCESSING 3 1 0 4
(Pre-requisite: ECE220)

Unit 1
The Discrete Fourier transforms: Review of main concepts form signals and systems course - frequency domain sampling and reconstruction of discrete time signals - the DFT as a linear transformation - relationship of the DFT to other transforms - properties of DFT - linear filtering methods based on DFT- efficient computation of the DFT-FFT algorithms. Efficient computation of DFT of two real sequences - efficient computation of the DFT of a 2N-point real sequences - use of FFT in linear filtering and correlation - introduction to DCT.

Unit 2

ECE230 ELECTROMAGNETICS AND WAVE PROPOGATION 3 1 0 4

Unit 1
Introduction to electric and magnetic fields: Vectors and co-ordinate systems cartesian, cylindrical and spherical systems - scalar and vector fields - electric and magnetic fields. Lorentz Force equation - line, surface and volume Integrals - electric and magnetic potential.

Unit 2
### Unit 3

**Wave Propagation:** Normal incidence at conductor interface - normal/oblique incidence at dielectric interface plane – earth reflection – space waves and surface waves – spherical earth propagation – reflection and refraction by ionosphere – sky wave transmission.

**TEXTBOOK:**

**REFERENCES:**

---

**ECE290**  **DIGITAL SYSTEMS LAB.**  
1. Realization of basic logic functions using universal logic gates.
2. Construction of simple decoder & multiplexer circuits using logic gates.
3. Design of combinational circuits for BCD to decimal conversion to drive 7-segment display using multiplexer.
6. Realization of synchronous and asynchronous up and down counter.
7. Adder circuit using shift register and full adder.

---

**ECE291**  **SIGNALS AND SYSTEMS LAB.**  
1. Periodicity and non periodicity of continuous time and discrete time signals.
2. Even and odd components of continuous time and discrete time signals.
3. Generation and operation of signals.
4. Experiments on LTI systems.
5. Response of discrete time system such as zero input, zero state, total response.
7. Convolution Integral and convolution sum of a continuous time and discrete time signals.
8. Fourier transforms Fourier series, DTFT, DTFS of a continuous time and discrete time signals.
9. Z-Transform and Laplace transform of a continuous time and discrete time signals systems.

---

**ECE292**  **DIGITAL SIGNAL PROCESSING LAB.**  

---

**ECE293**  **ELECTRONIC CIRCUITS LAB. I**  
1. Linear power supply
2. Operational amplifier circuits
3. Wave form generation using op-amp
4. Instrumentation amplifier, LC power amplifier
5. High power amplifier
6. Precision rectifier
7. Familiarization with simulation software.

---

**ECE310**  **INTRODUCTION TO MICROCONTROLLERS AND APPLICATIONS**  
(Pre-requisite: ECE210)

**Unit 1**
Introduction to 8085 microprocessor-architecture and programming.


**Introduction to elementary processor:** Organization - Data Transfer Unit (DTU) - operation - Enhanced Data Transfer Unit (EDTU) – Opcode - machine language - assembly language - pipeline scheme and system clock.


**Unit 3**  **PIC peripherals:** Application of each peripherals and its use: ports - IO ports - port configuration - parallel slave port - LED, LCD and keyboard interface -timers and counters - watchdog timer - analog to digital converter specification - operation. EEPROM data memory - serial communication – USART - CCP module.
Syllabi


Textbook:

References:

ECE311 ELECTRONIC CIRCUITS II 3 1 0 4
(Pre-requisite: ECE211)

Unit 1
Introduction: Basic BJT and MOS differential pairs – differential and common mode gains and input impedances, CMRR.
Feedback: Introduction, properties of negative feedback, basic topologies, analysis of ideal and practical voltage-shunt and voltage series configurations, closed loop frequency response.

Unit 2
Operational amplifiers: Ideal Op-amp, practical Op-amp, inverting configuration, non-inverting configuration, differential configuration, practical Op-amp parameters, open-loop and closed-loop frequency response, gain-bandwidth product, slew rate, CMRR.

Unit 3
Oscillators, filters and tuned amplifiers: Principle, Op amp RC oscillators, monostable, bistable and astable multivibrator, filters: filter transmission, types and specifications, transfer function, design of Butterworth and Chebyshev filters, tuned amplifiers.

Textbook:

References:
**SYLLABI**

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

2010 admissions onwards


**An overview of VLSI:** Basic concepts of VLSI design, MOSFETs: basic physics, I-V characteristics and models, MOSFETs as switches, NMOS and CMOS physical layouts and stick diagrams.

Unit 2

**Physical structure of integrated circuits:** NMOS and CMOS layers, designing FET arrays, FET sizing and unit transistor, physical design of logic gates and design hierarchies.

**Analysis of MOS logic gates:** DC switching characteristics of NMOS and CMOS inverters, DC characteristics of NAND and NOR gates, transient response, gate design for transient performance, transmission gates and pass transistors.

Unit 3

**Designing high speed CMOS logic networks:** Gate delays, driving large capacitive loads, logical effort, BICMOS drivers, clocking and data flow control - advanced techniques in CMOS logic circuits: Mirror circuits, pseudo-NMOS, tristate circuits, clocked CMOS, dynamic CMOS logic circuits, dual-rail logic networks.

**TEXTBOOKS:**

**REFERENCES:**

**ECE330**

**ANALOG COMMUNICATION**

3 1 0 4

**Unit 1**

Introduction to communication systems and its need, introduction to modulation and its need, classification of modulations.

**Amplitude modulation:** Amplitude modulation, DSB-SC, SSB modulation and demodulation, introduction to vestigial sideband modulation, AM radio broadcasting, implementation of AM modulator and demodulator, super heterodyne receiver.

**Unit 2**

**Angle modulation:** Angle modulation introduction and representation, spectral characteristics of angle modulation, implementation of modulator and demodulator for angle modulation, introduction of FM radio broadcasting (Block diagram and explanation).

**Unit 3**

**Random process:** Review of probability and random process, need for the study of probability and random process in communication engineering, random process basic concepts and linear systems.

**Noise analysis:** Gaussian white process, narrow band noise and filtering, effect of noise in AM signals, effect of noise in FM system, comparison of AM and FM systems.

**TEXTBOOK:**

**REFERENCES:**

**ECE331**

**DIGITAL COMMUNICATION**

3 1 0 4

(Pre-requisite: ECE330)

**Unit 1**

**Analog to digital conversion:** Sampling of signals and signal reconstruction from samples, quantization, encoding, waveform coding, analysis – synthesis techniques.

**Digital modulation in an additive white Gaussian noise base band channel:** Geometric representation of signal waveforms, binary pulse modulation, optimum receiver for binary modulated signals in additive white Gaussian noise, M-ary pulse modulation, probability of error for M-ary pulse modulation.

**Unit 2**

**Digital transmission through band limited AWGN channels:** Digital transmission through band limited channels, signal design for band limited channels, probability of error for detection of digital PAM, system design in the presence of channel distortion.

**Unit 3**

**Transmission of digital information via carrier modulation:** Amplitude modulated digital signals, phase modulated digital signals, Quadrature amplitude modulated digital signals, frequency modulated digital signals, comparison, symbol synchronization for carrier modulated signals.
TEXTBOOK:

REFERENCES:

ECE332 TRANSMISSION LINES AND RADIATING SYSTEMS 3 1 0 4
(Pre-requisite: ECE230)

Unit 1
Transmission line: Transverse electromagnetic wave along a parallel plate transmission line - general transmission line equations - characteristics of infinite and finite length transmission lines parameters – circuit elements – resistive and arbitrary terminations – circuits - introduction to Smith chart - transmission line impedance matching.

Unit 2
Guided wave structures: General wave behavior along uniform guiding structures – transverse electromagnetic, transverse electric and transverse magnetic waves.

Unit 3
Wave guides and radiating systems: TE and TM waves in parallel plate and rectangular waveguide - introduction to circular waveguide. Radiation concept - radiation fields of elemental electric dipole - antenna parameters description.

TEXTBOOK:

REFERENCES:


ECE351 IMAGE PROCESSING 3 0 3
(Pre-requisite: ECE220)

Unit 1
Review of matrices: Order, matrix operation, diagonal matrix, identity matrix, symmetric matrix, inverse, rank.
Review of probability and random variables: Set, probability, random variables, expected value and moments, Gaussian pdf, multivariate Gaussian density, linear transformation of random variables, random process.
Introduction: The origins of digital image processing - examples of fields that use DIP.
Image digitization & sampling: Elements of visual perception brightness & contrast - image sensing & acquisition - image sampling & quantization - some basic relationships between pixels.
Image enhancement in spatial domain: Image enhancement in the spatial domain - some basic gray level transformations - histogram processing - enhancement using arithmetic/logic operations - basics of spatial filtering - smoothing and sharpening spatial filters.

Unit 2
Image enhancement in frequency domain: Review of sampling and discrete fourier transform - image enhancement in the frequency domain – introduction - smoothing - sharpening, frequency domain filtering - homomorphic filtering.
Color image processing fundamentals: Color image processing - Pseudo color image processing - basics of full-color image processing.

Unit 3
Image transforms: Introduction to transformation used for Image processing applications - cosine – Hadamard – Haar – sine - KL transforms & their properties.

TEXTBOOK:

REFERENCE:

ECE376 EMBEDDED SYSTEMS 3 0 3
(Pre-requisite: ECE210)

Unit 1
Hardware fundamentals: Introduction to embedded systems – application areas
Unit 1

--- Hardware/software architectures of embedded system: compiling, linking and locating - downloading and debugging - emulators and simulators - types of memory - flash memory - built-in on the microprocessor - control and status register - device drivers and its design - CISC/RISC - RTOS and architectures - selecting an architecture.

--- Processor design for an embedded system: Single purpose processor design - peripherals - optimizing the processor, program, FSM, data path, FSM - general purpose processor design - architecture - programmer's view - development environment - ASIP's - digital signal processors - selecting an microprocessor.

--- High performance RISC architecture: ARM processor, ARM architecture, ARM organization and implementation - ARM instruction set - THUMB instruction set - basic ARM assembly language program, ARM CPU cores.

--- Real time operating systems: Tasks and task states - mutexes and semaphores - shared data - message queues - mail boxes and pipes - memory management - interrupt routine - encapsulating semaphores and queues - hard real time scheduling - power saving.

--- Case studies: Embedded C programming Multiple closure problems, basic outputs with PPI - controlling motors - bidirectional control of motors - H bridge - telephonic systems - inventory control systems.

--- Mixed logic circuits: Entered variable K-map minimization, multiple output minimization, resubstitution, decomposition, factorization; non-arithmetic combinational logic with EV K-maps, arithmetic logic with EV K-maps, carry lookahead adder, carry save adder, propagation delay & timing defects in combinational logic.

--- AC-DC converters and AC voltage controllers - controlled rectifiers - single phase and three phase converters - power factor improvements - design of converter circuits - AC voltage controllers - single phase and three phase - cyclo converters - single phase and three phase - design of AC voltage controller circuits.

--- DC to AC converters - voltage source inverters - pulse width modulation techniques - voltage and harmonic control - series resonant inverter - current source inverters - control of induction motors.
Advanced control of power electronic circuits - advanced control of power electronic circuits using microprocessors, microcontrollers - isolation amplifier circuits - synchronization circuits.

TEXTBOOK:

REFERENCES:

ECE390 MICROCONTROLLER LAB. 1 0 3 2
1. Programming PIC microcontroller
2. Programming 8051 microcontroller
3. Programming exercises which include interfacing using PIC Micro controller.

ECE391 ELECTRONIC CIRCUITS LAB. II 0 0 3 1
1. Basic experiments with Op-amps: adder, subtractor, integrator, differentiator, precision rectifiers, oscillators and design of electrical filters.
2. Basic experiments using linear IC’s - audio power amplifiers.
3. Design of modulation and demodulation circuits using IC’s.
4. Wide band amplifiers.

ECE392 VLSI DESIGN LAB. 0 0 3 1

ECE393 DIGITAL COMMUNICATION LAB. 0 0 3 1
1. Pulse amplitude modulation and demodulation,
2. Pulse code modulation and detection.
3. Experiments on delta modulator & demodulator.
4. Experiments on PCM/TDM system.
5. Experiments on digital modulation circuits.

ECE397 SEMINAR 2 0 0 2
The aim of seminar is to train students for higher-level technical presentations. The topics for presentation are chosen by the teacher and these may include the topics in the area of student’s project work.

ECE430 RADIO FREQUENCY ENGINEERING 3 1 0 4
(Pre-requisite: ECE230)
Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:
ECE431  INFORMATION THEORY AND CODING TECHNIQUES     3 1 0  4
(Pre-requisite: ECE330)

Unit 1
Introduction to information theory: Modeling of information sources; source coding theorem; source coding algorithms; modeling of communication channels; channel capacity; bounds on communication.

Unit 2
Linear block codes: Structure, matrix description, hamming codes, standard array arithmetic of Galois fields: integer ring, finite fields based on integer ring, polynomial rings, finite fields based on polynomial rings, primitive elements, structure of finite fields.
Cyclic codes: Structure of cyclic codes, encoding and decoding of cyclic codes.

Unit 3
BCH codes: Generator polynomials in terms of minimal polynomial, decoding of BCH codes, Reed-Solomon codes, Peterson-Gorenstein - Zierler decoder.
Implementation: Logic circuits for finite field arithmetic, shift register encoders and decoders.
Convolutional codes: Introduction to convolutional codes, basics of convolutional code encoding and decoding.

TEXTBOOK:

REFERENCES:

ECE445  WIRELESS COMMUNICATION     3 0 0  3
(Pre-requisite: ECE331)

Unit 1
Introduction to wireless communications: Evolution of mobile radio communications, paging system, cordless telephone system, cellular telephone system, modern wireless communication systems: 2G networks, 3G networks, WLL and LMDS, Bluetooth and personal area networks.
Mobile radio propagation: large scale path loss - free space propagation model, basic propagation mechanisms. Small scale fading and multi path - small scale multi path propagation, impulse response model of a multi path channel, small scale multi path measurements, parameters of mobile multi path channels, types of small scale fading.

Unit 2
Signal processing techniques: Modulation techniques for mobile radio, equalization and diversity techniques - fundamentals, training a generic adaptive equalizer, equalizer in communication receiver, linear equalizers, nonlinear equalizers, algorithms for adaptive equalization, fractionally spaced equalizers, diversity techniques, RAKE receiver, interleaving.

Unit 3
Wireless networking: Difference between wireless and fixed telephone networks, development of wireless networks, fixed network transmission hierarchy, traffic routing in wireless networks, wireless data services, common channel signaling, signaling system no.7, PCS/PCN protocols for network access, network databases. Wireless systems and standards: GSM, CDMA, CT2 for codeless telephones, PACS.

TEXTBOOK:

REFERENCES:

ECE450  DIGITAL SIGNAL PROCESSORS AND APPLICATIONS     3 0 0  3
(Pre-requisite: ECE220)

Unit 1
Programmable architecture: Review of digital signal processing concepts. Basic architectural features, DSP communicational building blocks, bus architecture & memory data addressing capabilities, address generation unit, programmability & program execution, speed issues, features for external interfacing.

Unit 2
Programmable digital signal processors: Commercial digital signal processing devices, data addressing modes of TMS320C54XX digital signal processors, data addressing modes of TMS320C54XX processors. Memory space of TMS320C54XX
processors, program control, TMS320C54XX instruction & programming, on-chip peripherals, interrupts of TMS320C54XX processors, pipeline operation of TMS320C54XX processors.

**Implementation of basic DSP algorithms:** The Q notation, FIR filters, IIR filters interpolation of filters, Decimation filters. PID controller, adaptive filters, 2-D signal processing. FFT algorithm for DFT computation, butterfly computation overflow and scaling, Bit reversed index generation. FFT implementation on the TMS320C54XX, Computation of signal spectrum.

**Unit 3**

**Interfacing concepts:** Memory space organization, external bus interfacing signals, memory interface, parallel I/O interface programmed I/O interrupts and I/O. Direct memory access (DMA). Synchronous serial interface, a multi-channel buffered serial port (Mc.BSP). Mc.BSP programming CODEC interface circuit, CODEC programming. CODEC-DSP interface.

**TEXTBOOK:**

**REFERENCES:**

**ECE451**

**INTRODUCTION TO SOFT COMPUTING**

(Pre-requisite: MAT212)

**Unit 1**

**Basic concepts:** Single layer perceptron - multi layer perceptron - supervised and unsupervised learning - back propagation networks - Kohnen’s self-organizing networks – hop field networks - distance measures.

**Unit 2**

**Fuzzy sets:** Properties, membership functions, fuzzy operations, applications, classification and regression tree - data clustering algorithms - rule based structure identification and regression trees - data clustering algorithms - rule based structure identification – neuro-fuzzy systems.

**Unit 3**

**Evolutionary computing:** Simulated annealing, survival of the fittest – fitness computation – cross over - mutation – reproduction – rank method – rank space methods. Case studies on applications of soft computing.

**TEXTBOOK:**

**REFERENCES:**

**ECE452**

**ADAPTIVE SIGNAL PROCESSING**

(Pre-requisite: ECE220)

**Unit 1**

**Adaptive systems:** Definition and characteristics, areas of application, general properties, open-loop and closed-loop adaptations, applications of closed-loop adaptation, example of an adaptive system.

**Stochastic processes and models:** Partial characterization of discrete-time stochastic process, mean Ergodic theorem, correlation matrix, stochastic models, wold decomposition, asymptotic stationary of an autoregressive process, Yule-Walker equations, power spectral density, properties of power spectral density, transmission of a stationary process through a linear filter, cramer spectral representation for a stationary process, power spectral estimation.

**Unit 2**

**Wiener filters:** Linear optimum filtering: principle of orthogonality, minimum mean-square error, Wiener-Hop equations, error-performance surface, multiple linear regression model.

**Linear prediction:** Forward linear prediction, backward linear prediction, Levinson-Durbin algorithm, properties, Schur-Cohen test.

**Method of steepest descent:** basic idea of the steepest-descent algorithm, the steepest-descent algorithm applied to the Wiener filter, stability.

**Unit 3**

**Least-mean-square (LMS) adaptive filters:** Overview of the structure and operation of the LMS algorithm, LMS adaptation algorithm, applications, statistical LMS theory, comparison of the LMS algorithm with the steepest-descent algorithm.

**Method of least squares:** Statement, data windowing, principle of orthogonality, minimum sum of error squares, normal equations and linear least square filters, time average correlation matrix, singular value decomposition. Introduction to RLS algorithm and Kalman filtering.

**TEXTBOOK:**
SYLLABI


REFERENCES:

ECE453 BIOMEDICAL SIGNAL PROCESSING 3 0 0 3
(Pre-requisite: ECE220)

Unit 1
Introduction: Computers in medicine; human anatomy and physiology; cell structure; origin of bio electric potentials; biomedical signals. Review of discrete time signals and systems; DFT and Z transforms.
Neurological signal processing: The brain and its potentials; electrophysiological origin of brain waves; EEG signal and its characteristics; EEG analysis; linear prediction theory; autoregressive (AR) method; recursive estimation of AR parameters; spectral error measure; adaptive segmentation; transient detection and elimination. Sleep EEG data acquisition and classification of sleep stages; the Markov model and Markov chains; dynamics of sleep – wake transitions.

Unit 2
Adaptive interference/noise cancellation: Principle of adaptive filter; steepest-descent algorithm; the Widrow-Hoff LMS adaptive algorithm; adaptive noise canceller - canceling donor-heart interference in heart transplant electrocardiography, cancellation of electrocardiography signal from the electrical activity of the chest muscles, cancellation of high frequency noise in electro-surgery.

Unit 3
Cardiological signal processing: ECG data acquisition; ECG lead system; ECG parameters and their estimation, arrhythmia analysis monitoring; ECG recording. ECG data reduction techniques, direct data compression techniques; direct ECG data compression techniques; transformation compression techniques. Prony’s method of exponential modeling; exponential parameter estimation; clinical applications of Prony’s method.

TEXTBOOKS:

REFERENCE:

SYLLABI


ECE454 SPEECH PROCESSING 3 0 0 3
(Pre-requisite: ECE221)

Unit 1
Introduction: Speech signal, digital speech processing, digital transmission and storage of speech, speech synthesis systems, speaker verification and identification, speech recognition systems, aids-to-the-handicapped, enhancement of signal quality.
Digital models for speech signal: Introduction, process of speech production, acoustic theory, lossless tube models, digital model for speech signals.

Unit 2
Time domain models for speech processing: Time dependent processing of speech, short-time energy and average magnitude, average zero-crossing rate, speech vs. silence discrimination, pitch period estimation, short-time autocorrelation function, average magnitude difference function, pitch period estimation. Short-time fourier analysis: Introduction, interpretation in terms of fourier transforms and linear filtering, sampling rates of \( X(f) \) in time and frequency, filter bank summation and overlap addition methods for short time synthesis, modifications to the short-time spectrum, additive modifications, basic model for short-time analysis and synthesis of speech, design of digital filter banks - practical considerations, design of IIR and FIR filters, implementation of filter banks - FFT approach. Digital coding of time - dependent fourier transform - phase Vocoder - channel Vocoder.

Unit 3
Homomorphic speech processing: Homomorphic systems for convolution (computational considerations), the complex cepstrum of speech, pitch detection, formant estimation, homomorphic Vocoder.
Linear predictive coding of speech: Basic principles, autocorrelation method, computation of gain, solution of the LPC equations - Durbin’s recursive solution, applications of LPC parameters for pitch detection, formant analysis; an LPC Vocoder - quantization considerations, voiced-excited LPC Vcoders, linear prediction analyzer.

TEXTBOOK:

REFERENCES:

**ECE455 WAVELET-BASED SIGNAL PROCESSING AND APPLICATIONS**

(Pre-requisite: ECE220)

**Unit 1**

**Fourier transform, STFT and introduction to wavelet**: Short time fourier transform, continuous wavelet transform, discrete wavelet transform with haar bases, daubechies wavelet system and their design.

**Unit 2**

**Filter banks and wavelets**: Introduction to biorthogonal wavelets, frequency domain approach, wavelet packets, M-band wavelet and multiwavelets, lifting schemes, ridgelets and curvelets.

**Unit 3**

**Applications**: Image compression using wavelets, JPEG standard-quantization, entropy coding, EZW coding, speech, audio, compression, feature extraction, denoising applications of wavelet, communication applications of wavelet, medical and biomedical signal and image processing.

**TEXTBOOK:**


**REFERENCES:**


**ECE456 SPOKEN LANGUAGE PROCESSING**

(Pre-requisite: ECE220, ECE221)

**Objectives**: The course is expected to give the student a detailed understanding of how the signal processing concepts learned in the previous semesters can be used in practical applications such as text to speech synthesis, speech coding for telecommunication and speech recognition applications.

**Objectives**: The course is expected to give the student a detailed understanding of how the signal processing concepts learned in the previous semesters can be used in practical applications such as text to speech synthesis, speech coding for telecommunication and speech recognition applications.

**Unit 1**

Speech analysis: source filter modeling, speech sounds, lip radiation, linear prediction, lattice filters, Levinson-Durbin recursion. Feature extraction for speech processing: short term fourier transform, wavelets, cepstrum, sinusoidal and harmonic representations, mel frequency cepstral coefficients (MFCC), perceptual linear prediction (PLP), mel filterbank energies, use of temporal patterns (TRAPS) in speech processing.

**Unit 2**

Principles of speech coding: main characteristics of a speech coder, key components of a speech coder, from predictive coding to CELP, improved CELP coders, wide band speech coding, audio-visual speech coding. Speech synthesis: linguistic processing, acoustic processing, training models automatically, text pre-processing, grapheme to phoneme conversion – rule based and decision tree approaches, syntactic prosodic analysis, prosodic analysis, speech signal modelling.

**Unit 3**

Principles of speech recognition: Hidden Markov models (HMM) for acoustic modeling, observation probability and model parameters, HMM as probabilistic automata, Viterbi algorithm, language models, n-gram language modeling, and difficulties with the evaluation of higher order n-grams and solutions. Spoken keyword spotting approaches, evaluation metric, spoken language identification – approaches, acoustic, phonotactic, LVCSR based.

**TEXTBOOKS:**


**ECE457 PATTERN RECOGNITION TECHNIQUES AND ALGORITHMS**

(Pre-requisite: MAT212)

**Unit 1**

Introduction: Applications of pattern recognition, statistical decision theory, image processing and analysis.

**Probability**: Introduction, probability of events, random variables, joint distributions and densities, moments of random variables, estimation of parameters from samples, minimum risk estimators.

**Unit 2**

Statistical decision making: Introduction, Bayes’ theorem, multiple features,
conditionally independent features, decision boundaries, unequal costs of error, estimation of error rates, the leaving-one-out technique, characteristic curves, estimating the composition of population. 

Nonparametric decision making: Introduction, histograms, kernel and window estimators, nearest neighbor classification techniques, adaptive decision boundaries, adaptive discriminant functions, minimum squared error discriminant functions, choosing a decision making technique.

Unit 3

Clustering: Introduction, hierarchical clustering, partitional clustering.

Processing of waveforms and images: Introduction, gray level scaling transformations, equalization, geometric image scaling and interpolation, smoothing transformations, edge detection, Laplacian and sharpening operators, line detection and template matching, logarithmic gray level scaling, the statistical significance of image features.

TEXTBOOK:

REFERENCES:

ECE458 KERNEL METHODS IN SPOKEN LANGUAGE PROCESSING 3 0 0 3
(Pre-requisite: ECE220, ECE221)

Objectives: The course is expected to help the student understand the concepts of Kernel methods and its applications. An introduction into vector spaces and linear algebra is aimed to refresh the basic concepts necessary for a good understanding of the course. Finally, an application of Kernel methods to spoken language processing with a case study of how it is used for speaker recognition will be discussed.

Unit 1

Kernel induced feature spaces: implicit mapping into feature space, making kernels, characterization of kernels, reproducing kernel Hilbert spaces, making kernels from kernels, making kernels from features, kernels and Gaussian processes.

Unit 2


Unit 3

Applications for kernel methods for spoken language processing: traditional approaches to speech processing, potential problems of the probabilistic approach, support vectors for binary classification, introduction to speaker recognition, text and language independence, type of errors, evaluation metric, DET and EER, cost function – weighted error rate, applications, Gaussian mixture models for feature extraction, SVM for speaker identification.

TEXTBOOKS:

REFERENCE:

ECE459 OPTICAL ENGINEERING 3 0 0 3
(Pre-requisite: ECE230)

Unit 1


Unit 2

Semiconductor detectors: PIN, APD devices, physics of light absorption - types of detectors and structures - noise in optical detection and generation.

Unit 3

ECE460  MICROWAVE SOLID STATE DEVICES  3 0 0 3
(Pre-requisite: ECE211)

Unit 1
Introduction to radio frequency transistors and diodes: Transit time effects –
silicon and GaAs material properties – applications. Bipolar transistors (BJT):
Physical structure – configuration – operation – amplification phenomena. Hetero
junction BJT: operational mechanism – applications: Tunnel effect: Tunnel diodes
and operation.

Unit 2
Field effect transistors (FET): Junction FET: structure – operation – I-V
characteristics. Metal semiconductor FET (MESFET): structure – operation – cutoff
and maximum oscillation frequency. High electron mobility transistors (HEMT):
structure – operation and electronic applications. Metal oxide semiconductor FET:
maximum operation frequency – CMOS, NMOS memory devices.

Unit 3
Transferred electron devices: Gunn effect – GaAs diode – Ridley’s Watkins
Hilsum theory – negative resistance – two valley model theory – high field domain
– modes of operation – classification of modes – limited space charge accumulation
– LSA diodes – InP diodes. Avalanche transit time devices: Read diodes – IMPATT –
TRAPATT – BARITT – parametric devices.

Monolithic microwave integrated circuits: Materials – substrate: conductor,
dielectric – resistive materials – MMIC fabrication techniques – MOSFET fabrication
– thin film formation – hybrid integrated circuit fabrication.

TEXTBOOK:

REFERENCES:
1. Matthew M. Radmanesh, “Radio Frequency and Microwave Electronics Illustrated”, First
ECE462  RADIO FREQUENCY CIRCUIT DESIGN  3 0 0 3  
(Pre-requisite: ECE332)

Unit 1
Radio frequency concepts: Frequency spectrum and applications – behavior of passive components at radio frequencies – design parameters.

RF passive components: Transmission lines and equivalent circuits – design of transmission lines and transmission lines based devices - Smith chart representation.

Unit 2
RF network theory: Interconnection of networks – scattering parameters and properties - RF measurements and principles.


Unit 3
RF system design: Impedance matching concepts – microstrip matching – transistor biasing networks – amplifier design concepts and power relations – design of portable systems.

TEXTBOOK:

REFERENCES:

ECE463  PRINCIPLES OF RFID DESIGN  3 0 0 3  
(Pre-requisite: ECE331)

Unit 1
Introduction to RFID: Concepts of RF front end and base band systems – wireless communication principles.

RFID architecture: Key functionalities – system components – quality considerations – architecture guidelines – system management.

Unit 2

ECE464  MICROSTRIP DEVICES AND CIRCUITS  3 0 0 3  
(Pre-requisite: ECE332)

Unit 3
RFID middleware: Logical architecture – event specifications – commercial RFID middleware.


TEXTBOOK:

REFERENCE:
REFERENCES:

ECE465 AVIATION ELECTRONICS 3 0 0 3

Unit 1
Introduction to electronics in aerospace: Requirement for military and civil – military specifications and arine, cockpit layout, aircraft equipment, control and display, electrical systems, magnetic compass watch. Aircraft Instruments, air speed indicator, attitude and direction indicator, vertical state indicator, horizontal state indicator, height meter, meanings of QFE and QNH, omni glass selection, turning and tilted indicator, magnetic indicator and radio, bug and flag.

Unit 2
Sensors and systems: Gyroscope, attitude gyroscope, rate and integrated fibre optic, ring laser gyroscope, accelerometer, inertia navigation systems, air data units, Doppler navigation systems.
Aviation equipments: EFIS and glass cockpit displays, electronic aviation equipment display, display and format generation, engine management display and instrumentation, maintenance status and fuel state display.

Unit 3
Communication systems: HF, VHF and UHF, antenna, audio communication systems, telephone systems satellite, mode ‘s’ transmission, radio navigation aids, automatic direction finders, VHF range-omni, instrument landing systems, microwave landing systems, tacan, loran, omega, global position system, traffic avoidance and collision system, transponder.

Standards: Aircraft data bus systems, MIL-STD 1553D and arine 4258725 radar and weapon systems, radar system principle.

TEXTBOOK:

REFERENCE:

ECE466 SPREAD SPECTRUM COMMUNICATION 3 0 0 3

Unit 1
Digital communication concepts - introduction to spread spectrum systems - binary shift register sequences for spread spectrum systems.

ECE467 ANTENNA SYSTEMS AND DESIGN 3 0 0 3

(Pre-requisite: ECE230)

Unit 1
Linear wire antennas: Dipole – ground effects – design for mobile communications.
Planar antenna: Rectangular patch – circular patch – design parameters and analysis.

Unit 2
Antenna arrays: Linear arrays – planar arrays – design and analysis.

Unit 3

TEXTBOOK:

REFERENCE:

ECE468 OPTICAL COMMUNICATION 3 0 0 3

(Pre-requisite: ECE331)

Unit 1
Optical fibers: Introduction of optical communication – ray theory – electromagnetic

**Semiconductor LASERS and LED:** Introduction to lasers – basic concepts – optical emission from semiconductors – light emitting diode – power and efficiency – LED structures – LED characteristics – modulation.

Unit 2


Unit 3


**Optical fiber communication systems:** Optical fiber communication systems - introduction – digital optical fiber telecommunications – data communication systems – analog systems – public network applications – trunk, local access, submerged and Industrial networks – the optical ether.

**TEXTBOOK:**


**REFERENCES:**


**ECE469**  
**DIGITAL TELEPHONY**  

**Unit 1**

**Introduction to telecommunication switching:** Evolution of telecommunication, simple telephone communications, basis of switching systems. Digital switching systems.

**Telecommunication traffic:** The unit of traffic, traffic measurements, mathematical model, lost call systems, traffic performance, loss systems in tandem, queuing systems, second Erlang distribution, probability of delay, finite queue capacity, system with single server, queue in tandem, delay tables, application of delay formulae.

**TEXTBOOK:**


**REFERENCES:**


**ECE470**  
**MULTIMEDIA COMMUNICATION STANDARDS**  

**Unit 1**

**Introduction to multimedia concepts:** Signals – audio, video - band limited and bandwidth requirements and constraints. Signal formats: Sources of signal generation.

**Unit 2**

**Digital coding techniques:** Colour formats – quantization, predictive coding, transform coding, hybrid coding, motion compensation, vector quantization, sub band coding.

**Unit 3**

**Standards:** JPEG still picture compression algorithm, ITU-T H.261 video coder, MPEG1, MPEG2, MPEG4, H.263, high definition television services, CMTT digital broadcasting standards.

**TEXTBOOK:**

ECE471 SATELLITE COMMUNICATION 3 0 0 3
(Pre-requisite: ECE331)

Unit 1

Unit 2

Unit 3

ECE472 MIMO AND MULTICARRIER SYSTEMS 3 0 0 3
(Pre-requisite: ECE445)

Unit 1
Need for MIMO and capacity calculation: Introduction - the crowded spectrum - need for high data rates - Multiple-Input Multiple-Output systems - multi-antenna systems and concepts - spatial multiplexing - MIMO system model - MIMO system capacity - channel known to the transmitter - channel unknown to the transmitter - water-pouring principle - capacity calculation – SIMO - MISO - Ergodic capacity - outage capacity - influence of fading correlation on MIMO capacity - influence of LOS on MIMO capacity.

Unit 2

Unit 3

REFERENCES:

ECE476 ANALOGIC DESIGN 3 0 0 3
(Pre-requisite: ECE211)

Unit 1
Introduction to analog integrated circuits: Analog integrated circuit design, notation, symbols and terminology, analog signal processing, example of analog VLSI mixed signal circuit design.
CMOS technology: Basic MOS semiconductor fabrication process, PN junction, the MOS transistor, passive components, other considerations of CMOS technology, integrated circuit layout - CMOS device modeling, simple MOS large signal model, other MOS large signal model parameter, small signal model for the MOS transistor, computer simulation model, sub threshold MOS model, SPICE simulation of MOS circuit.
Unit 2
**Analog CMOS sub circuits:** MOS switch, MOS diode/active resistor, current sinks and sources, current mirror, current and voltage reference, band gap reference - CMOS amplifier, inverter, differential amplifier, Cascode amplifier, current amplifier, output amplifier, high gain amplifier architecture.

Unit 3
**CMOS operational amplifier:** Design of CMOS op-amps, compensation of op-amps, design of two stage op-amps, power supply rejection ratio of two stage op-amps, Cascode op-amps, simulation and measurement of op-amps, Marco models for op-amps.

**TEXTBOOK:**

**REFERENCES:**

**ECE477**
**VLSI TECHNOLOGY**
**3 0 0 3**
(Pre-requisite: ECE311)

Unit 1
**Properties of crystals:** Crystal structure, crystal growth and epitaxy.

Unit 2
**Processing technology:** Unit processes for VLSI-oxidation, photolithography, diffusion and ion implantation. Deposition of metal and dielectric films by vacuum evaporation, sputtering and CVD techniques, metallization, models and simulations. Wet and dry etching techniques.

Unit 3
**Device and circuit fabrication:** Isolation techniques, self aligned processes. Resistors and capacitors, MOS based silicon ICs-NMOS and CMOS ICs. Memory devices, SOI devices, BJT based ICs PL and ECL transistors - BICMOS technology.

**TEXTBOOK:**
and interest, present & future values of streams, IRR - pixed income securities - market value for future cash, bond value, bond details, yields, convexity, duration, immunization, bond portfolio management - level of market interest rates, term structure of interest-rate theories.

Unit 2
**Stocks and derivatives**: Common stock valuation - present value of cash dividends, earnings approach, value versus price, efficient markets theory, technical analysis, analysis of financial statements - derivatives - futures and options.

Unit 3
**Portfolio analysis and capital market theory**: Covariance of returns, correlation, portfolio return, portfolio standard deviation, two asset case, efficient frontier, optimum portfolio.

**Capital market theory** - capital market line, simple diversification reduces risk, characteristic line, capital asset pricing model - arbitrage price theory, stock performance evaluation.

**TEXTBOOKS:**

**REFERENCE:**

**ECE481 AGENT-BASED MODELLING 3 0 0 3**

Unit 1

Unit 2

Unit 3
**Planning ABM project**: Planning ABM project and applications.

**TEXTBOOK:**

**REFERENCE:**

**ECE482 ECONOMETRICS 3 0 0 3**

Unit 1


Unit 2

Unit 3

**Risk measures** – symmetric dispersion measures – down side risk.

**TEXT BOOK:**

**REFERENCES:**

**ECE483 TELECOMMUNICATION MANAGEMENT 3 0 0 3**

Unit 1

Unit 2
**Business aspects of telecommunications**: Control of dispersed operations – automated teller machines – teleconferencing – telecommuting – enterprise
applications – customer oriented communication aspects – wireless LAN - business to business and business to consumer – bandwidth brokerage.

**Telecommunication project management:** Telecommunication design and implementation – network analysis and design – sources of projects – methodology for designing, developing and implementing telecommunication capabilities – network modeling – phases of project management – service providers.

Unit 3

**Business on bandwidth:** Concepts of data rate and bandwidth requirements – digital subscriber line - broadband technologies – wireless technologies – digital home – telecommuting – voice enabled DSL – International Telecommunication Union (ITU) and its role – frequency management – cost computations – mobile and DTH operations – role of wireless planning commission (WPC) for telecommunications in India.

**TEXTBOOK:**


**REFERENCES:**


**ECE484 SIGNAL PROCESSING FOR BUSINESS APPLICATIONS 3 0 0 3**

Unit 1

**Introduction** - fourier vs wavelets, seasonality filtering, signal denoising, identification of structural breaks, scaling, aggregate heterogeneity and time scales, multiscale cross correlation.


Unit 2

**Discrete wavelet transforms** – properties, DWT filters, the maximal overlap DWT, multi resolution analysis, ANOVA, practical issues, filtering FX intraday seasonalties, causality and co-integration in economics, money growth and inflation, long memory processes, fractional difference processes (FDP), the DWT of FDP, simulation of FDP, OLS estimation of FDP, approximate maximum likelihood estimation of FDP, application to stock prices, generalization of DWT and MODWT, applications to money supply.

**TEXTBOOKS:**


**REFERENCE:**


**ECE490 MICROWAVE AND ANTENNA LAB. 0 0 3 1**

Experiments using Klystron, Gunn diodes oscillators and study of various microwave devices.

Antenna: Measurement and analysis of RF antennas.

**ECE499 PROJECT 10 cr**

The project shall be focused on the synthesis of the knowledge gained over the past seven semesters, by taking up a work of relevance to the area of specialization covering – design / development / realization / application / conceptual ideas / state-of-the-art technology.

**EEE100 ELECTRICAL ENGINEERING 3 0 0 3**

Unit 1

Introduction to electrical engineering. System of units. Electric current, Coulomb’s law, Ohm’s law, Faraday’s law of electromagnetic induction, Kirchoff’s laws, Ampere’s law.

Ideal independent current and voltage-sources; Reference directions and symbols, energy and power; R, L and C- parameters; Series and parallel combination of resistances, capacitances and inductances, series-parallel circuits, superposition theorem, conversion of a voltage source to current source and vice versa, voltage divider and current divider rule. Network reduction by star–delta transformation, analysis of dc circuits by Mesh-current and nodal methods.
Unit 2

Transient analysis with energy storage elements (for RC-, RL- circuits with DC excitations): Writing differential equations for first order circuits, steady state solution of circuits containing inductors and capacitors, initial and final conditions, transient response of RL and RC circuits (rise and decay).

Sinusoidal steady state analysis: Generation of sinusoidal functions, average and effective values of periodic functions, instantaneous and average power, power factor, phasor representation of sinusoids, response of single elements (R, L and C) for sinusoidal excitation; phasor concept and phasor diagram; Impedance and Admittance concepts; The series RL, series RC and series RLC circuits, complex power and power triangle. Introduction to 3-phase systems; Balanced 3-phase systems (STAR and DELTA connections).

Unit 3

Magnetic circuits: MMF, magnetic flux, reluctance, flux density, analogy with electric circuits, analysis of magnetic circuits, self and mutual induced emfs, energy stored in a magnetic circuit.

Transformers; construction and principle of operation of transformers, Emf equation.

Three phase Induction motor: Types, construction, rotating magnetic field, principle of operation, slip, rotor induced emf.

Measuring instruments, Different types of instruments to measure voltage, current power and energy.

**TEXTBOOK:**

**REFERENCES:**

**EEE180 WORKSHOP B 1 0 2 2**

Electrical workshop:

Study of safety devices such as fuse, MCB, ELCB & earthing – electrical power distribution in domestic installations, study of tools and accessories used in electrical wiring – wiring practice for staircase circuit, fluorescent lamp, hospital wiring and godown lighting – study of domestic appliances like Mixie, fan, Electric iron, Air conditioner. Refrigerator – study of different types of electric lamps like Incandescent lamp, Fluorescent, CFL, Metal halide, Mercury vapour, Sodium vapour and halogen lamp.

Personal computer hardware workshop:

**EEE212 ELECTRIC CIRCUITS 3 1 0 4**

(Pre-requisite: EEE100)

Unit 1

Introduction: Brief idea about transition from field model to circuit model, electrical components, reference directions, brief review of mesh and nodal analysis for DC circuits with dependent and independent sources.

Network theorems (dc): Thevenin’s theorem, Norton’s theorem, maximum power transfer theorem, Telleghan’s theorem, Reciprocity theorem.

Transient analysis: Transient analysis of first order and second order circuits for dc and ac excitations using time domain equations, series and parallel circuits, RLC circuits, resonance, representation of circuit in the Laplace domain - transform impedance and admittance, application of Laplace transform in solving circuit equations.

Unit 2

Sinusoidal steady state analysis: Concept of phasor domain, representation of circuits in phasor domain and solution of circuits using mesh and nodal analysis, magnetically coupled circuit analysis with dot convention.

Network theorems (ac): Superposition theorem, Thevenin’s theorem, Norton’s theorem, maximum power transfer theorem.

Graph theoretic approach for circuit analysis: Introductory definitions: tree, twigs, co-tree, links, loops, cutsets. Graph matrices: Incidence matrix (A), cut-set matrix (Q), loop matrix (B), orthogonality, AB = 0 and QB = 0; relations between sub-matrices of A, B and Q. KCL and KVL in terms of A, B, Q matrices. Formulation of equations for different methods of circuit analysis. Development of algorithms for computer aided analysis.

Unit 3

Three phase circuit. Complex power, power factor correction, power measurement,
three phase circuit, power measurements in balanced and unbalanced systems, symmetrical components for solving unbalanced circuits.


**TEXTBOOK:**

**REFERENCE:**

EEE342 CONTROL ENGINEERING 3 1 0 4
(Pre-requisite: ECE220)

Unit 1
Introduction to control systems, mathematical models of physical systems, block diagram, signal flow graph, feedback control system characteristics, reduction of parameter variations, control over system dynamics and disturbance signals, use of software tools to analyze and design of control system, performance of feedback control systems, test input signals, transient and steady state response of second and higher order systems, performance indices.

Unit 2
Concept of stability, Routh-Hurwitz stability criterion, root locus method, concept, procedure, frequency response analysis, bode plots, polar plots, stability in the frequency domain, Nyquist criterion, Nichol’s chart.

Unit 3
Introduction to design of feedback systems, lead-lag compensation networks, PID controllers, introduction to state variable approach, design of state variable feedback systems, controllability, observability. Control system design case studies - cruise missile altitude controller, turbine governor, robotic hand design, ship steering control system.**

**TEXTBOOK:**

**REFERENCES:**

EIE 413 BIOMEDICAL INSTRUMENTATION 3 0 0 3

Unit 1
Human anatomy and physiology: Systems of the body - cell resting potential and action potential - origin and characteristics of ECG, EEG, EMG, EOG, and ERG.


Unit 2
Signal processing: Introduction, sampling, A/D conversion and signal to noise ratio and signal conditioning.

Recorders & monitors: Preamplifiers, sources of noise, amplifiers for ECG, EEG & EMG - design considerations - evoked potential systems - biomedical recorders.

Medical imaging techniques: Principle of X-ray machine, digital radiography, CT, MRI, ultrasonic imaging, PET and SPECT scanners, gamma camera.

Unit 3

Electrical safety: Physiological effects of electricity, micro & macro shock hazards - electrical safety codes & standards - protection of patients, power distribution and equipment design.

**TEXTBOOK:**

**REFERENCES:**
ENG111  COMMUNICATIVE ENGLISH  2023

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.

Unit 2
Writing: Prewriting techniques - kinds of paragraphs - basics of continuous writing;
Grammar and usage – topics including spelling and number rules (Workbook).

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.
Activities: Short speeches, seminars, quizzes, language games, debates, discussions and book reviews, etc.

TEXTBOOKS:
1. Language through Reading: Anthology compiled by Amrita;
2. Language through practice: Work book compiled by Amrita

REFERENCES:

ENG112  TECHNICAL COMMUNICATION  2023

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

Unit 1

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
Practice in oral communication: Group discussion, interviews and technical presentations.

REFERENCES:

ENG250  PROFESSIONAL COMMUNICATION  1022

Unit 1
Reading Comprehension: Focus will be on understanding of the given information, vocabulary, inference, logical thinking, and decision - making.

Unit 2

Unit 3
Practical: Telephonic conversations, interviews, group and panel discussions, and oral presentations.

REFERENCES:
ENG251 BUSINESS COMMUNICATION 1 0 2 2

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

Unit 1

Unit 2

Unit 3

Activities - case studies & role-plays

BOOKS RECOMMENDED:

ENG252 INDIAN THOUGHT THROUGH ENGLISH 1 0 2 2

Objectives:
To expose the students to the greatness of Indian Thought in English
To develop a sense of appreciation for the lofty Indian Thought
To develop an understanding of the eclectic Indian

REFERENCES:
8. Vidya, intranet, Amrita Vishwa Vidyapeetham.

ENG253 INSIGHTS INTO LIFE THROUGH ENGLISH LITERATURE 1 0 2 2

(Pre-requisite: Nil;Equivalent course in 2007 curriculum: Nil)

Objectives -
- to expose the students to different genres of Literature
- to inculcate reading skills
to provide deeper critical and literary insights
· to enhance creative thinking
· to help the student develop critical and analytical skills
· to promote the aesthetic sense

Unit 1
Poetry
Seamus Heaney – Digging; Philip Larkin – Ambulances; W.B.Yeats - Prayer for my daughter; W. H Auden - Miss Gee; Peter Porter - Your Attention Please; Rabindranath Tagore ‘s poems “Defamation” and “Playthings”.

Unit 2
Drama
Oscar Wilde - Importance of Being Earnest; Anton Chekov – Proposal; Scenes from the great tragedies of Shakespeare.

Unit 3
Essays

Practical:
Reviews of novels and short stories; Presentations, Review of Literature, Discussions, Role plays.

REFERENCES:

ENV200  ENVIRONMENTAL STUDIES  3 1 0  4

Unit 1
Overview of the global environmental crisis; Biogeochemical cycles; Climate change and related international conventions and treaties and regulations; Ozone hole and related international conventions and treaties and regulations; Overpopulation; Energy crisis; Water crisis, groundwater hydrogeology, surface water resource development


Unit 2
Ecology, biodiversity loss and related international conventions, treaties and regulations; Deforestation and land degradation; Food crisis; Water pollution and related international and local conventions, treaties and regulations; Sewage domestic and industrial and effluent treatment; Air pollution and related international and local conventions, treaties and regulations; Other pollution (land, thermal, noise).

Unit 3
Solid waste management (municipal, medical, e-waste, nuclear, household hazardous wastes); Environmental management, environmental accounting, green businesses, eco-labeling, environmental ethics, environmental impact assessment; Constitutional, legal and regulatory provisions; Sustainable development;

TEXTBOOK:

REFERENCE BOOKS:

FRE201  PROFICIENCY IN FRENCH LANGUAGE (LOWER)  1 0 2  2

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

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

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

TEXTBOOK:
Metro St Michel - Publisher: CLE international
FRE202  PROFICIENCY IN FRENCH LANGUAGE (HIGHER)  1 0 2  2

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

GER201  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.

GER202  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.

GER211  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  Number 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.

GER212  GERMAN FOR BEGINNERS II  1 0 2  2

Unit 1  Shopping and orientation in supermarket; Conversation between the customer and
salesman; Where one finds what in supermarket; Asking for requests and suggestions.
Grammar: Dative of personal pronouns. Imperative form.
Vocabulary: Consumables and measurements;

Unit 2
Appointments; Work and leisure time activities; Time, weekdays, months and seasons; saying the date; fixing up an appointment.
Grammar: Model verbs; Prepositions with time and place; Ordinal numbers.
Vocabulary: Leisure activities, weekdays, months and seasons.

Unit 3
Family and household; Family and relations; household and daily routine.
Grammar: Possessive articles; Divisible and indivisible verbs.
Vocabulary: Family circle; Household articles.

HUM250 INDIAN CLASSICS FOR THE TWENTY-FIRST CENTURY 1 0 2 2

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

HUM251 INTRODUCTION TO INDIA STUDIES 1 0 2 2

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

Unit 1
A brief outline of Indian history from prehistoric times to the present times.
Contributions of India to world culture and civilization:
Indian Philosophy and Religion; Art and Literature; Physical and Social Sciences.

Unit 2
Modern India: Challenges and Possibilities –
Scientific and technological progress in post-independence era; Socio-cultural and political movements after independence; Challenges before the nation today - unemployment – corruption – degradation of cultural and moral values - creation of a new system of education; Creation of a modern and vibrant society rooted in traditional values.

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

TEXTBOOK:
Material given by the Faculty
BACKGROUND LITERATURE:
1) Selections from The Cultural Heritage of India, 6 volumes, Ramakrishna Mission Institute of Culture (Kolkata) publication.
2) Selections from the Complete Works of Swami Vivekananda, Advaita Ashrama publication.
3) Invitations to Indian Philosophy, T. M. P. Mahadevan, University of Madras, Chennai.
4) Outlines of Indian Philosophy, M. Hiriyanna, MLBD.
5) An Advanced History of India, R. C. Majumdar et al, Macmillan.
6) India Since 1526, V. D. Mahajan, S. Chand & Company
7) The Indian Renaissance, Sri Aurobindo.
8) India’s Rebirth, Sri Aurobindo.
9) On Nationalism, Sri Aurobindo.
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.
Unit 1
Introduction
A peep into India’s glorious past
Ancient India – the vedas, the vedic society and the Sanatana Dharma – rajamandala and the Cakravartins – Ramarajya – Yudhisthira’s ramarajya; Sarasvati - Sindhu Civilization and the myth of the Aryan Invasion; Classical India – Dharma as the bedrock of Indian society – Vaidika Brahmanyak Dharma and the rise of Jainism and Buddhism – the sixteen Mahajanapadas and the beginning of Magadhan paramountcy – Kautilya and his Arthasastra – Chandragupta Maudya and the rise of the Mauryan empire – Gupta dynasty Indian art and architecture – classical sanskrit literature – Harsavardhana; Trade and commerce in classical and medieval India and the story of Indian supremacy in the Indian ocean region; The coming of Islam – dismantling of the traditional Indian polity – the Mughal empire – Vijayanagara samrajya and days of Maratha supremacy.

Unit 2
India’s contribution to the world: spirituality, philosophy and sciences
Indian Philosophy – the orthodox (Vaidika) and the heterodox (atheistic) schools; Ramayana and Mahabharata; Bhagavad Gita; Saints and sages of India; Ancient Indian medicine: towards an unbiased perspective; Ancient Indian mathematics; Ancient Indian astronomy; Ancient Indian science and technology.
The arrival of Europeans, British paramountcy and colonization
What attracted the rest of the world to India?; India on the eve of the arrival of European merchants; The story of colonization and the havoc it wrecked on Indian culture and civilization; Macaulay and the start of the distortion of Indian education and history; Indian economy – before and after colonization: a brief survey; The emergence of modern India.

Unit 3
Women in Indian society
The role and position of women in Hindu civilization; Gleanings from the Vedas, Brihadaranyak Upanishad, Saptasati Devi Mahatmyam, Ramayana, Mahabharata, Manusmriti, Kautilya’s Arthasastra and Mrichchhakatikam of Sudraka; The role and position of Indian women vis-a-vis Islam and European cultures; The great women of India.
Modern India
The national movement for freedom and social emancipation; Swami Vivekananda, Sri Aurobindo, Rabindranath Tagore; Understanding Mahatma Gandhi; A new nation is born as a republic – the pangs of birth and growth; India since Independence – the saga of socio-political movements; Problems facing the nation today;

REFERENCES:
17. Aurobindo, Sri. The Indian Renaissance / India’s Rebirth / On Nationalism.
25. Danino, Michel. The Invasion That Never Was.
HUM253  GLIMPSES INTO THE INDIAN MIND:  1 0 2  2
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; Sister Nivedita;
Mahatma Gandhi; Jawaharlal Nehru; B.R. Ambedkar; Sri Chandrasekharendra Saraswati, the Paramacharya of Kanchi; Dharampal; Raja Rao; V.S. Naipaul.

Conclusion

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

HUM254  GLIMPSES OF INDIAN ECONOMY AND POLITY  1 0 2  2

Unit 1
Introduction
General Introduction; Primitive man and his modes of exchange – barter system; Prehistoric and proto-historic polity and social organization. Ancient India – up to 600 B.C.

Early India – the vedic society – the varnashramadharma – socio-political structure of the various institutions based on the four purusarthas; The structure of ancient Indian polity – Rajamandala and Cakravartins – Prajamandala; Socio-economic elements from the two great Epics – Ramayana and Mahabharata – the concept of the ideal King (Sri Rama) and the ideal state (Ramarajya) – Yudhisthira’s ramarajya; Sarasvati - Sindhu civilization and India’s trade links with other ancient civilizations; Towards chiefdoms and kingdoms – transformation of the polity: kingship – from gopati to bhupati; The mahajanapadas and the emergence of the srenis – states and cities of the Indo-Gangetic plain.

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

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

Unit 3
Modern India: 1720 - 1947
the Indian market and economy before the arrival of the European traders; Colonisation and British supremacy (dismantling of everything that was ‘traditional’ or ‘Indian’) – British attitude towards Indian trade, commerce and economy and the
resultant ruination of Indian economy and business – man-made famines – the signs of renaissance: banking and other business undertakings by the natives (the members of the early Tagore family, the merchants of Surat and 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.

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

* The syllabus and the study material in use herein has been developed out of a ‘summer programme’ offered by the Centre for Policy Studies (CPS), Chennai at the Indian Institute of Advanced Study (IIAS), Rashtrapati Nivas, Shimla, sometime ago. The same has been very kindly made available to us by Professors Dr M.D. Srinivas (Chairman) and Dr J.K. Bajaj (Director) of the CPS.

**JAP201 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.

**JAP202 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.

**MAT111 CALCULUS, MATRIX ALGEBRA AND ORDINARY DIFFERENTIAL EQUATIONS**

Unit 1
Linear systems of equations, Gauss elimination, rank of a matrix, linear dependence.

Solutions of linear systems: existence, uniqueness, general form, eigen values, eigen vectors, some applications of eigen value problems, symmetric, skew-symmetric and orthogonal matrices, complex matrices: Hermitian, Skew Hermitian, unitary, similarity of matrices, basis of eigen vectors, diagonalization. (Sections: 6.3, 6.4, 6.5, 7.1, 7.2, 7.3, 7.4, and 7.5)

Limits and continuity. (Sections (in textbook 1): 2.2, 2.3, 2.4, 2.5, 2.6)

Unit 2
Derivatives, curve sketching, improper integral. (Sections (in textbook 1): 3.1, 4.1, 4.3, 4.4, 8.8)

Basic concepts and ideas, exact differential equations, integrating factors, orthogonal trajectories of curves. (Sections: 1.1, 1.5, 1.8)

Unit 3
Review of linear differential equations and Bernoulli equation, modelling; mixing problem, electric circuits. Review of homogeneous linear equations of second order, Euler-Cauchy equations, solution by undetermined coefficients, solution by variation of parameters. System of linear equation, basic concepts and theory, homogeneous systems with constant coefficients, phase plane, critical points. Criterion for critical points and stability. (Sections: 1.6, 1.7, 2.1, 2.2, 2.3, 2.6, 2.9, 2.10, 3.1, 3.2, 3.3, 3.4)
**TEXTBOOKS:**

**MAT112 VECTOR CALCULUS, FOURIER SERIES AND PARTIAL DIFFERENTIAL EQUATIONS**

Unit 1
Vector and scalar functions, derivatives, curves, tangents, arc length, curves in mechanics, velocity and acceleration, gradient of a scalar field, directional derivative, divergence of a vector field, curl of a vector field. (Sections: 8.4, 8.5, 8.6, 8.9, 8.10, 8.11)
Line integral, line integrals independent of path (Sections: 9.1, 9.2)

Unit 2
Green’s theorem in the plane, surfaces for surface integrals, surface integrals, triple integrals – Gauss divergence theorem, Stoke’s theorem. (Sections: 9.4, 9.5, 9.6, 9.7, 9.9)

Unit 3
Periodic functions, trigonometric series, Fourier series, functions of any period p = 2L, even and odd functions, half range expansions (theorem statement only), complex Fourier series, applications of Parseval’s identity. (Sections: 10.1 to 10.5)
Basic concepts, modeling; vibrating string, wave equation, separation of variables, use of Fourier series, d’Alembert’s solution of the wave equation, heat equation; solution by Fourier series. (Sections: 11.1 to 11.5)

**TEXTBOOK:**

**MAT211 INTEGRAL TRANSFORMS AND COMPLEX ANALYSIS**

Unit 1
Complex numbers, complex plane, polar form of complex numbers. Powers and roots, derivative. Analytic functions, Cauchy-Riemann equations, Laplace equation, conformal mapping, exponential function, trigonometric functions, hyperbolic functions, logarithms, general power, linear fractional transformation. (Sections: 12.1, 12.2, 12.3, 12.4, 12.5, 12.6, 12.7, 12.8, 12.9)

Unit 2
Complex line integral, Cauchy integral theorem, Cauchy integral formula, derivatives of analytic functions. (Sections: 13.1, 13.2, 13.3, 13.4)

**TEXTBOOK:**

**MAT212 MATHEMATICAL STATISTICS AND NUMERICAL METHODS**

Unit 1
Probability, random variables, probability distributions (continuous and discrete), mean and variance of a distribution, expectation and moment generating functions, binomial, poisson and normal distributions, random sampling, estimation of parameters. (Sections: 22.3, 22.5, 22.6, 22.7, 22.8, 23.1, 23.2)

Unit 2
Confidence interval and central limit theorem, testing of hypothesis. (Sections: 23.3, 23.4)
Solution of equations by iterative methods, interpolation. (Sections: 17.2, 17.3)

Unit 3

**TEXTBOOK:**

**MEC100 ENGINEERING MECHANICS**

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 dimensions and three dimensions: Moment of a force about a point - moment of a force about an axis - moment of a couple – equivalent force - couple system - rigid body equilibrium – support reactions.

Unit 2
Centroid and centre of gravity: Centroids of lines, areas and volumes – composite bodies.
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 theorems – velocity and acceleration calculations in moving frames of reference – Coriolis acceleration.

TEXTBOOKS:

REFERENCES:

MEC180 WORKSHOP A

Product detailing workshop: (Study of simple mechanical and electromechanical system)
Disassemble the product or subassembly – measure various dimensions using measuring instruments – free hand rough sketch of the assembly and components – name 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.
MEC182  COMPUTER AIDED DRAWING  1 0 3  2

Introduction to CAD
Preparation of drawings using CAD Tools
Introduction to VBA / LI.SP
Introduction to 3D modeling and Surface Modeling

TEXTBOOKS:

REFERENCES:
CADian Manual

MEC401  OPERATIONS RESEARCH  3 0 0  3

Unit 1
Linear programming: Formulations - graphical solutions - simplex method - duality, dual simplex method.
Transportation model: Assignment model – travelling salesman problem.
Dynamic programming: concepts, Bellman’s principle – solutions to simple problems.

Unit 2
Decision theory: Decision trees. Game theory - 2 person zero sum; mixed strategies;
2 x n and m x 2 games.

Unit 3
Sequencing model – 2 machines ‘n’ jobs, ‘m’ machines ‘n’ jobs – n jobs 2 machines.
Inventory models: deterministic & probabilistic models. Quantity discounts. Selective inventory management.
Queuing models: Poisson arrival and exponential service times. Single server, multi-server. Queues - infinite and finite capacity queues.
Simulation – Monte Carlo simulation; simple problems.

TEXTBOOK:

REFERENCES:

MEC482  FINANCIAL MANAGEMENT  3 0 0  3

Unit 1
Introduction: Financial management an overview – financial decisions in a firm –
goal of FM – function of the financial system.
Fundamental valuation concepts: Time value of money – risk and return.

Unit 2
Capital budgeting: techniques of capital budgeting investment criteria – NPV –
benefit cost ratio – IRR – payback period – ARR – investment appraisal in practice –
estimation of project cost flows.

Unit 3
Cash and liquidity management. Working capital financing.
Mergers and takeovers - international trade.

TEXTBOOK:

REFERENCES:

MEC490  ENTERPRISE MANAGEMENT  3 0 0  3

Unit 1

Unit 2
Supply chain management – basic concepts, SC dynamics, push-pull boundary,

Unit 3

TEXTBOOKS:

REFERENCES:

MNG400 PRINCIPLES OF MANAGEMENT 3 0 0 3

Unit 1

Unit 2
ORGANISING: nature and purpose – formal and informal organization – organization chart – structure and process – departmentation by difference strategies – line


Unit 3


TEXTBOOKS:

REFERENCES BOOKS:

PHY100 PHYSICS 3 0 0 3

Unit 1
Special theory of relativity: Frames of reference, postulates of special theory of relativity, time dilation, length contraction, relativistic mass, relativistic momentum, mass and energy, Lorentz transformation, velocity addition, Doppler effect.

Physical background for quantum mechanics: Black body radiation, photoelectric effect, Compton effect, X-ray diffraction, pair production, de-Broglie waves, uncertainty principle.

Unit 2
Quantum mechanics: Wave function, wave equation, Schrodinger equation (time dependent), expectation values-operators, eigen functions and eigen values,
Schroedinger equation (steady state), particle in a box - finite potential, tunneling effect, quantum theory of hydrogen atom.

Unit 3

TEXTBOOK:

REFERENCES:

PHY181 PHYSICS LAB. 0 0 3 1

Experiments on mechanics
1. Torsional pendulum.
2. Co-efficient of viscosity of liquid.
3. Young's modulus - non-uniform bending.

Experiments on optics
1. Determination of lycopodium powder particle size using laser.
2. Dispersive power of prism.

Experiments on electricity
1. Meter bridge / energy gap.
2. Frequency of AC current.
3. Temperature co-efficient of resistance.

TEXTBOOK:
The manual for experiments prepared by the Department of Physics, AVVP. Experiments will be renewed as an when feasible.

PHY250 ELECTRICAL ENGINEERING MATERIALS 3 0 0 3

Unit 1
Conducting materials: The nature of chemical bond, crystal structure Ohm's law and the relaxation time, collision time, electron scattering and resistivity of metals, heat developed in a current carrying conductor, thermal conductivity of metals, superconductivity.
Semiconducting materials: Classifying materials as semiconductors, chemical bonds in Si and Ge and its consequences, density of carriers in intrinsic semiconductors, conductivity of intrinsic semiconductors, carrier densities in n type semiconductors, n type semiconductors, Hall effect and carrier density.

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

Unit 3
Dielectric materials: Static dielectric constant, polarization and dielectric constant, internal field in solids and liquids, spontaneous polarization, piezoelectricity.
PN junction: Drift currents and diffusion currents, continuity equation for minority carriers, quantitative treatment of the p-n junction rectifier, the n-p-n transistor.

TEXTBOOK:

REFERENCES:

PHY251 OPTOELECTRONIC DEVICES 3 0 0 3

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

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


Unit 2


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

Unit 3


REFERENCES:

PHY253

ELECTROMAGNETIC FIELDS AND WAVES

Unit 1

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

Poisson’s and Laplace’s equations: The potential field of a point charge, potential field of a system of charges: conservative property, potential gradient, the dipole.
Unit 2
Poisson's and Laplace's equations, uniqueness theorem, examples of the solution of Laplace's equation, solution of Poisson's equation.

**Electromagnetics**: Biot Savart law, magnetic flux and magnetic flux density, scalar and vector magnetic potentials, derivation of steady magnetic field laws, Faraday's law, 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:**

**PHY254 MICROELECTRONIC FABRICATION 3 0 0 3**

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

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

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

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

**REFERENCE:**

**PHY255 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.
SYLLABI

Unit 3

TEXTBOOK:

REFERENCE:

PHY260 PHYSICS OF LASERS AND APPLICATIONS 3 0 0 3

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

Unit 2
Properties of LASERS
Gain mechanism, threshold condition for PI (derivation), emission broadening - line width, derivation of Dw 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. (ii) CO₂ LASER - principle, construction, working and application.

REFERENCES:

PHY261 LASERS IN MATERIAL PROCESSING 3 0 0 3

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

Unit 2
Laser cutting and drilling: Mechanism for inert gas and oxygen-assisted cutting, factors controlling cut quality and kerf width. Laser assisted drilling.
Laser welding: Introduction to laser keyhole welding and contrast with conduction limited welding, applications.

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:
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:**

**PHY262 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.

**REFERENCES:**

**TEXTBOOK:**

**PHY263 CONCEPTS OF NANOPHYSICS AND NANOTECHNOLOGY 3 0 0 3**

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

**Concept of quantum confinement and phonon confinement**
Basic concepts – excitons, effective mass, free electron theory and its features,

Unit 2
Tools for characterization:

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

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

TEXTBOOKS:

PHY264 THIN FILM PHYSICS 3 0 0 3

Unit 1

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

Unit 2
Thin film analysis: Structural studies: XRD and electron diffraction. Surface
S 116

SYLLABI

Schools of Engineering Amrita Vishwa Vidyapeetham

Unit 3

TEXTBOOK:

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

PHY272  QUANTUM PHYSICS AND ITS APPLICATIONS  3 0 0 3

Unit 1

Unit 2

Unit 3

TEXTBOOK:
A Beiser, Perspectives in Modern Physics,Mc Graw Hill

REFERENCES:
**PHY273**  
**COMPUTATIONAL PHYSICS**  
3 0 0 3

Unit 1  
**Differentiation:** Numerical methods, forward difference and central difference methods, Lagrange's interpolation method.  
**Integration:** Newton - coates expression for integral, trapezoidal rule, Simpson's rule, Gauss quadrature method.

Unit 2  
**Solution of differential equations:** Taylor series method, Euler method, Runge Kutta method, predictor-corrector method.  
**Roots of equations:** Polynomial equations, graphical methods, bisectional method, Newton-Raphson method, false position method.

Unit 3  
**Solution of simultaneous equations:** Elimination method for solving simultaneous linear equations, Gauss elimination method, pivotal condensation method, Gauss-Seidel iteration method, matrix inversion method.  
**Eigen values and Eigen vectors of matrix:** Determinant of a matrix, characteristic equation of a matrix, eigen values and eigen vectors of a matrix, power method.

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

**REFERENCES:**  
2. M Hijroth Jensen, Department of Physics, University of Oslo, 2003 (Available in the Web)

**PHY274**  
**ASTROPHYSICS**  
3 0 0 3

Unit 1  
**Historical introduction:** Old Indian and western – astronomy - Aryabhatta, Tycho Brahe, Copernicus, GalileeO - Olbers paradox - solar system – satellites, planets, comets, meteories, 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  
**Stellar astronomy:** H-R diagram, color-magnitude diagram - main sequence - stellar evolution – red giants, white dwarfs, neutron stars, black holes - accretion disc - Schwarzschild radius - stellar masses Saha–Boltzman equation - derivation and interpretation.  
**Variable stars:** Cepheid, RR Lyrae and Mira type variables - Novae and Super novae. Binary and multiple star system - measurement of relative masses and velocities. Interstellar clouds-Nebulae.

Unit 3  
**Galactic astronomy:** Distance measurement - red shifts and Hubble’s law – age of the universe, galaxies – morphology - Hubble’s classification - gravitational lens, active galactic nuclei (AGNs), pulsars, quasars.  
**Relativity:** Special theory of relativity - super-luminal velocity - Minkowski space - introduction to general theory of relativity – space - time metric, geodesics, space-time curvature. Advance of perihelion of Mercury, gravitational lens.  
**Cosmology:** Cosmic 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.  

**SSK111**  
**SOFT SKILLS I**  
0 0 3 1

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; Cryptographs.

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

REFERENCES:
3. The BBC and British Council online resources
4. Ow Purdue University online teaching resources
5. The grammarbook.com online teaching resources
6. www.englishpage.com online teaching resources and other useful websites.


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

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

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

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

Data sufficiency: Concepts and problem solving.

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

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

TEXTBOOKS:
5. Quick Maths – Tyra.
SYLLABI


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
   www.englishpage.com online teaching resources and other useful websites.

SSK113  SOFT SKILLS III  0 0 3 1

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

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

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

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

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

Problem solving level – IV: Geometry; Trigonometry; Heights and distances; Co-ordinate geometry; Mensuration.

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

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

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