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CHY100

CHEMISTRY

3 0 3

Unit 1


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

Unit 2


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

Unit 3


TEXTBOOKS:

REFERENCES:

CHY181

CHEMISTRY LAB.

0 0 3

1. Estimation of Hardness of sample water.
2. Estimation of alkalinity of sample water.
4. Estimation of HCl and CH\textsubscript{3}COOH by conductometric titration.
5. Estimation of Fe\textsuperscript{2+} 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 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
enlarges, 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, polypyrrole, 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 nitrate (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:**

**CHY253 ADVANCED POLYMER CHEMISTRY 3 0 0 3**

**Unit 1**


**Unit 2**

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

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

**Unit 3**


**TEXTBOOKS:**
SYLLABI
B. Tech. - Computer Science & Engg. 2010 admissions onwards

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 milling and
ball milling.

Carbon nanostructures: Carbon Clusters: Fullerenes, structure, synthesis, alkali
doped C_{60}, superconductivity in C_{60}, 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, TiO_{2} 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:
1. Rao C N R, Muller A, Cheetham A K (Eds.), “The Chemistry of Nanomaterials: Synthesis,
4. William A Goddard, III, Donald W Brenner, Sergey Edward Lysheski and Gerald J. Iafrate,
5. Balzani V, Credi A, Venturi M, “Molecular devices and machines - A journey in to the

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

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

Unit 3
Toxicant Analysis and Quality Assurance Principles: Introduction to
procedures, principles and operation of analytical laboratories in toxicology.
Summary of the general policies - analytical laboratory operation, analytical
measurement systems, quality assurance (QA) - quality control (QC) procedures.
Environmental Risk Assessment: Environmental risk assessment procedures -
particular environmental risk problem - appropriate endpoints - development of
conceptual models, analyzing exposure – effects, information - characterizing
exposure - ecological effects - management of risks.

Future Considerations for Environmental and Human Health: Changes in
toxicology - evaluation of future risk assessment - more fundamental aspects of
ecological risk - management of risks.

TEXTBOOK:

REFERENCES:

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

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

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

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

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

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

TEXTBOOK:

REFERENCES:

SYLLABI
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CHY257 BIOMATERIALS SCIENCE 3 0 0 3

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:

CHY259 ORGANIC SYNTHESIS AND STEREOCHEMISTRY 3 0 0 3

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

Unit 2
Atropisomerism - isomerism of biphenyls - alkenes and spiranes - ansa compounds - Geometrical isomerism, E, Z Isomerism. Asymmetric synthesis.
Conformational Analysis: Optical activity and chirality - Conformational Analysis of cyclic and acyclic system - Conformational effects on reactivity of acyclic systems only.

Unit 3

TEXT BOOKS:
REFERENCES:

CHY261 UNIT PROCESSES IN ORGANIC SYNTHESIS 3 0 0 3

Unit 1

Unit 2
Organic reactions and mechanisms: Substitution reaction - aliphatic

Unit 3


TEXTBOOK:

REFERENCES:

CHY262 MEDICINAL ORGANIC CHEMISTRY 3 0 0 3

Unit 1


Unit 2

Enzymes and hormones: Enzymes - nomenclature, classification and characteristics of enzymes - mechanism of enzyme action, factors affecting enzyme action, cofactors and co-enzymes, enzyme inhibition, enzymes in organic synthesis. Hormones and vitamins - representative cases. Medicinal agents from natural products: Natural products as therapeutic agents, medicinal plants, animal products as medicine, isolation methods of alkaloids, terpenes, anti-oxidants.

Unit 3

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

TEXTBOOKS:

REFERENCES:

CHY263 ORGANIC REACTION MECHANISMS 3 0 0 3

Unit 1

Introduction to organic chemistry: Lewis structure and formal charges of organic compounds - electro negativities and dipole, resonances, aromaticity and anti aromaticity - equilibrium, tautomerism and hyper conjugation - acidity and basicity - pKa, nucleophiles and electrophiles - hydrogen bonding - different types of organic reaction - addition, substitution, elimination and rearrangement - oxidations and reductions - general principles of writing organic reaction mechanism - reactive intermediates. Reaction of nucleophiles and bases: Nucleophilic substitution - $S_{N}1$ and $S_{N}2$ reactions, nucleophilic substitution at aliphatic sp2 carbon and aromatic carbon - nucleophilic addition to carbonyl compounds - addition of grignard and organo lithium reagents - reactions of nitrogen containing nucleophiles with aldehyde and ketones - aldol condensation.

Unit 2

Michael and 1,4-addition reaction - Favorskii rearrangement - benzilic acid rearrangement - reaction mechanism in basic media - Mannich reaction - enols and enolates. Reaction involving acids and other eletrophiles: 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 carboxylic 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, terephthalic 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 Macquarrie; Blackwell 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.


TEXTBOOKS:
SYLLABI
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REFERENCES:

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 sealed lead acid), nickel-cadmium, nickel-zinc, nickel-metal hydride batteries, lithium ion batteries, ultra thin lithium polymer cells (comparative account) Advanced Batteries for electric vehicles, requirements of the battery - sodium-beta and redox batteries.

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

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TEXTBOOKS:

CHY272 COMPUTATIONAL CHEMISTRY 3 0 0 3 AND MOLECULAR MODELLING

Unit 1
Introduction: Stability, symmetry, homogeneity and quantization as the requirements of natural changes - Born - Haber cycle – Energetic – kinetics - Principles of spectra.
Computational techniques: Introduction to molecular descriptors, computational chemistry problems involving iterative methods, matrix algebra, Curve fitting.
Introduction to Quantum mechanics - Schrodinger equation - Position and momentum - MO formation - Operators and the Hamiltonian operator - The quantum oscillator - Oscillator Eigen value problems - Quantum numbers - labeling of atomic electrons.

Unit 2
Molecular Symmetry: Elements of symmetry - Point groups - Determination of point groups of molecules.
Huckel’s MO theory: Approximate and exact solution of Schrodinger equation - Expectation value of energy - Huckel’s theory and the LCAO approximation - Homogeneous simultaneous equations - Secular matrix - Jacobi method - Eigen vectors: Matrix as operator - Huckel’s coefficient matrix - Wheeland’s method - Hoffmann’s EHT method - Chemical applications such as bond length, bond energy, charge density, dipole moment, Resonance energy.
Unit 3


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:

CHY273 FUEL CELLS - PRINCIPLES AND APPLICATIONS 3 0 0 3

Unit 1

Introduction: relevance, importance and classification of fuel cells.

Background Theory: Thermodynamic aspects of electrochemistry energy conversion and its efficiency - factors affecting the efficiency - electrode kinetics of electrochemical energy conversion.

Unit 2

Description, working principle, components, applications and environmental aspects of the following types of fuel cells: alkaline fuel cells, phosphoric acid, solid oxide, molten carbonate, direct methanol fuel cells.

Proton Exchange Membrane Fuel cells: basic aspects - working and high temperature operation – recent development in technology.

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S 19
fourier synthesis in crystal structure analysis of S-Tetrazine. Structure of Rutile, Fluorite, Antifluorite, Zinc blende, Wurtzite, diamond and graphite.

REFERENCES:

CSE100 COMPUTER PROGRAMMING 3 0 0 3

Unit 1
Introduction to problem solving - algorithm development, flowcharting. C fundamentals, datatypes, variables, constants, enumerations, operators, bitwise operators, expressions, type cast, data input and output statements - formatted & unformatted, control structures - if, if else, switch.. case, while loop, do.. 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:

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

CSE210 COMPUTER ORGANIZATION AND ARCHITECTURE 3 1 0 4
(Pre-requisite: ECE210)

Unit 1
Computer abstractions and technology: introduction, classes of computing applications and their characteristics, classic components of a computer, memory system, moore's law, various technologies used for building processors and memories. Instructions, representation of instructions in the computer, instruction format, logical operations, instructions for making decisions, loops, addressing modes. Design principles of instruction sets. Comparison of RISC and CISC architectures.

Unit 2
Arithmetic for computers: signed and unsigned numbers addition and subtraction, multiplication, division, floating point numbers. Assessing and understanding performance: CPU performance and its factors, evaluating performance, SPEC
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benchmarks, Amdahl's law. The processor: data path and control: basic implementation, clocking methodology, building a datapath, ALU control, designing the main control unit, performance of single cycle implementation, a multicycle implementation, instruction execution cycle, exceptions, types of control unit. Microprogramming.

Unit 3
Pipeline and vector processing: an overview of pipelining, pipelined data path, pipeline control, data hazards and forwarding, data hazards and stalls, branch hazards. Memory hierarchy: introduction, the basics of cache memory, measuring and improving cache performance, virtual memory, Pentium P4 and AMD Opteron memory hierarchies. Storage, networks and other peripherals: disk storage and dependability, networks, buses and other connections between processors, memory and I/O devices, I/O performance measures.

TEXTBOOK:

REFERENCES:

CSE220
OBJECT ORIENTED PROGRAMMING

Unit 1
Comparison of various programming methodologies, OOPS concepts, C and C++, compilers for C++, structure of a C++ program, revision of data types, control statements, arrays, insertion and extraction operators, manipulators. Structures, functions within structures, access specifiers, classes and objects, array within a class, array of objects, scope resolution operator, inline functions, static class members. References and reference parameters, default arguments.

Unit 2
Pointers and dynamic memory allocation with new and delete operators. Constructors and destructors, friend functions. Objects as members of classes, Friend classes. Function overloading, overloading a constructor, this pointer. Operator overloading with member functions and friend functions, overloading stream insertion and stream, extraction operators, type conversion.

CSE221
STRUCTURE AND INTERPRETATION OF COMPUTER PROGRAMS

Unit 3
Inheritance, types of inheritance, function overriding, virtual base class, run time polymorphism, virtual functions, pure virtual function, abstract class. Files & file handling, templates, function templates and class templates, exception handling.

TEXTBOOK:

REFERENCES:

CSE230 DATA STRUCTURES 3 1 0 4
(Pre-requisite: CSE220)

Unit 1

Unit 2

Unit 3

TEXTBOOKS:

REFERENCES:

CSE291 DATA STRUCTURES LAB. 0 0 3 1
Note: Lab to be conducted in C++
1. Implementing sample ADT, templates.
2. Stacks and queues: array implementation, applications, using STL.
3. Linked list: implementation, linked stacks, D-queue, circular queue
4. Implementing as STL: vector, lists, sequences, iterators
5. Trees: binary search tree, priority queue, heaps, AVL, red-black tree
6. Graph traversals: BFS, DFS

CSE300 OPERATING SYSTEMS 3 1 0 4
Unit 1

Unit 2

Unit 3
Paging and segmentation - segmentation with paging - virtual memory - demand
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CSE310  
COMPUTER NETWORKS  
3 1 0 4

Unit 1
The internet: the network edge, the network core, delay, loss and throughput in packet switched networks, protocol layers and their service models. Principles of network applications: the web and HTTP, file transfer: FTP, electronic mail in the internet, DNS - the internet’s directory service, peer-to-peer applications. Introduction and transport layer services: multiplexing and demultiplexing, connectionless transport - UDP, principles of reliable data transfer.

Unit 2
Transport layer: connection oriented transport - TCP, principles of congestion control, TCP congestion control. Introduction network layer: virtual circuit and datagram networks, inside a router, the Internet Protocol (IP) - forwarding and addressing in the internet, routing algorithms, routing in the internet, broadcast and multicast routing.

Unit 3
The link layer and Local Area Networks (LAN): introduction and services, error-detection and correction techniques, multiple access protocols, link-layer addressing, ethernet, link-layer switches, PPP - the point-to-point protocol. Introduction to wireless networks: wireless links and network characteristics, WiFi- 802.11 wireless LANs, mobile IP, wireless and mobility - impact on higher-layer protocols.

TEXTBOOK:

REFERENCES:

CSE320  
SOFTWARE ENGINEERING  
3 1 0 4

Unit 1

Unit 2

Unit 3
Performing user interface design - golden rules - user interface analysis and design - interface analysis - interface design steps - web engineering - attributes, layers, processes and best practices - initiating, analysis, design and testing of Webapp projects. Testing strategies: testing tactics - testing fundamentals - black-box and white-box testing - product metrics. Case study: SWEBOK

TEXTBOOK:

REFERENCES:
CSE330  DESIGN AND ANALYSIS OF ALGORITHMS  3 1 0  4
(Pre-requisite: CSE230)

Unit 1
Sorting: bubble - insertion sort – selection sort. Divide and conquer: quick sort -
merge sort - bucket sort - lower bounds - heap sort - comparisons of sorting.

Unit 2
Greedy algorithm: fractional knapsack problem - task scheduling problem. Dynamic
programming: matrix multiplication problem – 0-1 knapsack.

Unit 3
Graph algorithms: graph traversal (DFS, BFS with analysis) – biconnected
components - strong connectivity, shortest path algorithms (along with analysis) –
Dijkstra – Bellman Ford – Floyd Warshall. All pair shortest path algorithm – minimum
spanning tree (with analysis) – Kruskal – Prim’s – BaruK’a's. NP problems: definition -
P, NP, NP complete, NP hard & co-NP, examples – P, NP.

TEXTBOOK:

REFERENCES:
Pearson Education Asia, 2002.
1998.

CSE331  FORMAL LANGUAGES AND AUTOMATA  3 1 0  4

Unit 1
Automata and languages: introduction finite automata - regular operations -
nondeterministic finite automata - equivalence of NFAs and DFAs - regular
expressions - non-regular languages - pumping lemma for regular languages.

Unit 2
Context free languages - Chomsky normal form - push down automata - pumping
lemma for context free language.

CSE340  DATABASE MANAGEMENT SYSTEMS  3 1 0  4

Unit 1
Introduction and the relational model: introduction to DBMS - data models. Structure
of relational databases - fundamental relational algebra operations - additional
relational algebra operations. SQL: background - SQL data types and schemas -
integrity constraints – data definition - basic structure of SQL queries - set
operations - aggregate functions - null values. Database design: overview of the
design process - the entity-relationship model – constraints - entity-relationship
diagrams.

Unit 2
Entity-relationship design issues - weak entity sets - extended E-R features -
reduction to relational schemas. SQL & advanced SQL: nested sub-queries -
complex queries - views - join relations – authorization - functions and procedural
constructs. Relational database design: features of good relational designs - atomic
domains and 1NF - decomposition using functional dependencies (2NF) – 3NF,
4NF, BCNF - functional dependency theory.

Unit 3
Decomposition using functional dependencies - decomposition using multi-valued
dependencies – P,NF and DKNF. Transaction management: transactions – concept –
state - atomicity and durability - concurrent executions - serializability –
concurrency control – lock-based protocols – deadlock handling.
CSE351 ADVANCED DATABASES 3 0 0 3

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

CSE352 PATTERN RECOGNITION 3 0 0 3

Unit 1

Unit 2

Unit 3

TEXTBOOKS:

REFERENCES:

CSE353 SOFT COMPUTING 3 0 0 3

Unit 1
CSE354  AGENT BASED INTELLIGENT SYSTEMS  3 0 0 3

Unit 1

Unit 2

Unit 3

Case studies on applications of AI.

TEXTBOOKS:

REFERENCES:

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

CSE363 REAL-TIME COMPUTING SYSTEMS 3 0 0 3

Unit 1

TEXTBOOK:

REFERENCES:

CSE371 VISUAL PROGRAMMING 3 0 0 3

Unit 1

Unit 2

Unit 3
CSE380 INFORMATION TECHNOLOGY ESSENTIALS  3 0 0 3

Unit 1
Computer hardware and system software concepts: computer architecture, system software, operating systems, computer networking, programming fundamentals: problem solving concepts, modular approach though use of functions, error handling techniques, structured programming and data structures, structured statements, string handling functions, sorting and searching, file handling functions. Object oriented concepts: managing software complexity, concepts of object oriented programming, abstraction, class, object, member data, member methods, encapsulation, data hiding, inheritance, polymorphism, binding.

Unit 2
Analysis of algorithms: principles and tools for analysis of algorithms, analysis of popular algorithms, code tuning techniques, intractable problems. Relational database management: basic RDBMS concepts, database design, SQL commands, embedded SQL concepts, OLTP concepts.

Unit 3
System development methodology: software engineering and software development life cycle (SDLC), quality concepts and quality system procedures, analysis and design methods, structured programming concepts and principles of coding, software testing. User interface design: process of user interface design, elements of user interface design, speech user interface, web design issues. Introduction to web architecture: basic architecture of a web application, security, performance of web based applications, architecture documents.

REFERENCES:

CSE390 JAVA PROGRAMMING 0 0 3 1

Unit 1

Unit 2

Unit 3

REFERENCES:

CSE391 DATABASE MANAGEMENT SYSTEMS LAB. 0 0 3 1

1. Working with objects using SQL for the following: data definition language: create, alter, grant, revoke, drop, truncate. Data manipulation language: select, insert, update, delete. Transaction control statements - commit, rollback, save point.
2. Constraints - queries: simple selection, projection and selection with conditions.
3. Functions: aggregate functions, group by, order by, and date and conversion functions.
4. Set operators, joins, sub query: simple, nested, correlated, existence test, membership test, DDL and sub queries and DML and Sub queries.
5. Working with other schema objects: view, sequence, index, synonym, cluster, lock, BLOB, CLOB, nested table, type.
6. PL/SQL programs, cursors, functions, procedures, packages, triggers, exception handling.
7. Front end tool: forms creation, validation, triggers and report generation.
8. Mini project.

CSE392 OPERATING SYSTEMS LAB. 0 0 3 1

1. Basic Unix commands
2. Shell scripts
3. Process creation
4. Scheduling algorithms
5. Pipes-shared memory - implementation of algorithms for critical section problem for two processes.
7. Implement the banker’s algorithm of deadlock avoidance
8. Implementation of deadlock detection algorithm
9. Page replacement policies

CSE393 SOFTWARE ENGINEERING LAB. 0 0 3 1

2. Software requirement specification (SRS) preparation.
3. Data flow diagram design.
4. Use case model – identifying actors, identifying use cases, use case flow of events, data dictionary creation. Create use case realization.
5. Activity diagram – identifying activities, adding start and end states, state transitions, decisions and guard conditions.
6. Class design
7. Interaction diagrams, deployment and component diagrams.

TOOL: Rational Rose with UML/Visual Modeler, VISIO tool, Magic View.

CSE394 COMPUTER NETWORKS LAB. 0 0 3 1

1. Client server communication using basic socket communication
2. Experimental study of application protocols such as HTTP, FTP, SMTP, using network packet sniffers and analyzers such as Ethereal. Small exercises in socket programming in C/C++/Java.
3. Packet sniffers for understanding the TCP protocol.
4. File transfer between nodes in a network.
5. Introduction to ns2 (network simulator) - small simulation exercises to study TCP behavior under different scenarios.

6. Setting up a small IP network - configure interfaces, IP addresses and routing protocols to set up a small IP network. Study dynamic behavior using packet sniffers
7. Design and implementation of congestion control in TCP/IP network.

CSE400 COMPUTER GRAPHICS AND VISUALIZATION 3 1 0 4

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

CSE421 NET CENTRIC PROGRAMMING 3 1 0 4

Unit 1
(Javascript, VBScript, PHP). XML: comparison with HTML - DTD - XML elements -
content creation - attributes - entities - XSL - XLINK - XPATH - XPOINTER -
namespaces - applications - integrating XML with other applications.

Unit 2

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

TEXTBOOKS:

CSE430 COMPUTER LANGUAGE ENGINEERING 3 1 0 4
(Pre-requisite: CSE331)

Unit 1
Overview of translators and different types of programming languages: bootstrap compiler, compiler-compiler, portable compiler, tombstone representation – phases of compiler – simple straight line program interpreter - lexical analysis: regular expressions, finite automata, JLex – parsing: predictive parsing, LR parsing, error recovery.

Unit 2
Abstract syntax: semantic actions and AST – semantic analysis: symbol table, bindings and type checking – activation records, translation to IR - basic blocks and traces: canonical trees, handling conditional branches.

Unit 3

TEXTBOOK:

REFERENCES:

CSE451 COMPUTATIONAL FINANCE 3 0 0 3

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

CSE452 MULTIMEDIA DATABASES 3 0 0 3
(Pre-requisite: CSE340)

Unit 1
Introduction: an introduction to object-oriented databases; multidimensional data
structures: k-d trees, point quadtrees, the MX-Quadtree, R-Trees. Image databases: raw images, compressed image representations, image processing: segmentation, similarity-based retrieval, alternative image DB paradigms, representing image DBs with relations, representing image DBs with R-Trees.

Unit 2
Text/document databases: precision and recall, stop lists, word stems and frequency tables, latent semantic indexing, TV-Trees, other retrieval techniques. Video databases: organizing content of a single video, querying content of video libraries, video segmentation, video standards.

Unit 3
Audio databases: a general model of audio data, capturing audio content through discrete transformation, indexing audio data. Multimedia databases: design and architecture of a multimedia database, organizing multimedia data based on the principle of uniformity, media abstractions, query languages for retrieving multimedia data, indexing SMDSs with enhanced inverted indices, query relaxation/expansion.

TEXTBOOK:

REFERENCES:

CSE453  NATURAL COMPUTING  3 0 0 3

Unit 1
Introduction: philosophy of natural computing, three branches, conceptualization, constituent computing techniques. Evolutionary computing: problem solving as search task, standard evolutionary algorithm, constituent algorithms - similarities and differences, applications. Swarm intelligence: social adaptation of knowledge, ant colony optimization, particle swarm optimization and other variants, applications.

Unit 2
Neural computing: biological and artificial neuron, typical neural networks and learning algorithms, applications. Immuno computing: artificial immune systems, algorithms, artificial immune networks, applications.

Unit 3

TEXTBOOK:

REFERENCES:

CSE454  PRINCIPLES OF DIGITAL IMAGE PROCESSING  3 0 0 3

Unit 1

Unit 2
Intensity transformation and spatial filtering – filtering in frequency domain.

Unit 3
Image restoration and reconstruction – color image processing. Image processing applications.

TEXTBOOK:

REFERENCES:

CSE455  DATA WAREHOUSING AND DATA MINING  3 0 0 3

(Pre-requisite: CSE340)

Unit 1
Unit 2

Unit 3

TEXTBOOKS:

REFERENCE:

CSE456  INFORMATION RETRIEVAL  3 0 0 3

Unit 1
Boolean retrieval – the term vocabulary and postings lists – dictionaries and tolerant retrieval – index construction. Index compression – scoring, term weighting and the vector space model – computing scores in a complete search system – evaluation in information retrieval.

Unit 2

Unit 3
Web search basics – web crawling and indexes – link analysis.

TEXTBOOKS:

CSE457  BUSINESS INTELLIGENCE  3 0 0 3
(Pre-requisite: CSE340)

Unit 1
Introduction to business intelligence - introduction to OLTP and OLAP. BI definitions & concepts, business applications of BI. BI framework, role of data warehousing in BI, BI infrastructure components – BI process, BI technology, BI roles & responsibilities. Basics of data integration (extraction transformation loading) - concepts of data integration need and advantages of using data integration.

Unit 2
Introduction to common data integration approaches, introduction to ETL using SSIS, introduction to data quality, data profiling concepts and applications. Introduction to Multi-dimensional data modelling - introduction to data and dimension modeling, multidimensional data model, ER modeling vs. multi dimensional modeling, concepts of dimensions, facts, cubes, attribute, hierarchies, star and snowflake schema.

Unit 3
Introduction to business metrics and KPIs, creating cubes using SSAS. Basics of enterprise reporting - introduction to enterprise reporting, concepts of dashboards, balanced scorecards, introduction to SSRS architecture, enterprise reporting using SSRS.

TEXTBOOK:

REFERENCES:
CSE458 COMPUTER VISION 3 0 0 3

Unit 1
Introduction, image formation – geometric primitives and transformations, photometric image formation, digital camera, image processing – point operators, linear filtering, neighborhood operators, fourier transforms, segmentation.

Unit 2
Feature detection and matching – points and patches, edges, lines, feature-based alignment - 2D, 3D feature-based alignment, pose estimation, image stitching, dense motion estimation – optical flow - layered motion, parametric motion, structure from motion.

Unit 3
Recognition - object detection, face recognition, instance recognition, category recognition, stereo correspondence – epipolar geometry, correspondence, 3D reconstruction.

TEXTBOOK:

REFERENCES:

CSE460 COMPUTER SYSTEMS ENGINEERING 3 0 0 3  

(Pre-requisite: CSE300, CSE310)

Unit 1
Introduction to systems - complexity in computer systems - abstractions and naming - modularity with client/server - operating system structure - clients and servers within a computer - virtualizing processors: threads – performance.

Unit 2
Introduction to networks - layering and link layer - network layer, routing - end-to-end layer - congestion control - distributed naming - reliability - atomicity concepts - recoverability – isolation.

Unit 3

TEXTBOOK:

REFERENCES:
CSE462  WIRELESS AND MOBILE COMMUNICATION  3 0 0 3
(Pre-requisite: CSE310)

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, UWB pulse transmission, digital cellular transmission, spread spectrum transmissions, diversity and smart transmission.

Unit 2

Unit 3

TEXTBOOKS:

REFERENCES:

CSE463  INFORMATION CODING TECHNIQUES  3 0 0 3

Unit 1
Source coding: uncertainty, information and entropy; source coding theorem, Huffman coding, arithmetic coding, Lempel-Ziv algorithm. Channel model, channel capacity and channel coding; Information capacity theorem, Shannon limit.

CSE464  EMBEDDED PROGRAMMING  3 0 0 3

Unit 1

Unit 2
SYLLABI

B. Tech. - Computer Science & Engg. 2010 admissions onwards

looping constructs - bit manipulation - efficient switches - handling unaligned data optimized primitives: double-precision integer multiplication - integer normalization and count leading zeros - division - square roots - transcendental functions: log, exp, sin, cos - endian reversal and bit operations - saturated and rounded arithmetic - random number generation. Caches: the memory hierarchy and cache memory - cache architecture - cache policy - coprocessor and caches - flushing and cleaning cache memory - cache lock-down - caches and software performance.

Unit 3

Memory unit: memory protection units - protected regions - initializing the MPU, caches and write buffer - demonstration of an MPU system - memory management units: moving from an MPU to an MMU - how virtual memory works - details of the ARM MMU - page tables - the translation look aside buffer - domains and memory access permission - the caches and write buffer - coprocessor and MMU configuration - the fast context switch extension - demonstration: a small virtual memory system. Embedded operating systems: fundamental components - example: simple little operating system, RTOS – basic concepts. Exception and interrupt handling: exception handling – interrupts - interrupt handling schemes. Firmware: firmware and boot loader example: sandstone

REFERENCES:


CSE465 PARALLEL AND DISTRIBUTED COMPUTING 3 0 0 3

(Pre-requisite: CSE310)

Unit 1


Unit 2

Communication - interconnection network design, topological and parametric models of interconnection networks; routing mechanisms; flow control mechanisms, communication protocols. Communication primitives - point-to-point communication primitives; group communication patterns; broadcast in distributed systems, CSP, MPI; synchronization - locks, monitors, barriers; deadlock; hardware primitives and implementation issues; clock synchronization, distributed mutual exclusion; distributed deadlock detection. Computation: threads - creation, coordination, termination, futures.

Unit 3

Shared memory - models of memory consistency; implementation of consistency protocols; transactions: serializability, concurrency - control, commit protocols; Linda. scheduling and load balancing: load distribution algorithms; task migration; co-scheduling; affinity scheduling - self-scheduling in loops.

TEXTBOOKS:


REFERENCE:


CSE471 FREE AND OPEN SOURCE SOFTWARE 3 0 0 3

Unit 1

Introduction: history - the rise of proprietary software and free software - “Free” versus “Open Source” - overview of development process; technical infrastructure - mailing lists - version control - bug tracker - IRC/Real-time chat systems - RSS feeds - wikis - web site - overview of funding activities, communications - packaging, releasing and daily development - licenses, copyrights and patents.

Unit 2


Unit 3

FOSS - collaborative software development: introduction to autotools (Autoconf, Automake, Libtool) – how to run configure and make – introducing Makefile – a minimal Autotools project; Integrated development environments, documentation - eclipse, LaTeX; Case studies of open source software development - Apache and Mozilla. Featuered development and defect repair (FDDR) case study: a simulated environment of the collaborative development process, standards and techniques to emphasize on large-scale programming and improve the program writing, understanding and debugging skills - to work on large ongoing projects especially on feature addition/ enhancement and/or maintenance in a controlled environment.
CSE472  DATA COMPRESSION  3 0 0 3

Unit 1

Unit 2

Unit 3

TEXTBOOK:

REFERENCES:

CSE473  SOFTWARE QUALITY ASSURANCE  3 0 0 3

(Pre-requisite: CSE320)

Unit 1
Introduction - software quality in the business context - managing software quality in the organization - quality management systems - planning for software quality assurance - product quality and process quality.

Unit 2
Software measurement and metrics - walkthroughs and inspections - ISO 9001 - what is ISO 9001 - what is CMMI - introduction to CMMI for development - process area components - understanding capability levels - introduction to people CMM.

Unit 3
Statistical quality control and process control - software maintenance models - cyclomatic complexity - principles of coupling and cohesion - introduction to Six Sigma. Case studies - Indian software industry in perspective.

TEXTBOOKS:
2. CMMI for development Version 1.2, CMMI website: www.sei.cmu.edu/reports/06tr008.pdf

REFERENCES:

CSE474  COMPONENT BASED DEVELOPMENT  3 0 0 3

(Pre-requisite: CSE421)

Unit 1
Introduction to components: terms and concepts. Components - objects - components and objects – modules - white box versus black box abstractions and reuse. Interfaces. Components, interfaces and re-entrance: components and interfaces - direct and indirect interfaces – versions - interfaces as contracts.
Unit 2
Patterns, frameworks, architectures, wiring standards. The OMG way (CORBA, CCM, OMA, and MDA), Microsoft COM, .NET CLR: the first fundamental wiring model – COM, DCOM, .NET framework, common language frameworks, XML and data - enterprise services - web services with .NET.

Unit 3
Component development: the methodology - component-oriented programming - problems of asynchrony – multithreading - learning from circuit design - living without implementation inheritance - nutshell classes - language support - dynamic base objects with forwarding semantics - caller encapsulation - The environment, selecting target frameworks - the tools, selecting programming languages.

**TEXTBOOK:**

**REFERENCES:**

**CSE475  NATURAL LANGUAGE PROCESSING  3 0 0 3**
(Pre-requisite: CSE331)

Unit 1
Introduction: words - morphology and finite state transducers - computational phonology and pronunciation modelling - probabilistic models of pronunciation and spelling - N-gram models of syntax - hidden markov models and speech recognition - word classes and part of speech tagging.

Unit 2

Unit 3

**TEXTBOOK:**

**REFERENCES:**
CSE481 MANAGEMENT INFORMATION SYSTEMS  3 0 0 3

Unit 1

Unit 2
Electronic commerce systems & DSS – e-commerce systems: scope, processes, payment systems, application, case studies; decision support systems: introduction, structure of decisions, trends, systems, OLAP, usage, EIS, portals, artificial intelligence and its applications in business, case studies. Strategic role of IT – competing with IT: strategic IT, uses of IT, value chain, reengineering, agility, virtual organizations, knowledge creation, case studies; Business/IT strategy: organizational planning, scenario approach, SWOT, business models, IT planning, IT strategies, application planning; implementation challenges, barriers, change management, case studies.

Unit 3
Management challenges - security and ethical challenges: IT security, ethics, computer crime, privacy issues, ethical responsibilities, cyber laws, challenges; security management: tools, security defense in the internet, security measures, system controls and audits, case studies; enterprise and global management of IT: business and IT, managing IT, IT function in enterprises. Organizing the IT function, outsourcing, off shoring, failures; managing global IT: cultural, political, geo-economic issues, global IT applications, platforms and strategies, data access Issues, global system development, case studies.

TEXTBOOK:

REFERENCE:

CSE482 SOFTWARE PROJECT MANAGEMENT  3 0 0 3

Unit 1
Introduction to software project management - software projects - ways of categorizing software projects – problems with software projects - project life cycle – management - setting objectives – stakeholders - project team – step wise: an overview of project planning - project evaluation - selection of appropriate project approach. Software effort estimation – function point analysis - object point - COCOMO.

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

Unit 3
Monitoring and control – visualizing progress, earned value analysis – managing people and organizing teams – organizational structures – planning for small projects. Case study: PMBOK.

TEXTBOOK:

REFERENCES:
SYLLABUS


2010 admissions onwards

CSE491 COMPUTER LANGUAGE ENGINEERING LAB. 0 0 3 1

1. Program for performing the operations on languages.
2. Program to implement the lexical analyzer using DFA.
3. Program for constructing NFA using Thompson's algorithm.
4. Program for constructing DFA from a regular expression.
5. Program to implement Shift reduce parsing algorithm.
6. Program for constructing LR parsing table.
7. Program to generate DAG for the given expression.
8. Program to simulate the storage management.
9. Program to generate a code for a given intermediate code.

CSE497 SEMINAR 0 0 3 1

Each student is to prepare a seminar paper related to Computer Science and Engineering in an approved format and present it at the end of the semester. No weekly slot to be allotted for presentation.

CSE499 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. A report should be submitted in approved format before final examination.

CUL101 CULTURAL EDUCATION I 2 0 0 2

Unit 1
Introduction to Indian Culture; Introduction to Amma's life and Teachings; Symbols of Indian Culture;

Unit 2
Science and Technology in Ancient India; Education in Ancient India; Goals of Life – Purushurthas; Introduction to Vedanta and Bhagavad Gita;

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

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

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

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

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

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

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

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

Communication Skills - An Indian Perspective;

Unit 3
Developing Positive Attitude & Friendliness- (Vedic Perspective);
Achieving Work Excellence (Karma Yoga by Swami Vivekananda & teachings based on Amma);
Leadership Qualities – (A few Indian Role models & Indian Philosophy of Leadership);

REFERENCE BOOKS:
1. Awaken Children (Dialogues with Sri Mata Amritanandamayi) Volumes 1 to 9
2. Complete works of Swami Vivekananda (Volumes 1 to 9)
3. Mahabharata by M.N Dutt published by Parimal publications – New Delhi (Volumes 1 to 9)
4. Universal message of Bhagavad-Gita (An exposition of Gita in the light of modern thought and Modern needs) by Swami Ranganathananda. (Volumes 1 to 3)
7. Art of Man Making - Swami Chinmayananda published by Chinmaya Mission, Bombay
8. Will Power and its Development- Swami Budhananda published by Advaitha Ashram, Kolkatta
10. Yoga In Daily Life - Swami Sivananda – published by Divine Life Society
12. All about Hinduism – Swami Sivananda - Published by Divine Life Society
13. The Mind and its Control by Swami Budhananda published by Advaitha Ashram, Kolkatta
15. Valmiki Ramayana – Four volumes- published by Parimal Publications, Delhi
17. Mind Sound Resonance Technique (MSRT) published by Swami Vivekananda Yoga Prakashana, Bangalore.
18. Yoga & Memory - Dr H R Nagendra & Dr. Shirley Telles, published by Swami Vivekananda Yoga Prakashana, Bangalore.
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?
2. The Great Flaw. The subject-object relationship between individual and world. Promote subject enhance excellence.
3. To work towards excellence, one must know where he is. Our present state.. An introspective analysis. Our faculties within.

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

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

**REFERENCES:**
The Bhaja Govindam and the Bhagavad Gita.

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 Vairagya - Foundation of Abhyasah - Foundation of Vairagya.

**Patanjali Yoga Sutra – 4**
Introduction to Samadhi - Samprajnata-Samadhi - Reasoning in Samprajnata-Samadhi -
- Reflection in Samprajnata-Samadhi - Bliss in Samprajnata-Samadhi - Sense of Individuality in Samprajnata-Samadhi.

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

**Patanjali Yoga Sutra – 6**
How to make mind peaceful? - Cultivating opposite virtues: happiness – friendliness; misery – compassion; virtue – gladness; vice – indifference.

**Patanjali Yoga Sutra – 7**

Unit 3

**Patanjali Yoga Sutra – 8**

**Patanjali Yoga Sutra – 9**

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

Report review

Conclusion

**REFERENCES:**
- The course book will be “The four chapters of Freedom” written by Swami Satyananda Saraswat 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 Adwaita Ashram, Uttarajal.
- ‘Hatha Yoga Pradipika’ Swami Mukbulodhananda, Yoga Publications Trust, Munger, Bihar, India.

**TEXTBOOK:**

REFERENCES:

**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**

**Combinational 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:**
**ECE300  INTRODUCTION TO DIGITAL SIGNAL PROCESSING  3 0 0 3**

Unit 1

Unit 2
Fourier transforms: Discrete Fourier series for periodic sequences, discrete Fourier transform and properties, circular convolution, linear convolution, and DFT relationship, DFT computation – DIT and DIF algorithm and computation, impulse response and frequency response of LTI systems.

Unit 3
Filter design techniques: Filter specifications, analog filters (Butterworth filter may be studied in detail and concept of Chebyshev filters), IIR filter design using impulse invariance and bilinear transformation, FIR filter design – linear phase – windowing (rectangular, hamming/hanning), frequency transformation, filter structures and implementation of transfer function (direct form 1 and 2).

**TEXTBOOK:**

**REFERENCES:**

**ECE370  INTRODUCTION TO VLSI DESIGN  3 0 0 3**

Unit 1
Introduction to VHDL: Design units VHDL statements - data flow – behavioural - structural modeling – library - package - subprograms function - procedure – generics – configuration. 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:**

**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

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 Moie, 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:
Study of basic components in a computer - study of basic components in a network – study of diagnostic tools for system and study of floppy disk controller – study of hard disk controller – drivers for different components – trouble shooting in printer – communication between two computers with null modem – transferring characters from PC to LCD.

Electronics and basic microprocessor workshop:

ENG111 COMMUNICATIVE ENGLISH

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

Unit 1
Reading: Different styles of communication – reading comprehension - critical thinking and analysis – note-making.

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

Objectives:
To introduce the students to the elements of technical style
To introduce the basic elements of formal correspondence
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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

REFERENCES:

ENG250 PROFESSIONAL COMMUNICATION 1 0 2 2

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:

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

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Unit 1

Unit 2

Unit 3
Drama and Speech: Rabindranath Tagore – Chandalika; Mahashwetadevi – Bayen; Swami Vivekananda – Chicago Address; J.Krishnamurthy / C.N.R Rao - Audio speech.

Short Story:

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
Bibhu Mishra “When I took over from her”; R.K.Narayan “Junk”; M K Naik * The Postman’s Knock”.

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

REFERENCES:
ENV200  ENVIRONMENTAL STUDIES  3104

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;


REFERENCE BOOKS:  

FRE201  PROFICIENCY IN FRENCH LANGUAGE (LOWER)  1022

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

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

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

TEXTBOOK:  Metro St Michel - Publisher: CLE international

FRE202  PROFICIENCY IN FRENCH LANGUAGE (HIGHER)  1022

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

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)  1022

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

Some useful websites will be given.

**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

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

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

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

REFERENCES:
17. Aurobindo, Sri. The Indian Renaissance / India’s Rebirth / On Nationalism.
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 varnas; The structure of ancient Indian polity – Rajamandala and Cakravartins; Socio-economic elements from the two great Epics – Ramayana and Mahabharata – the concept of the ideal King (Sri Rama) and the ideal state (Ramarajya); Sarasvati - the cultural institutions 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 Digivijaya: dharma-vijaya, lobha-vijaya and asura-vijaya; Glimpses into the south Indian economies: political economies of the peninsula – Chalukyas, Rashtrakutas and Cholas

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

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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 ruining of Indian economy and business – man-made famines – the signs of renaissance: banking and other business undertakings by the nates (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.
2. Kautilya, Arthasastra.
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HUM255 SCIENCE AND SOCIETY – AN INDIAN PERSPECTIVE* 1 0 2 2

Unit 1

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

Unit 2

Indian sciences
Introduction; Ancient Indian medicine: towards an unbiased perspective; Indian approach to logic; The methodology of Indian mathematics; Revision of the traditional Indian planetary model by Nilakantha Somasutvan in circa 1500 AD Science and technology under the British rule
Introduction; Indian agriculture before modernization; The story of modern forestry in India; The building of New Delhi

Unit 3

Science and technology in Independent India
Introduction; An assessment of traditional and modern energy resources; Green revolution: a historical perspective; Impact of modernisation on milk and oilseeds economy; Planning without the spirit and the determination.

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, Shanti, 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                      3 1 0  4
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)

MAT112                  VECTOR CALCULUS, FOURIER SERIES                 3 1 0  4
AND PARTIAL DIFFERENTIAL EQUATIONS

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:
MAT211 INTEGRAL TRANSFORMS AND COMPLEX ANALYSIS  3 1 0 4

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)
Power series, Taylor series and Maclaurin series. Laurent series, zeros and singularities, residues, Cauchy residue theorem, evaluation of real integrals using residue theorem. (Sections: 14.4, 15.1, 15.2, 15.3, 15.4)

Unit 3
Laplace transforms, inverse transforms, linearity, shifting, transforms of derivatives and Integrals, differential equations, unit step function, second shifting theorem, Dirac's delta function. Differentiation and integration of transforms. Convolution, integral equations, partial fractions, differential equations, systems of differential equations. (Sections: 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7)

MAT212 MATHEMATICAL STATISTICS AND NUMERICAL METHODS  3 1 0 4

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)
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

Unit 3
Dynamics of particles: Kinematics of particles – rectilinear motion – relative motion - position, velocity and acceleration calculations in cylindrical coordinates. Dynamics of rigid bodies: General plane motion - translation and rotation of rigid bodies – Chasle’s theorem – velocity and acceleration calculations in moving frames of references – Coriolis acceleration.

TEXTBOOKS:

REFERENCES:

MEC180 WORKSHOP A

Product detailing workshop: (Study of simple mechanical and electromechanical system)
Disassemble the product or sub assembly – 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 / LISP
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.


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.
Financial analysis and planning: Analyzing financial performance – break – even
analysis and Leverages – financial planning and budgeting.
Mergers and takeovers - international trade.


REFERENCES:
1. Denzil Watson & Antony Head, ‘Corporate Finance- Principles and Practice’, 2e, Pearson
Education Asia, 2002.
12e, 2010.

MNG400    PRINCIPLES OF MANAGEMENT    3 0 0 3

Unit 1
HISTORICAL DEVELOPMENT: definition of management – science or art –
management and administration – development of management thought – contribution
of Taylor and Fayol – functions of management – types of business organisations.
PLANNING: nature & purpose – steps involved in planning – objectives – setting
objectives – process of managing by objectives – strategies, policies & planning
premises - forecasting – decision-making.

Unit 2


Unit 3


TEXTBOOKS:

REFERENCES BOOKS:

PHY100

PHYSICS

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.

PHY181

PHYSICS LAB.

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 it’s consequences, density of carriers in intrinsic semiconductors, conductivity of intrinsic semiconductors, carrier densities in n type semiconductors, n type semiconductors, Hall effect and carrier density.

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

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

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

TEXTBOOK:

REFERENCES:

PHY251  OPTOELECTRONIC DEVICES  3 0 0 3

Unit 1

REFERENCES:

PHY252  PHYSICS OF SEMICONDUCTOR DEVICES  3 0 0 3

Unit 1
Introduction: Unit cell, Brawais 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 semiconductors:** Intrinsic and extrinsic semiconductors, band structure of semiconductors, carrier concentration in intrinsic and extrinsic semiconductors, electrical conductivity and conduction mechanism in semiconductors, Fermi level in intrinsic and extrinsic semiconductors and its dependence on temperature and carrier concentration. Carrier generation-recombination, mobility, drift-diffusion current, Hall effect.

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

Unit 3


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

**TEXTBOOKS:**

**REFERENCES:**

**PHY253 ELECTROMAGNETIC FIELDS AND WAVES 3 0 3**

Unit 1

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

**Poisson’s and Laplace’s equations:** The potential field of a point charge, potential field of a system of charges :conservative property, potential gradient, the dipole.
Unit 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:**

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**PHY255 ELECTRONIC MATERIALS SCIENCE**

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

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

### Unit 3
Optical Properties of Materials: Reflection, Refraction, Dispersion, Refractive Index, Snells Law, Light Absorption and Emission, Light Scattering, Luminescence, Polarization, Anisotropy, Birefringence; Dielectric Properties of Materials:

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**PHY260 PHYSICS OF LASERS AND APPLICATIONS**

### Unit 1


### 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, (i) CO, LASER - principle, construction, working and application. Liquid chemical and dye LASERS. Semiconductor LASER: Principle, characteristics, semiconductor diode LASERS, homo-junction and hetero-junction LASERS, high power semi conductor diode LASERS.

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

Applications of LASERS in other fields:

Holography: Principle, types, intensity distribution, applications, laser induced fusion.

Harmonic generation. LASER spectroscopy. LASERS in industry: Drilling, cutting and welding, Lasers in medicine: Dermatology, cardiology, dentistry and ophthalmology.

REFERENCES:

SYLLABI
B. Tech. - Computer Science & Engg. 2010 admissions onwards

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.

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

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

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

SYLLABI
B. Tech. - Computer Science & Engg. 2010 admissions onwards

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.

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

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

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

Unit 3
Time-series properties: examples, conventional linear methods, a case study, time-delay embeddings.
Nonlinear prediction and noise-reduction: linear predictors, state-space prediction, noise reduction, Lyapunov exponents from experimental data, false nearest neighbors.

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

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

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

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

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

TEXTBOOK:

REFERENCES:

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

Unit 2
Tools for characterization:
Nanoscale materials – properties and applications:


Unit 3
Applications of carbon nanotubes


TEXTBOOKS:

PHY264 THIN FILM PHYSICS 3 0 0 3

Unit 1
Introduction and preparation of thin film: Difference between thin and thick film, Appreciation of thin film technology in modern era. Deposition technology: Physical methods, chemical methods, other new techniques, vacuum technology: Vacuum pumps & pressure gauges.
Defects in thin film: General concepts, nature of defect, microscopic defect and dislocation. Boundary defects. Defect and energy states - donar acceptor levels, trap and recombination centers, excitons, phonons.

Unit 2
Properties of thin film: Optical behaviors: transmission, reflection, refractive index, photoconductivity, and photoluminescence.

Unit 3
Electrical behaviors: sheet resistivity, electron mobility and concentration, Hall effect, conduction in MIS structure.
Mechanical behaviors: stress, adhesion, hardness, stiffness.
Applications of thin films in various fields: Antireflection coating, FET, TFT, resistor, thermistor, capacitor, solar cell, and MEMS fabrication of silicon wafer: Introduction. preparation of the silicon wafer media, silicon wafer processing steps.
SYLLABI
B. Tech. - Computer Science & Engg.  2010 admissions onwards

TEXTBOOK:

REFERENCES:

PHY270  MEDICAL PHYSICS  3 0 0 3

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

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

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

TEXTBOOK:

REFERENCE BOOKS
1. Glasser.O,Medical Physics Vol.1, 2, 3 Book Publisher Inc Chicago, 1980
    Williams and wiliins(2002)
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 - cotes expression for integral, trapezoidal rule, Simpson’s rule, Gauss quadrature method.

Unit 2

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

Unit 2

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 -
SSK111 SOFT SKILLS I

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;

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

SSK112 SOFT SKILLS II


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.

REFERENCES:
3. The BBC and British Council online resources
4. Owl Purdue University online teaching resources
6. 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; Flow detection; Puzzles; Cryptogrithms.
8. Quantitative Aptitude by R.S. Aggarwal ,S. Chand
9. Quantitative Aptitude – Abijith Guha ,TMH.
10. Quantitative Aptitude for Cat: Arun Sharma, TMH.
Problem solving level – III: Money related problems; Mixtures; Symbol based problems; Clocks and calendars; Simple, linear, quadratic and polynomial equations; special equations; Inequalities; Functions and graphs; Sequence and series; Set theory; Permutations and combinations; Probability; Statistics.

Data sufficiency: Concepts and problem solving.

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

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

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

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

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 – Nisik K Sinkha
7. Puzzles –Shakuntala Devi

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