# B. Tech. (CSE) – Curriculum (NITTUGCSE14)

## Semester-wise Curriculum

### I Semester

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Total Credits: 24

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Total Credits: 24
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**Total Credits: 24**

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**Total Credits: 23**
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List of Electives

Odd Semester Electives

V Semester (1 out of 3)
- Human Computer Interaction : Software Systems
- Multimedia Systems : Software Systems
- Mobile Computing and Communication : Networking

VII Semester (2 out of 5)
- Big Data Analytics : Database
- Cloud Computing : Networking
- Artificial Intelligence and Expert Systems : Software Systems
- Programming for Embedded Systems : Systems
- Advanced Cryptography : Theoretical CS

Even Semester Electives

VI Semester (2 out of 5)
- Wireless Network Systems : Networking
- Design and Analysis of Parallel Algorithms : Theoretical CS
- Principles of Processor Design : Systems
- Data Warehousing and Data Mining : Database
- Real Time Systems : Software Systems

VIII Semester (3 out of 6)
- Randomized Algorithms : Theoretical CS
- Natural Language Processing : Software Systems
- Network Processors Design : Systems
- Image Processing : Software Systems
- Software Quality Assurance : Software Systems
- Advanced Database Management Systems : Database
### Electives for B. Tech. (Honors)*

<table>
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* - Eligibility Criteria: As per the existing institute norms
FIRST SEMESTER
HM101 English for Communication

Objectives
- To develop in the under-graduate students of engineering a level of competence in English
- To develop effective communication for academic and social needs

Outcome
- Ability to in a meaningful manner to different levels of people in their academic and social domains

Unit – I
Communication
- An introduction - Its role and importance in the corporate world
- Tools of communication
- Barriers
- Levels of communication
- English for Specific purposes and English for technical purposes.

Unit – II
Listening process & practice
- Exposure to recorded & structured talks, class room lectures
- Problems in comprehension & retention
- Note-taking practice
- Listening tests- Importance of listening in the corporate world.

Unit – III
Reading
- Introduction of different kinds of reading materials: technical & non-technical
- Different reading strategies: skimming, scanning, inferring, predicting and responding to content
- Guessing from context
- Note making
- Vocabulary extension.

Unit – IV
Speaking
- Barriers to speaking
- Building self-confidence & fluency
- Conversation practice
- Improving responding capacity
- Extempore speech practice
- Speech assessment.

Unit – V
Writing
- Effective writing practice
- Vocabulary expansion
- Effective sentences: role of acceptability, appropriateness, brevity & clarity in writing
- Cohesion & coherence in writing
- Writing of definitions, descriptions & instructions
- Paragraph writing
- Introduction to report writing.

Text Books

Reference Books
MA101 Mathematics I

Objective
- To acquire fundamental knowledge and apply in engineering disciplines.

Outcome
- Ability to solve engineering problems

Unit – I

Unit – II
Sequences of real numbers – Limit of a sequence – Convergent and divergent sequences– sub sequence- Cauchy’s sequence – monotone convergence theorem (without proof)- Sequence with recurrence relations.

Unit – III

Unit – IV

Unit – V
Double integral – Changing the order of Integration – Change of variables from Cartesian to Polar Coordinates – Area using double integral in Cartesian and Polar Coordinates – Triple integral – Change of Variables from Cartesian to Spherical and Cylindrical Coordinates – Volume using double and triple integrals.

Text Books

Reference Books
PH101 Physics I
(Common to all branches)
2-0-3-3

Objectives
- To make a bridge between the physics in school and engineering courses
- To introduce the basic concepts of modern science like Photonics, Engineering applications of acoustics, fundamentals of crystal physics and materials science

Outcomes
- Ability to understand many modern devices and technologies based on lasers and optical fibers
- Ability to understand various material properties which are used in engineering applications and devices.

Unit – I

Unit – II

Unit – III

Unit – IV

Unit – V
Text Books

Reference Books
Objective
- To introduce students to water chemistry, bonding concepts, entropy and basic organic chemistry

Outcome
- Ability to learn about quality of water, bonding theories, entropy change for various processes and basic stereo chemical aspects

Unit – I
Water - Sources, hard & soft water, estimation of hardness by EDTA method, softening of water, zeolite process & demineralization by ion exchangers, boiler feed water, internal treatment methods, specifications for drinking water, BIS & WHO standards, treatment of water for domestic use, desalination - reverse osmosis & electrodialysis.

Unit – II
Chemical Bonding - Basic concepts, bonding in metals, electron gas theory, physical properties of metals (electrical & thermal conductivity, opaque & lusture, malleability & ductility), Alloy-substitutional alloys, interstitial alloys. Coordinate bond, EAN rule, 16 & 18 electron rule, crystal field theory, splitting of 'd' orbitals in octahedral, tetrahedral and square planar complexes.

Unit – III
Shape & Intermolecular Interactions - Shape-Lewis dot structures, formal charge, VSEPR method, consequences of shape, dipole moment, valence bond theory; Intermolecular interactions-ion ion interactions, ion-dipole interactions, hydrogen bonding, dipole-dipole interactions, London / dispersion forces, relative strength of intermolecular forces; Consequences-surface tension.

Unit – IV
Thermodynamics - Entropy as a thermodynamic quantity, entropy changes in isothermal expansion of an ideal gas, reversible and irreversible processes, physical transformations, work & free energy functions, Helmholtz and Gibbs free energy functions, Gibbs-Helmholtz equation, Gibbs-Duhem equation, Clapeyron-Clausius equation & its applications, Van't Hoff isotherm and applications.

Unit – V
Fuels & Lubricants - Fuels - Classification, examples, relative merits, types of coal, determination of calorific value of solid fuels, Bomb calorimeter, theoretical oxygen requirement for combustion, proximate & ultimate analysis of coal, manufacture of metallurgical coke, flue gas analysis, problems. Lubricants - Definition, theories of lubrication, characteristics of lubricants, viscosity, viscosity index, oiliness, pour point, cloud point, flash point, fire point, additives to lubricants, Solid lubricants.
Text Books

Reference Books
ME101 Engineering Mechanics  
(Common to all branches) 
3-0-0-3

Objectives
- To explain the importance of mechanics in the context of engineering and conservation equations
- To explain the significance of centroid, centre of gravity and moment of inertia.
- To introduce the techniques for analyzing the forces in the bodies.
- To apply the different principles to study the motion of a body, and concept of relative velocity and acceleration
- To describe the trajectory of a particle under projectile motion
- To identify the basic elements of a mechanical system and write their constitutive equations.

Outcomes
- Ability to identify and analyze the problems by applying the fundamental principles of engineering mechanics
- Ability to research, design and develop mechanical systems

Unit – I

Unit – II
Friction Laws of friction, static friction, rolling friction, application of laws of friction, ladder friction, wedge friction, body on inclined planes, simple screw jack – velocity ratio, mechanical advantage, efficiency, Numerical.

Unit – III
Statics Principles of statics, types of forces, concurrent and non-concurrent forces, composition of forces, forces in a plane and space, simple stresses and strains, elastic coefficients, Numerical.

Unit – IV
Kinematics Fundamentals of rectilinear and curvilinear motion, application of general equations, concept of relative velocity, analytical and graphical techniques, Numerical.

Unit – V
Dynamics Principles of dynamics, D’Alembert’s principle, conservation of momentum and energy, vibrations of simple systems, Numerical.
Text Books

Reference Books
**Objectives**
- To learn the fundamentals of computers
- To learn the problem solving techniques writing algorithms and procedures
- To learn the syntax and semantics for C programming language
- To develop the C code for simple logic
- To understand the constructs of structured programming including conditionals and iterations

**Outcomes**
- Ability to write algorithms for problems
- Knowledge of the syntax and semantics of C programming language
- Ability to code a given logic in C language
- Knowledge in using C language for solving problems

**Unit – I**
Introduction to computers – Computer Organization – Characteristics – Hardware and Software – Modes of operation – Types of programming languages – Developing a program.

**Unit – II**

**Unit – III**

**Unit – IV**
Modular Programming – Functions and Procedures – Examples – Parameter passing methods.

**Unit – V**
Text Books

Reference Books
CC101 Energy and Environmental Engineering

Objectives
- To teach the principal renewable energy systems
- To explore the environmental impact of various energy sources and also the effects of different types of pollutants.

Outcomes
- Ability to explore the principal renewable energy systems
- Ability to explore the environmental impact of various energy sources and also the effects of different types of pollutants.

Unit – I
Present Energy resources in India and its sustainability - Different type of conventional Power Plant---Energy Demand Scenario in India-Advantage and Disadvantage of conventional Power Plants – Conventional Vs Non-conventional power generation

Unit – II

Unit – III

Unit – IV
Air pollution- Sources, effects, control, air quality standards, air pollution act, air pollution measurement. Water pollution-Sources and impacts, Soil pollution-Sources and impacts, disposal of solid waste.

Unit – V

Text Books

References Books
MP101 Engineering Graphics

1-0-4-3

Objectives
- To possess efficient drafting skill
- To provide neat structure of industrial drawing

Outcome
- Ability to perceive/visualize the engineering components

Fundamentals Drawing standard - BIS, dimensioning, lettering, type of lines, scaling-conventions.

Geometrical constructions - dividing a given straight line into any number of equal parts, bisecting a given angle, drawing a regular polygon given one side, special methods of constructing a pentagon and hexagon – conic sections – ellipse – parabola – hyperbola - cycloid – trochoid.

Orthographic projection Introduction to orthographic projection, drawing orthographic views of objects from their isometric views - Orthographic projections of points lying in four quadrants, Orthographic projection of lines parallel and inclined to one or both planes Orthographic projection of planes inclined to one or both planes. Projections of simple solids - axis perpendicular to HP, axis perpendicular to VP and axis inclined to one or both planes.

Sectioning of solids - Section planes perpendicular to one plane and parallel or inclined to other plane. Intersection of surfaces Intersection of cylinder & cylinder, intersection of cylinder & cone, and intersection of prisms. Development of surfaces - Development of prisms, pyramids and cylindrical & conical surfaces.

Isometric and perspective projection Isometric projection and isometric views of different planes and simple solids, introduction to perspective projection. Computer aided drafting Introduction to computer aided drafting package to make 2-D drawings.

Text Books

Reference Books
SECONDE SEMESTER
HM 102 Professional Communications

Objectives

- To develop in the under-graduate students of engineering a level of competence in English required for independent and effective communication for their professional needs.

Outcomes

- Ability to apply English in professional Environment
- Ability to communicate themselves effectively in their chosen profession

Unit – I

Listening: Barriers to listening: Physical & psychological – Steps to overcome them – Purposive listening practice – Active listening and anticipating the speaker – Use of technology in the professional world.

Unit – II


Unit – III


Unit – IV

Writing: Professional Correspondence – Formal and informal letters – Argument Writing practice – Perspectives in writing – Narrative writing - Different registers - Tone in formal writing – Summary writing practice - Introduction to reports.

Unit – V

Study Skills Reference Skills - Use of dictionary, thesaurus etc – Importance of contents page, cover & back pages – Bibliography.

Reference Books

MA102 Mathematics II

Objective
- To learn mathematical concepts and methods

Outcome
- Ability to solve industrially applicable problems

Unit – I

Unit – II

Unit – III
Gradient, Divergence and Curl – Directional Derivative – Tangent Plane and normal to surfaces – Angle between surfaces – Solenoidal and irrotational fields – Line, surface and volume integrals – Green’s Theorem, Stokes’ Theorem and Gauss Divergence Theorem (all without proof) – Verification and applications of these theorems.

Unit – IV
Analytic functions – Cauchy – Riemann equations (Cartesian and polar) – Properties of analytic functions – Construction of analytic functions given real or imaginary part - Conformal mapping of standard elementary and bilinear transformation.

Unit – V
Cauchy’s integral theorem, Cauchy’s integral formula and for derivatives– Taylor’s and Laurent’s expansions (without proof) – Singularities – Residues – Cauchy’s residue theorem – Contour integration involving unit circle.

Text Books

Reference Books
**PH102A Physics II**  
*(Circuit Branches)*

**3-0-3-4**

**Objectives**
- To make a bridge between the physics in school and engineering courses.
- To introduce the basic concepts of modern physics like fundamentals of quantum mechanics, nuclear physics and advanced materials
- To introduce fundamental physics like electrodynamics and semiconductor physics for circuit branch students.

**Outcome**
- Ability to understand the fundamentals of electrodynamics and semiconductor physics

**Unit – I**  
**Quantum Mechanics**

**Unit – II**  
**Nuclear and Particle Physics**
Nuclear properties and forces - Nuclear models - Shell model - Nuclear reaction - Radioactivity - types and half lives - application in determining the age of rock and fossils - Stellar nucleosynthesis. Fundamental forces - Particle physics - classification of matter - quark model - neutrino properties and their detection.

**Unit – III**  
**Advanced Materials**

**Unit – IV**  
**Electrodynamics**
Unit – V
Semiconductor Physics
Introduction-Direct and indirect band gap semiconductors - Intrinsic semiconductor at 0 K-
Intrinsic semiconductor at room temperature-Intrinsic carriers- Electron and Hole
concentrations-doping-n-type – p-type-temperature variation of carrier concentration in
extrinsic semiconductor-Extrinsic conductivity-Law of Mass action-Charge neutrality-
Fermi level in extrinsic semiconductors-Electrical conduction in extrinsic semiconductors-Hall
effect.

Text Books
8th ed., New Delhi, 2001

Reference Books
Delhi, 2012
5. Peter J. Collings, “Introduction to Liquid Crystals Chemistry and Physics”, 2nd ed,
Objective
- To understand the basic principles of electrochemistry, cell construction and evaluation, and electrochemical power sources

Outcome
- Ability to comprehend electrochemistry, solids, their properties and applications, and the polymer materials

Unit – I
Electrochemistry- Conductivity of electrolytes- Specific, molar and equivalent conductivity, Nernst equation for electrode potential, EMF series, hydrogen electrode, calomel electrode, glass electrode, Electrolytic and galvanic cells, cell EMF, its measurement and applications, Weston standard cell, reversible and irreversible cells, concentration cell, electrode (hydrogen gas electrode) and electrolyte concentration cell, concentration cell with and without transference

Unit – II
Corrosion - Dry corrosion and wet corrosion, mechanisms, types of corrosion, DMC, DAC, stress, inter granular, atmospheric and soil corrosion, Passivity, Polarization, over potential and its significance, Factors affecting corrosion, protection from corrosion by metallic coatings, electroplating, electroless plating and cathodic protection, Chemical conversion coatings and organic coatings- Paints, enamels

Unit – III
Batteries Different types of batteries-Primary, Secondary & Flow battery and Fuel cell. Working principle and uses-Laclanche cell, Alkaline battery, nicad battery, lithium battery & Mercury battery. Fuel cell- Theory, working and application. Different types of fuel cells- H2/O2, propane-oxygen, PEFC and SOFC. Lead Acid storage cell-charging & discharging principle, operation and uses. Solar battery- its working principle

Unit – IV
Solid State - Types of solids - close packing of atoms and ions - bcc , fcc structures of rock salt – cesium chloride- spinel - normal and inverse spinels, Stoichiometric Defect, controlled valency & Chalcogen semiconductors, Non-elemental semiconducting Materials, Preparation of Semiconductors-steps followed during the preparation of highly pure materials and further treatments. Semiconductor Devices-p-n junction diode

Unit – V
Polymer - Nomenclature, functionality, classification, methods of polymerization, mechanism of polymerization, molecular weight determination - Viscometry, light scattering methods. Plastics-Moulding constituents of a plastics and moulding of plastics into articles. Important thermoplastics and thermosetting resins- synthesis
& applications of PVA, FLUON, PC, Kevlar, ABS polymer, phenolic & amino resins, epoxy resins and polyurethanes, Conductive polymers

**Text Books**

**Reference Books**
BE I 102 Basic Civil Engineering
(for Chemical, CSE, ECE, EEE, ICE, Mechanical, MME, and Production)

Objectives
- To give an overview of the fundamentals of the Civil Engineering fields to the students of all branches of Engineering
- To realize the importance of the Civil Engineering Profession in fulfilling societal needs

Outcome
- Ability to gain knowledge on on-site selection, construction materials, components of buildings, roads and water resources

Unit – I
Properties and uses of construction materials - stones, bricks, cement, concrete and steel.

Unit – II
Site selection for buildings - Component of building - Foundation- Shallow and deep foundations - Brick and stone masonry - Plastering - Lintels, beams and columns - Roofs.

Unit – III

Unit – IV
Surveying -Classification-Chain Survey-Ranging-Compass Survey-exhibition of different survey equipment.

Unit – V
Sources of Water - Dams- Water Supply-Quality of Water-Wastewater Treatment – Sea Water Intrusion – Recharge of Ground Water

Reference Books
5. Lecture notes prepared by Department of Civil Engineering, NITT.
BE II 102 Basic Mechanical Engineering  
(for Civil, CSE, ECE, EEE, ICE)  

2-0-0-2

Objectives
- To explain the importance of concepts of mechanical engineering and conservation equations
- To introduce the techniques for analyzing the forces, momentum and power.
- To introduce the various properties of materials, and the techniques of selection of materials
- To identify the basic elements of a mechanical system and write their constitutive equations and performance analysis techniques.

Outcomes
- Ability to identify, appreciate and analyze the problems by applying the fundamentals of mechanical engineering
- Ability to develop mechanical systems

Unit – I  
Fundamentals  Introduction to mechanical engineering, concepts of thermal engineering, mechanical machine design, industrial engineering, and manufacturing technology.

Unit – II  
Thermal Engineering  Laws of thermodynamics, types of systems, concepts and types of IC engine, air compressors, principle of turbomachines, properties of steam and steam generators, automobile engineering, introduction to gas turbines and refrigeration & air-conditioning.

Unit – III  
Engineering Materials  Types of materials, selection of materials, material properties, introduction to materials structure, machine elements, transmission, fasteners, and support systems.

Unit – IV  
Manufacturing Technology  Manufacturing, classification, lathe, drilling machines, milling machines, metal joining, metal forming, casting, forging, and introduction to powder metallurgy.

Reference Books
1. Lecture notes prepared by Department of Mechanical Engineering, NITT.
2. K. Venugopal, Basic mechanical Engineering
BS 102 Branch Specific Course in CSE

2-0-0-2

Objectives

- To make the student understand the basic building blocks of a computing system
- To make the student understand the flow of Concept-Program-Input-Processing-Output
- To introduce low level language, translators, operating system

Outcomes

- Ability to trace the Concept-Program-Input-Processing-Output
- Ability to generate low level code for simple programs
- Ability to design simple arithmetic and memory units

Unit – I Concept-Program-Input-Processing-Output

Demo of simple high level language program to low level machine level language program tracing their execution from high level to circuit level/gate level - Overview of the Hardware Description Language (HDL) - Designing a set of elementary logic gates from primitive NAND gates.

Design of binary adders, culminating in the construction of a simple ALU (Arithmetic-Logic Unit) using logic gates - Design of memory hierarchy from elementary flip-flop gates to registers and RAM units of arbitrary sizes using logic gates

Unit – II Introduction to Low level language

Introducing an instruction set, in both binary and assembly (symbolic) versions; Writing some low-level assembly programs - Other details of computer architecture - Basic language translation techniques: parsing, symbol table, macro-assembly

Unit – III Introduction to Virtual Machine

The role of virtual machines in modern software architectures like Java and .NET; Introduction of a typical VM language, focusing on stack-based arithmetic, logical, and memory access operations - VM abstraction and implementation, focusing on stack-based flow-of-control and subroutine call-and-return techniques

Unit – IV Introduction to Compilers

Context-free grammars and recursive parsing algorithms; Building a syntax analyzer (tokenizer and parser) The syntax analyzer to generate XML code reflecting the structure of the translated program - Code generation, low-level handling of arrays and objects

Unit – V Introduction to OS

Discussion of OS/hardware and OS/software design trade-offs, and time/space efficiency considerations - Design and implementation of some classical arithmetic and geometric algorithms for the implementation of OS - memory management, string processing, and I/O handling algorithms

Text Book

THIRD SEMESTER
CS201 Data Structures and Algorithms

Objectives
- To introduce first level topics covering basics in Algorithms and Data Structures
- To provide examples for various design paradigms
- To expose different problem categories

Outcomes
- Ability to comprehend the basics in algorithms and data structures
- Ability to solve problems that involve these concepts/similar problems
- Ability to provide algorithmic solutions/approaches to new problems

Unit – I
Mathematical preliminaries, time complexity and space complexity, worst-case and average-case analyses, use of order notations and related results, divide and conquer recurrences, recurrence relations: substitution method, recurrence trees, Master’s theorem and its applications.

Unit – II
QuickSort and its analyses, MergeSort recurrence, Strassen's matrix multiplication, fast multiplication of large integers, binary search trees, priority queues, Heaps and HeapSort

Unit – III
Data structures for disjoint sets, Path compression, union by rank, Prim’s and Kruskal’s algorithms, Huffman coding, LZW coding, shortest paths, greedy activity selection, set cover and greedy heuristics.

Unit – IV
Dynamic Programming basics, matrix chain multiplication, DP solution for traveling salesman and 0/1 Knapsack problems, least common subsequences, independent sets and backtracking algorithm, Breadth/depth-first algorithms.

Unit – V
Topological sort, recursive graph algorithms, string matching: KMP algorithm, Rabin-Karp algorithm, number theory algorithms: basics, GCD and extended Euclidean algorithm, primality testing.

Textbook
CS203 Discrete Structures
Credit: 3

Objectives

- To get familiar and understand the fundamental notions in discrete mathematics
- To understand and demonstrate the basic concept of an algorithm and its application in combinatorial mathematics
- To identify the basic properties of graphs and trees and model simple applications

Outcomes

- Ability to distinguish between the notion of discrete and continuous mathematical structures
- Ability to construct and interpret finite state diagrams and DFSA
- Application of induction and other proof techniques towards problem solving

Unit – I


Unit – II


Unit – III


Unit – IV


Unit – V

Graph Theory - Definitions And Basic Results - Representation Of A Graph By A Matrix And Adjacency List - Trees - Cycles - Properties - Paths And Connectedness - Subgraphs - Graph Isomorphism - Operations On Graphs - Vertex And Edge Cuts - Vertex And Edge Connectivity.

Text Books

Reference Books
CS205 Digital Systems Design

Objectives

- To understand the essential knowledge on the fundamentals and applications of digital circuits and digital computing principles
- To understand the overview on the design principles of digital computing systems

Outcome

- Ability to design and implement complicated digital systems using Verilog

Unit I


Unit II


Unit III

Sequential logic - Basic latch - Flip-flops (SR, D, JK, T and Master-Slave) - Triggering of flip-flops - Counters - Design procedure - Ripple counters - BCD and Binary - Synchronous counters, Registers - Shift registers - Registers with parallel load, Reduction of state and flow tables - Race-free state assignment - Hazards.

Unit IV


Unit V


Text Books


Reference Books

CS207 Data Communication

3-0-0-3

Objectives
- To understand the fundamental concepts of encoding techniques
- To familiarize with various multiplexing techniques
- To understand the importance of error correcting codes in data transmission

Outcomes
- Ability to design and implement error correction and detection codes for correct transmission of data
- Ability to apply data communication concepts in practical areas

Unit – I Introduction to Waveform Encoding

Unit – II Physical Layer
Digital and Analog Signals, Periodic Analog Signals, Signal Transmission, Limitations of Data Rate, Digital Data Transmission, Performance Measures, Line Coding, Digital Modulation, Media and Digital Transmission System

Unit – III Multiplexing
Multiplexing Techniques: FDM, TDM, STDM, Transmission Media: Classification and Selection of Media, Switching Networks: Packet, Circuit, Massage, Telephone Networks: Packet and Circuit Switching in telephone network

Unit – IV Error Detection and Correction
Types of Errors, Two dimensional parity check, Detection verses correction, Block Coding, Linear Block Coding, Cyclic Codes, Checksum, Standardized Polynomial Code, Error Correction Methods, Forward Error Correction

Unit – V Case Study

Reference Books
CS209 Computer Organization

Objectives

- To understand the basic hardware and software issues of computer organization
- To understand the representation of data at machine level
- To understand how computations are performed at machine level

Outcomes

- Ability to analyze the abstraction of various components of a computer
- Ability to analyze the hardware and software issues and the interfacing
- Ability to work out the tradeoffs involved in designing a modern computer system

Unit – I

Unit – II
MIPS Addressing for 32-Bit Immediates and Addresses, Parallelism and Instructions: Synchronization, Translating and Starting a Program, Addition and Subtraction, Multiplication, Division, Floating Point, Parallelism and Computer Arithmetic: Subword Parallelism, Streaming SIMD Extensions and Advanced Vector Extensions in x86.

Unit – III
Logic Design Conventions, Building a Datapath, A Simple Implementation Scheme, overview of Pipelining, Pipelined Datapath, Data Hazards: Forwarding versus Stalling, Control Hazards, Exceptions, Parallelism via Instructions, The ARM Cortex – A8 and Intel Core i7 Pipelines, Instruction –Level Parallelism and Matrix Multiply Hardware Design language

Unit – IV
Memory Technologies, Basics of Caches, Measuring and Improving Cache Performance, dependable memory hierarchy, Virtual Machines, Virtual Memory, Using FSM to Control a Simple Cache, Parallelism and Memory Hierarchy: Redundant Arrays of Inexpensive Disks, Advanced Material: Implementing Cache Controllers

Unit – V
Disk Storage and Dependability, RAID levels, performance of storage systems, Introduction to multi threading clusters, message passing multiprocessors.

Text Book

Reference Book
HM201 Corporate Communication

Objectives
- To help in participation in seminars, group discussions, and interviews successfully
- To prepare to present ideas effectively to different levels of people
- To enable write reports, research papers, and proposals

Outcomes
- Ability to express themselves meaningfully in seminars and GD
- Ability to write reports, notices, etc., required in the corporate world
- Ability to listen and comprehend and also retain information presented by others

Unit – I: Importance of Communication in the Corporate World
Corporate culture & communication – Networks & channels of communication – Barriers to communication – Strategies to overcome them - Role of psychology in communication- Internal & External Communication- Management & Communication - Institute & Corporate Social Responsibility

Unit – II: Fluent Oral Communication Techniques

Unit – III: Listening Skills
Importance of listening in the corporate world -Listening for information and content – Kinds of listening – Factors affecting this – Methods to overcome them – Retention of facts, data & figures- Role of Speaker in listening.

Unit – IV: Writing for Technical Purposes

Unit – V: Writing for Business Purposes

Reference Books
1. David Lindsay, “Scientific Writing = Thinking in Words”, 2011
CS213 Data Structures Laboratory

Objectives

- To analyze the time and space complexities and efficiency of various algorithms.
- To understand the practical application of linear and nonlinear data structures.
- To introduce and practice advanced algorithms, programming techniques necessary for developing sophisticated computer application programs.

Outcomes

- Ability to apply and implement the learned algorithm for problem solving
- Ability to identify the data structure to develop program for real time applications

Experiments

- Problems in C/C++/ Java using data structures involving arrays, stacks, queues, strings, linked lists, trees, graphs.
- Operations on stacks, queues and linked lists
- Conversion of infix expressions to postfix and evaluation of postfix expressions
- Implementation of priority queue
- Implementation of Binary Tree and Binary Search Tree
- Implementation of Sorting Techniques

CS215 Digital System Design Laboratory

Objectives

- To develop programs in Hardware Description Language
- To design and implement synchronous sequential, asynchronous sequential circuits
- To be familiar with basic combinational and sequential components used in the typical data path designs

Outcomes

- Ability to design synchronous sequential circuits using basic flip-flops, counters, PLA, PAL
- Familiarize with the necessary software skills to design basic digital systems
- Technical expertise in debugging the digital circuits

Experiments

- Design of a 32-bit carry look-ahead adder with logarithmic depth using Verilog
- Design of a Wallace tree multiplier using Verilog
- Design of a 4-bit DSP processor using Verilog
- Burning the 4-bit DSP processor on a FPGA
FOURTH SEMESTER
CS202 Operating Systems

Objectives
- To provide knowledge about the services rendered by operating systems
- To provide a detailed discussion of the various memory management techniques
- To discuss the various file-system design and implementation issues
- To discuss how the protection domains help to achieve security in a system

Outcomes
- Ability to comprehend the techniques used to implement the process manager
- Ability to comprehend virtual memory abstractions in operating systems
- Ability to design and develop file system interfaces, etc.
- Technical knowhow of the working principle of various types of operating systems

Unit – I

Unit – II

Unit – III
Memory Management Strategies – Contiguous and Non-Contiguous allocation – Virtual memory Management – Demand Paging- Page Placement and Replacement Policies

Unit – IV

Unit – V
Distributed Systems – Distributed operating systems – Distributed file systems – Distributed Synchronization.

Text Book

References Books
MA204 Introduction to Probability Theory

Objectives
- To introduce the fundamental concepts and theorems of probability theory
- To apply elements of stochastic processes for problems in real life
- To understand elementary queuing concepts and apply elsewhere in computer science.

Outcomes
- Conceptualize the necessity of randomness concept in practical situation
- Approximate the real problems using stochastic process and deduce results
- Deduce useful results and interpret them based on the analysis of queuing theory

Unit – I
Axioms of probability theory - Probability spaces - Joint and conditional probabilities- Bayes’ Theorem- Independent events.

Unit – II
*Random Variable and random vectors - Distributions and densities. Independent random variables – Functions of one and two random variables.*

Unit – III
Moments and characteristic functions - Inequalities of Chebyshev and Schwartz. Convergence concepts.

Unit – IV

Unit – V
Gaussian processes - Processes with independent increments - Poisson processes - Lowpass and Bandpass noise representations.

Text Books
CS206 Computer Networks

Objectives
- To provide insight about networks, topologies, and the key concepts
- To gain comprehensive knowledge about the layered communication architectures (OSI and TCP/IP) and its functionalities
- To understand the principles, key protocols, design issues, and significance of each layers in ISO and TCP/IP
- To know the basic concepts of network security and its various security issues related with each layer

Outcomes
- Obtain insight about basic network theory and layered communication architectures
- Provide solutions to various problems in network theory

Unit – I
Introductory Concepts - Network hardware - Network software – Review of Physical layer - Guided transmission media - Cable television

Unit – II
Data Link Layer - Design issues - Channel allocation problem - Multiple access protocols - Ethernet - Wireless LAN - 802.11 architecture

Unit – III
Network Layer - Design issues - Routing algorithms - Congestion control algorithms - Quality of Service - Internetworking

Unit – IV

Unit – V
Application Layer - DNS - Electronic mail - World Wide Web - Multimedia

Text Books

Reference Book:
CS208 Automata and Formal Languages

Objectives
- To introduce concepts in automata theory and theory of computation
- To identify different formal language classes and their relationships
- To design grammars and recognizers for different formal languages

Outcomes
- Ability to relate practical problems to languages, automata, and computability
- Ability to demonstrate an increased level of mathematical sophistication
- Ability to apply mathematical and formal techniques for solving problems

Unit – I Introduction
Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem

Unit – II Regular Expression (RE)
Regular expression (RE) Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen’s Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages. Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

Unit – III Context Free Grammar (CFG) and Context Free Languages (CFL)
Definition, Examples, Derivation, Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure proper ties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs

Unit – IV Push Down Automata (PDA)
Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG,

Unit – V Turing machines (TM)
Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church’s Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory
Text Book

Reference books
CS210 Advanced Algorithms

3-0-0-3

Objective
- To expose the students to advanced topics in algorithms including use of advanced concepts in data structures and algorithms for manipulations

Outcomes
- Ability to apply hashing techniques, use data structures in new algorithms
- Ability to comprehend complex real world scenarios and map to advanced algorithms understand

Unit – I
Review of algorithmic paradigms, Finding max and min in a list adversary arguments selection in expected liner time, selection in worst case, hashing technique- hash tables, hash functions, open hashing, perfect hashing, related theorems.

Unit – II
Binary search trees, AVL trees, randomly built binary search trees, optimal binary search trees, greedy strategy and matroids, weighted matroids and task scheduling problem, introduction to amortised analysis, illustrative examples

Unit – III
B-Trees, Binomial heaps, data structures for disjoint sets, shortest paths: difference constraints and shortest paths, proofs of shortest path properties, relationship to matrix multiplication, Floyd-Warshall algorithm, Johnson’s algorithm for sparse graphs

Unit – IV
Flow networks and their properties, Ford-Fulkerson method, maximum bipartite matching, FFT algorithm, DFT and FFT, efficient FFT implementation, primality testing basics, Miller-Rabin algorithm and its proof

Unit – V
Polynomial time and exponential time algorithms, 3-CNF satisfiability and other representative hard problems, decision and optimization problems, encodings, formal language framework, verification algorithms, classes P and NP, NP-Hard and NP complete problems, efficient reduction proofs via examples

Textbook
CS212 Combinatorics and Graph Theory

Objective
- To introduce basic combinatorics and graph theory

Outcomes
- Ability to apply combinatorial ideas in other mathematical arguments in other subjects e.g., analysis of algorithms, queueing theory, etc.
- Ability to comprehend graph theory fundamentals and tackle problems in dynamic programming, network flows, etc.

Unit – I
Scope of the course, Application areas in CS, A feel of some advanced problems in Combinatorial Optimization/ Graph Theory, Sum/Product rules, Power set - algorithm, Bijections/Mapping/Examples Permutations and combinations, examples, Combinatorial ideas, Pascal Triangle Counting principles via examples, Insertion sort, Stirling numbers

Unit – II
Average case analysis and combinatorial ideas Double counting - Fubini's method, PHP principle, various illustrations Stirling numbers of II kind, Combinatorial identities, Binominal theorem Multinomial theorem, P(n,t1, - - - ,tp) notation, Euler PHI-function, Properties, Steps in Sieve of Eratosthenes

Unit – III

Unit – IV
Basics of GFs, Review problems, Examples, GF manipulations Coupled difference equations, Graph theory fundamentals, Representations, Examples in CS - MST review, Party problem Distance in graphs, Floyd-Warshall algorithm, Operations in graphs, Meanings of products

Unit – V
Regular graphs, related results, Coloring, Cliques and independent sets, Trees, definitions, related problems, properties, Network Flows, Definitions, Related discussions and Max-Flow Min-Cut Theorem, Introduction to optimization problems in CS, LP formulation, Branch-and-Bound

Text books
CS214 Algorithms Laboratory

Objectives
- To learn how to analyze the complexity of algorithms
- To compare and evaluate algorithms in terms of time and space complexity
- To program brute force, divide and conquer, decrease and conquer, transform and conquer, greedy, and dynamic techniques

Outcomes
- Ability to solve and analyze general algorithms based on space and time complexity
- Ability to implement and empirically compare fundamental algorithms and data structures to real-world problems
- Knowledge about different algorithmic paradigms and optimization

Experiments
- Estimating worst-case/average-case complexity of algorithms via programs
- Determining machine constants
- Programs involving some advanced data structures
- Implementing example problems
- Illustrating the different paradigms of algorithm design
- Solving miscellaneous problems e.g. problems in string manipulation, graph theory, optimization

CS216 Operating Systems Laboratory

Objectives
- To understand the concept of Operating System
- To experience the practical side of the functioning of various blocks in OS

Outcomes
- Ability to make use of tools for solving synchronization problems
- Ability to compare and contrast various CPU scheduling algorithms
- Ability to understand the differences between segmented and paged memories

Experiments
1. Hands on Unix Commands
2. Shell programming for file handling
3. Shell Script programming using the commands grep, awk and sed
4. Implementation of CPU scheduling algorithms
5. Pthread Programming
6. Implementation of Synchronization problems using Semaphores, Message Queues and Shared Memory
7. Implementation of Memory Management - Allocation, Placement and replacement Algorithms
References
FIFTH SEMESTER

CS301 Computer Architecture

Objectives

- To understand the concept of advanced pipelining techniques
- To understand the current state of art in memory system design
- To know the working principle of I/O devices

Outcomes

- Ability to apply performance metrics to find the performance of systems
- Ability to identify the problems in components of computer
- Ability to comprehend and differentiate various computer architectures and hardware

Unit I


Unit II

Basic and Intermediate pipelining Concepts, The Major Hurdle of Pipelining – Pipeline Hazards, Pipelining Implementation, Implementation issues that makes Pipelining hard, Extending the MIPS Pipeline to Handle Multicycle Operations, The MIPS R4000 Pipeline.

Unit III


Unit IV


Unit V

Review of Memory Hierarchy Design, Cache Performance, Basic Cache Optimizations, Virtual Memory, Protection and Examples of Virtual Memory, Advanced Optimizations of Cache Performance, Memory Technology and Optimizations, Protection: Virtual Memory and Virtual Machines, Crosscutting Issues: The Design of Memory Hierarchies. Case Studies / Lab Exercises
Text Book

Reference Book
MA304 Principles of Operations Research

Objectives
- To classify and formulate real-life problem for modelling, solving and applying for decision making.
- To study the formulation and various methods of solutions for linear programming, transportation, assignment, CPM and PERT problems
- To solve problems using dynamic programming method

Outcomes
- Analyse problems in engineering, management, or business environment, focusing on important details
- Formulate real problems in terms of input-output-parameters relationships and identify the solution procedure

Unit - I
Introduction to operational research-Linear programming problems (LPP)-Graphical method-Simplex method-Big M Method-Dual simplex method-Primal Dual problems.

Unit – II
Dual theory and Sensitivity analysis-Transportation and assignment problems-Applications(Emphasis should be more on problems than theory)

Unit – III
CPM and PERT –Network diagram-Events and activities-Project Planning-Reducing critical events and activities-Critical path calculations-example-Sequencing problems.

Unit – IV
Replacement problems-Capital equipment-Discounting costs-Group replacement. Inventory models-various costs- Deterministic inventory models-Economic lot size-Stochastic inventory models-Single period inventory models with shortage cost.

Unit – V
Dynamic programming-Formulation-Invest problem-General allocation problem-Stage coach problem-Production Scheduling.

Text Books
- H. M. Wagner, Principles of operational research with applications to managerial decisions, PH, Inc, 1975
CS303 Internetworking Protocols

Objectives
- To know the design principles of internetworking protocols
- To know the implementation details of IPv4, IPv6, and TCP
- To adapt the IP for Mobile applications

Outcomes
- Ability to code and implement MAC protocols, IPv4, IPv6, and TCP
- Ability to design and develop Mobile IP

Unit – I

Unit - II
IPv4 headers, IP forwarding, Host Processing of IP datagrams, DHCP and Autoconfiguration, Firewalls and NAT, ICMPv4, IP Fragmentation, Broadcasting and Local Multicasting – IGMP and MLD, Routing Protocols

Unit – III
IPv6 Transition issues, Protocol basics, Addressing, Options and Extension headers, ICMPv6, Neighbor Discovery, Routing, Autoconfiguration, IPv6 and DNS

Unit – IV
Introduction to TCP, TCP Header and Encapsulation, TCP Connection Management, TCP Timeout and Retransmission, TCP Data Flow and Window Management, TCP Congestion Control, TCP Timers

Unit - V
Need for Mobile IP, Overview of Mobile IP, Details of Mobile IP, Tunneling, Mobility for IPv6, Applications of Mobile IP – Security primer, Campus Mobility, Internet wide mobility, A service provider perspective

Text Books

Reference Books
CS305 Database Management Systems

Objectives
- To learn data models, conceptualize and depict a database system using ER diagram
- To understand the internal storage structures in a physical DB design
- To know the fundamental concepts of transaction processing techniques

Outcomes
- Ability to Install, configure, and interact with a relational database management system
- Ability to master the basics of SQL and construct queries using SQL

Unit – I Introduction

Unit – II Relational Model
Relational Data Model - Concept of relations, schema-instance distinction, keys, referential integrity and foreign keys, relational algebra operators, SQL - Introduction, data definition in SQL, table, key and foreign key definitions, update behaviors. Querying in SQL, notion of aggregation, aggregation functions group by and having clauses, embedded SQL

Unit – III Database Design
Dependencies and Normal forms, dependency theory - functional dependencies, Armstrong's axioms for FD's, closure of a set of FD's, minimal covers, definitions of 1NF, 2NF, 3NF and BCNF, decompositions and desirable properties of them, algorithms for 3NF and BCNF normalization, 4NF, and 5NF

Unit – IV Transactions
Transaction processing and Error recovery - concepts of transaction processing, ACID properties, concurrency control, locking based protocols for CC, error recovery and logging, undo, redo, undo-redo logging and recovery methods.

Unit – V Implementation Techniques
Data Storage and Indexes - file organizations, primary, secondary index structures, various index structures - hash-based, dynamic hashing techniques, multi-level indexes, B+ trees.

Text Books
References Books
CS307 Software Engineering

Objectives
- To understand the Software Engineering Practice & Process Models
- To understand Design Engineering, Web applications, and Software Project Management

Outcome
- Ability to enhance the software project management skills

Unit-I

Unit-II

Unit-III

Unit–IV

Unit-V

Text books
CS309 Network Programming Laboratory

Objectives
- To create client and server applications using the "Sockets" API and the implementation of Data link layer protocol and TCP layer
- To conduct computer communication network simulations
- To have a hands on experience of computer network simulation and modeling techniques using NS-3 simulation software

Outcomes
- Ability to invoke analytical studies of Computer Networks through network simulation
- Technical knowhow of the various components in NS-3 toolkit and its importance in designing a real network

Experiments
1. Exercises on Socket Programming using C and Java
2. Exercises using NS-3 Network Simulator
   a. Basics of Network Simulation
      - Introduction, Platform required to run network simulator, Backend Environment of Network Simulator, Agents and applications, Tracing
   b. Simulating a Local Area Network
      - Local Area Network, LAN Topologies, MAC Protocol, Taking turns, Ethernet, Ethernet Frame Structure, Ethernet Versions, Simulating a LAN using Network Simulator 3
      - Implementation of various MAC protocols
      - Setting up of various network topologies
      - Measurement of routing protocols
   c. Measuring Network Performance
      - Setting up of network that carries various application protocols and analyzing the performances
3. Hands on experiments on Network equipments
   a. Switches, Routers
   b. Hardware firewall

References
CS311 Database Management Systems Laboratory

Objectives

- To explore the features of a Database Management Systems
- To interface a database with front end tools
- To understand the internals of a database system

Outcomes

- Ability to use databases for building client server applications
- Gaining knowledge about the internals of a database system

Experiments

- Working with DDL, DML and DCL
- Inbuilt functions in RDBMS.
- Nested Queries & Join Queries.
- Set operators & Views in SQL.
- Control structures.
- Working with Procedures and Functions.
- Triggers
- Dynamic & Embedded SQL
- Working with XML
- Forms & Reports
- Database Design and implementation (Mini Project)

References

SIXTH SEMESTER
CS302 Principles of Cryptography

Objectives
- To gain knowledge about the mathematics of the cryptographic algorithms
- To get an insight into the working of different existing cryptographic algorithms
- To learn how to use cryptographic algorithms in security

Outcomes
- Able to understand the basic concepts of symmetric cryptosystem, public key cryptosystem and digital signature scheme
- Able to reason about the security of cryptographic constructions
- Able to break the cryptosystems that are not secure

Unit – I
Number Theory:  Fermat's theorem, Cauchy 's theorem, Chinese remainder theorem, Primality testing algorithm, Euclid's algorithm for integers, quadratic residues, Legendre symbol, Jacobi symbol

Unit – II
Cryptography and cryptanalysis, Classical Cryptography, different type of attack: CMA, CPA, CCA etc., Shannon perfect secrecy, OTP, Pseudo random bit generators, stream ciphers and RC4

Unit – III
Block ciphers: Modes of operation, DES and its variants, finite fields ($2^n$), AES, linear and differential cryptanalysis

Unit – IV
One-way function, trapdoor one-way function, Public key cryptography, RSA cryptosystem, Diffie-Hellman key exchange algorithm, ElGamal Cryptosystem

Unit – V
Cryptographic hash functions, secure hash algorithm, Message authentication, digital signature, RSA digital signature

Text Book

Reference
3. Thomas Koshy, “Elementary Number Theory with Applications”, Elsevier India, 2005
4. Online course: course on cryptography by Dan Boneh
CS304 Service Oriented Architecture

Objectives
- To provide an overview of XML Technology and modeling databases in XML
- To provide an overview of Service Oriented Architecture and Web services and their importance
- To introduce Security solutions in XML and Web Services and to introduce Security standards for Web Services

Outcomes
- Ability to design and develop real work applications using the concepts of SOA and Web services
- Ability to comprehend approaches for providing security for XML documents as well as messages exchanged among Web Services

UNIT I XML Technology

UNIT II SOA Basics
Service Oriented Architecture (SOA) – Comparing SOA with Client-Server and Distributed architectures - Characteristics of SOA – Benefits of SOA -- Principles of Service orientation – Service layers - Business Process management

UNIT III Web Services (WS)

UNIT IV WS Technologies and Standards

UNIT V XML and WS Security

Text Books
**Reference Books**

CS306 Microprocessors and Microcontrollers

Objectives
- To understand the concepts of Architecture of 8086 microprocessor
- To understand the design aspects of I/O and Memory Interfacing circuits
- To understand the architecture and programming of ARM processor

Outcomes
- Ability to design and implement programs on 8086 microprocessor
- Ability to design I/O circuits and Memory Interfacing circuits
- Ability to design and develop components of ARM processor

Unit – I THE 8086 MICROPROCESSOR
Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.

Unit – II 8086 SYSTEM BUS STRUCTURE

Unit – III MICROCONTROLLER

Unit – IV INTRODUCTION TO EMBEDDED SYSTEMS
Complex systems and micro processors– Embedded system design process – Instruction sets preliminaries - ARM Processor – CPU: programming input and output supervisormode, exceptions and traps – Co-processors- Memory system mechanisms – CPU performance

Unit – V EMBEDDED COMPUTING PLATFORM DESIGN AND OPTIMIZATION
The CPU Bus-Memory devices and systems–Designing with computing platforms – platform-level performance analysis - Components for embedded programs-Models of programs- Assembly, linking and loading – compilation techniques- Program level performance analysis – Software performance optimization – Analysis and optimization of program size- Program validation and testing.
**Text Books**

**References Books**
CS308 Mobile Applications Development

Objectives
- To learn the basics of mobile application development
- To get accustomed to Android platform
- To develop skills in developing basic Android applications

Outcomes
- Ability to design and develop Android applications
- Acquire skill set to execute applications in Android based devices

Unit – I Introduction to Android
Native Android Application; SDK Features; Introduction to Open Handset Alliance; Development Framework; Creating Application: Creating applications, Creating Virtual Device, Running and Debugging Application; Developing for Mobile and Embedded Devices; Android Development Tools

Unit – II User Interfaces and Resource Management
Basic UI Design; Fragments; Widget Toolbox; Creating New View; Adapters; Introduction to Intents; Intent Filters and broadcast Receivers; Device Monitoring Using Broadcast Intents; Downloading and Parsing Internet Resources; Download Manager; Internet Services

Unit – III Files and Database Handling
Saving Application Data; Shared Preferences; Preference Framework and Activity; Static File as Resource; File System; Introduction to SQLite Database; Querying SQLite; Content Provider; Adding Search to Application; Native Android Content Provider

Unit – IV Background Services and User Experience Enhancement
Creating and Controlling Service; Binding Services to Activities; Background Threads; Alarms; Action Bar;Menus and Action Bar Items; Dialogs; Customizing Toast; Notifications; Adding Notification and Dialog to Earthquake Monitor

Unit – V Multimedia, Wireless Connectivity and Telephony
Audio and Video Handling; Manipulating Raw Audio; Sound Effects; Camera Programming; Video Recording; Managing Wireless Connectivity : WiFi, Bluetooth, Near Field Communication; Hardware Support for Telephony; Telephony Management; SMS and MMS

Reference Books
Objectives

- To learn the basics of mobile application development
- To get accustomed to Android platform
- To develop skills in developing basic Android applications

Outcomes

- Hands on experience in Android application
- Acquire skill set to execute applications in Android based devices

Experiments

1. Install the Android SDK and developer tools and build a test project to confirm that those tools are properly installed and configured
2. Write a program using a Table Layout for our restaurant data entry form, add a set of radio buttons to represent the type of restaurant
3. Write a program using activity class to show different events.
4. Write a program to send user from one application to another. (For example redirection to map)
5. Write a program to play audio files.
6. Write a program to play video files.
7. Write a program to capture image using built in camera.
8. Write a program to send SMS.
9. Write a program to convert text to speech.
10. Write a program to call a number.
CS312 Microprocessor and Microcontroller Laboratory

Objectives
- To understand and learn the assembly language programming of various microprocessor architectures
- To obtain the practical training of interfacing the peripheral devices with the processor.
- To control the components of a microprocessor based system through the use of interrupts.
- To have a practical knowledge on assembling PC hardware, installation and troubleshooting the Microprocessor and Microcontrollers.

Outcomes
- Obtain knowledge to do programs in assembly language programming using the trainer kits
- Utilize development kits effectively for the real time applications of various peripheral devices with the processor
- Hands on experience in interfacing devices with the microprocessor

Experiments
- Solving problems using 8085
- Interfacing various devices with the microprocessor: A/D converter, D/A converter, seven segment display, stepper motor, external keyboard, interrupt controller and 8251 for serial data transfer
- Interfacing using microcontroller trainer kits
- PC hardware assembly
- Installation and trouble shooting
SEVENTH SEMESTER
CS401 Web Technology

Objectives
- To understand the basics of Web Designing using HTML, DHTML, and CSS
- To learn the basics about Client side scripts and Server side scripts

Outcomes
- Ability to design and develop client side scripting techniques
- Ability to build real world applications using client side and server side scripting languages

Unit - I
HTML- List, Tables, Images, Forms, Frames, Cascading Style sheets. XML- Document type definition, XML Schemas, Document Object model

Unit – II
Java Script -Control statements, Functions, Arrays, Objects, Events, Dynamic HTML with Java Script, Ajax

Unit – III
Web servers – IIS (XAMPP, LAMPP) and Tomcat Servers. Java Web Technologies- Servlets, JavaServer Pages, Java Server Faces, Web Technologies in Netbeans, Building a Web Application in Netbeans, JSF Components, Session Tracking, Cookies

Unit – IV
PHP- Basics, String Processing and Regular Expressions, Form Processing and Business Logic, Using Cookies, Dynamic Content, Operator Precedence Chart

Unit – V
Database Connectivity with MySQL - Servlets, JSP, PHP. Case Studies- Student information system, Health Management System

Text books

Reference Books
CS403 Parallel Architectures and Programming

Objectives
- To understand the fundamental principles and engineering trade-offs involved in designing modern parallel computers
- To develop programming skills to effectively implement parallel architecture

Outcomes
- Ability to design parallel programs to enhance machine performance in parallel hardware environment
- Ability to design and implement parallel programs in modern environments such as CUDA, OpenMP, etc.

Unit – I
Introduction: The need for parallelism, Forms of parallelism (SISD, SIMD, MISD, MIMD), Moore's Law and Multi-cores, Fundamentals of Parallel Computers, Communication architecture, Message passing architecture, Data parallel architecture, Dataflow architecture, Systolic architecture, Performance Issues.

Unit – II
Large Cache Design: Shared vs. Private Caches, Centralized vs. Distributed Shared Caches, Snooping-based cache coherence protocol, directory-based cache coherence protocol, Uniform Cache Access, Non-Uniform Cache Access, D-NUCA, S-NUCA, Inclusion, Exclusion, Difference between transaction and transactional memory, STM, HTM.

Unit – III

Unit – IV
Introduction to Parallel Programming: Strategies, Mechanism, Performance theory, Parallel Programming Patterns: Nesting pattern, Parallel Control Pattern, Parallel Data Management, Map: Scaled Vector, Mandelbrot, Collative: Reduce, Fusing Map and Reduce, Scan, Fusing Map and Scan, Data Recognition: Gather, Scatter, Pack , Stencil and Recurrence, Fork-Join, Pipeline

Unit – V
Text Books/Reference Books
CS405 Principles of Compiler Design

Objectives
- To introduce the major concept areas of language translation and compiler design
- To enrich the knowledge in various phases of compiler and its use
- To provide practical programming skills necessary for constructing a compiler

Outcomes
- Ability to apply the knowledge of lex tool & yacc tool to develop a scanner & parser
- Ability to design and develop software system for backend of the compiler
- Ability to comprehend and adapt to new tools and technologies in compiler design

Unit – I Introduction to Compiling

Unit – II Syntax Analysis

Unit – III Intermediate Code Generation

Unit – IV Code Optimization and Run Time Environments

Unit – V Code Generation

Text Books
Reference books
2. C. N. Fischer and R. J. LeBlanc, “Crafting a compiler with C”, Benjamin Cummings, 2003
CS407 Network Security

Objectives

- To understand the network security, services, attacks, mechanisms, types of attacks
- To comprehend and apply authentication services, authentication algorithms
- To comprehend and apply network layer security protocols, Transport layer security protocols, Web security protocols.

Outcomes

- Be able to determine appropriate mechanisms for protecting the network.
- Design a security solution for a given application, system with respect to security of the system

Unit-I

Unit-II

Unit-III

Unit-IV
Intruders, Viruses, Worms, Trojan horses, Distributed Denial-Of-Service (DDoS), Firewalls, IDS, Honey nets, Honey pots.

Unit-V

Text Books

Reference Books
CS409 Web Technology Laboratory

Objectives
- To learn the basics in web designing using HTML, CSS, and XML
- To develop web applications using JSP, Servlets, PHP, and Net Beans

Outcomes
- Ability to design and develop web pages using HTML, CSS, and XML
- Ability to design and deploy real world applications using client side and server side scripting languages

Experiments
- Designing static web pages using HTML
- Designing dynamic web pages using different cascading style sheets
- Designing XML Schemas
- Programs using Java Script
- Programs using Java servlets and JSP
- Designing web applications using PHP
- Designing web applications in Net Beans Environment
- Database Connectivity with MySQL using Java Servlets, JSP, and PHP

CS411 Compiler Design Laboratory

Objectives
- To provide practical programming skills necessary for designing and implementing the various phases of a compiler
- To learn and use the compiler construction tools such as LEX and YACC for implementing the various phases of a compiler

Outcomes
- Ability to apply knowledge of LEX and YACC tools to develop a new compiler
- Ability to optimize a code

Experiments
1. Develop programs to implement regular expression to recognize and validate tokens
2. Develop programs to implement a Lexical Analyzer using LEX/FLEX for identifying and validating tokens of a language
3. Develop programs to identify left recursions and left factors and eliminate them from the grammar given
4. Develop programs using YACC to construct a parse tree and check the syntax of the statement
5. Develop programs using LEX & YACC to generate Intermediate code for a given fragment of a program
6. Develop program to optimize the intermediate codes
7. Develop program to generate an equivalent assembly program for a given HLL program fragment
EIGHTH SEMESTER

HM402 Software Project Management 3-0-0-3

Objectives
- To understand the basic concepts and issues of software project management
- To understand successful software projects that support organization's strategic goals

Outcomes
- Ability to maintain software projects and monitor software project process
- Ability to design and develop project modules and assign resources

Unit – I SPM concepts

Unit – II Software Measurements
Monitoring & measurement of SW development – cost, size and time metrics – methods and tools for metrics – issues of metrics in multiple projects.

Unit – III Software Quality
Quality in SW development – quality assurance – quality standards and certifications – the process and issues in obtaining certifications – the benefits and implications for the organization and its customers – change management.

Unit – IV Risk Issues
The risk issues in SW development and implementation – identification of risks – resolving and avoiding risks – tools and methods for identifying risk management.

Unit – V SPM Tools
Software project management using Primavera & Redmine and case study on SPM tools.

Text Books
List of Elective Subjects
CS313 Human Computer Interaction 3-0-0-3

Objectives
- To gain knowledge on the interplay between humans, tasks, technology, and contexts
- To gain knowledge on important human factors that affect HCI
- To be able to apply HCI principles, guidelines, methods, and techniques

Outcomes
- Ability to comprehend the basics of human and computational abilities and limitations
- Ability to evaluate the quality of a user interface
- Ability to apply appropriate HCI techniques to design systems that are usable by people

Unit – I
Introduction to Human-computer Interaction - Methodology for Designing User-computer Interfaces - Task analysis - Conceptual, semantic, syntactic, and lexical levels of the

Unit – II
Design of an interactive system - Interaction Styles - Question and answer - Form-based - Command language - Menus - Natural language - Direct manipulation - Virtual Reality - Augmented Reality - Other emerging interaction styles

Unit – III
Design and Evaluation Process - Prototyping - Testing and evaluating interface designs - Guidelines and criteria for designing UI, UI Software and Specifications - Languages and tools for specifying and building interfaces - Dialogue independence - UIMS Languages and software abstractions - Programming support tools - Basic Interaction Tasks, Techniques, and Devices

Unit – IV
Human Performance - Scientific foundations for designing user interfaces - Visual presentation of information - Graphical design - Designing experiments - Introduction to Research in Human-Computer Interaction - Why do HCI research? - Research prototypes - Interdisciplinary nature of HCI research - Examples of HCI research

Unit – V
New Interaction Techniques - New modes of human-computer communication - Voice Gesture - Eye movement - Tangible user interfaces - Brain-computer interfaces - Case Study.

Reference Books
CS315 Multimedia Systems

Objectives
- To understand the different media and design issues in multimedia systems
- To understand Multimedia security and data hiding for image/video

Outcomes
- To design multimedia components efficiently
- To develop integrated, collaborative multimedia systems
- To develop data hiding algorithms for the specialized applications

Unit – I Multimedia Elements

Unit – II Data and File Formats

Unit – III Multimedia Networks
Protocol - QOS Issues - RTP, RTCP, RTSP, SIP - Media on demand –ITV - STB
Broadcast Schemes for VoD Buffer Management- Multimedia over wireless networks

Unit – IV Multimedia Security and Forensics
Multimedia encryption -Digital Watermarking - Security Attacks- Digital Forensics taxonomy, goals/requirements - Forensic Data Acquisition -Forensics Analysis and Validation

Unit – V Multimedia Data Hiding
Overview– Data hiding framework-Key elements -Basic embedding mechanisms-Techniques for Embedding multiple bits-Quantitative model for Uneven embedding Capacity- CER-VER -Data Hiding in Binary image-Multilevel embedding-Multilevel image and video data hiding

Text Books

Reference Books
CS317 Mobile Computing and Communication

Objectives
- To understand the fundamentals of wireless communication.
- To understand the architecture of various Wireless Communication Networks.
- To understand the significance of different layers in mobile system

Outcomes
- Ability to develop a strong grounding in the fundamentals of mobile Networks
- Ability to apply knowledge in MAC, Network, and Transport Layer protocols of Wireless Network

Unit – I

Unit – II

Unit – III

Unit – IV

Unit – V
WAP Model- Mobile Location based services -WAP Gateway –WAP protocols – WAP user agent profile- caching model-wireless bearers for WAP - WML WMLScripts - WTA - iMode- SyncML.

Text Books
Reference Books

CS314 Wireless Network Systems

Objectives
- To understand the fundamentals of wireless communication
- To understand the architecture of different Wireless Networks
- To understand the significance of MAC and Network layers in Wireless Network System

Outcomes
- Be able to make critical assessment of wireless networks
- Develop a strong grounding in the fundamentals of Wireless Networks
- Apply the knowledge gained in the development of MAC, Network Layer protocols of Wireless Network

Unit – I Wireless Communications & Cellular System Fundamentals
Introduction to wireless communications systems, examples, comparisons and trends. Cellular systems, Frequency Management and Channel Assignment- types of handoff and their characteristics, dropped call rates & their evaluation. MAC techniques for Wireless Communication: FDMA, TDMA, MA (FHMA/CDMA/Hybrid techniques), SDMA techniques

Unit – II Wireless WAN

Unit – III Wireless LAN
Introduction to wireless LANs - IEEE 802.11 WLAN – Architecture and Services, Physical Layer, MAC sublayer- MAC Management Sublayer, Other IEEE 802.11 standards, HIPERLAN, WiMax standard.

Unit – IV Adhoc and Sensor Networks
Characteristics of MANETs, Table-driven and Source-initiated On Demand routing protocols, Hybrid protocols, Wireless Sensor networks- Classification, MAC and Routing protocols.

Unit – V Wireless MAN and PAN
Wireless MANs – Physical and MAC layer details, Wireless PANs – Architecture of Bluetooth Systems, Physical and MAC layer details, Standards.

Text Books
Reference Books
CS316 Design and Analysis of Parallel Algorithms

Objectives
- To understand parallel computing algorithms and models
- To analyze parallel algorithms for PRAM machines and various interconnection networks

Outcome
- Ability to design and analyze parallel algorithms for PRAM machines

Unit – I
Introduction to Parallel Computers - SIMD - EREW, CREW - SM-SIMD algorithms - Shared memory SIMD - Tree and mesh interconnection computers - Classifying MIMD Algorithms - Hypercube SIMD Model.

Unit – II

Unit – III
Matrix operations - Mesh transpose – Shuffle transpose - EREW transpose - Mesh multiplication - Cube multiplication - Matrix by vector multiplication - Tree multiplication.

Unit – IV

Unit – V

Text Book
Reference Book
CS318 Principles of Processor Design

Objectives
- To understand the basics of Verilog HDL
- To study about the design aspects of various circuits using Verilog

Outcome
- Ability to design and implement a CPU to exploit the full capability of Verilog HDL

Unit – I

Unit – II

Unit – III

Unit – IV
Design Examples – Bus structure – Simple processor – Timer – SRAM – Cache – Clock synchronization, Digital filters and signal processors - Pipelined Architectures - Halftone Pixel Image Converter

Unit – V
Register Transfer Level Design and Test – Sequential multiplier – Shift-and-add multiplication process - Sequential multiplier design - Multiplier testing - Von Neumann computer model – Processor and memory model - Processor model specification – Designing the adding CPU - Design of datapath - Control part design - Adding CPU Verilog description - Testing adding CPU - CPU design and test

Text Books

Reference Books
CS320 Data Warehousing and Data Mining  

Objectives
- To understand the principles of Data Warehousing and Data Mining
- To know the Architecture of a Data Mining system
- To perform classification, association, and prediction of data

Outcome
- To apply the Data Mining techniques in real time applications

Unit – I

Unit – II

Unit – III
Classification and Prediction: Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

Unit – IV

Unit – V

Text Book
1. Jiawei Han, Micheline Kamber, and Jian Pei, “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2011

Reference Books
4 Pang-Ning Tan, Michael Steinbach and Vipin Kumar “Introduction to Data Mining”, Pearson Education, 2007
CS322 Real Time Systems

3-0-0-3

Objectives
- To study issues related to the design and analysis of systems with real-time constraints.
- To learn the features of Real time OS.
- To study the various Uniprocessor and Multiprocessor scheduling mechanisms.
- To learn about various real time communication protocols.
- To study the difference between traditional and real time databases

Outcomes
- Knowledge about Schedulability analysis.
- Ability to learn Real-time programming environments.
- Knowledge about real time communication and databases.
- Ability to develop real time systems.

Unit – I
Introduction to real-time computing - Structure of a real-time system - Characterization of real-time systems and tasks - Performance measures.

Unit – II
Task Assignment and Scheduling - Uniprocessor scheduling algorithms - Task assignment - Mode changes - Fault tolerant scheduling.

Unit – III
Real-time Communication - Network topologies and architecture issues - Protocols - Contention-based, token-based, polled bus - Fault tolerant routing.

Unit – IV
Real-time Databases - Transaction priorities and aborts - Concurrency control issues - Scheduling algorithms - Two-phase approach to improve predictability.

Unit – V
Programming Languages and Tools - Hierarchical decomposition - Run-time error handling - Overloading - Timing specification - Recent trends and developments.

Text Book

Reference Books
CS413 Big Data Analytics

Objectives
- To understand the financial value of big data analytics
- To explore tools and practices for working with big data
- To understand how big data analytics can leverage into a key component

Outcomes
- Ability to apply the concepts of big data analytics for a domain
- Ability to design and develop Hadoop and Map Reduce Framework
- Ability to contextually integrate and correlate large amounts of information

UNIT – I Introduction to Big Data

UNIT – II Data Analysis

UNIT - III Stream Computing

UNIT – IV Predictive Analytics and Visualization
UNIT – V Frameworks and Applications

Text Books/Reference Books
CS415 Cloud Computing

Objectives
- To provide comprehensive knowledge of fundamental concepts and of cloud computing
- To demonstrate an understanding of Service models, deployment models, Virtualization
- To describe the programming and software environments of Cloud
- To shed light on the security issues in Cloud

Outcomes
- Ability to articulate the Virtualization concepts
- Ability to identify the architecture, service models and deployment models of Cloud
- Ability to master the programming aspects of Cloud

Unit – I

Unit – II
Virtual Machines and Virtualization – Implementation levels of Virtualization – Virtualization structures/tools and Mechanisms – Virtualization of CPU, Memory and I/O Devices – Storage Virtualization

Unit – III

Unit – IV

Unit – V

Text Book

Reference Books
CS417 Artificial Intelligence and Expert Systems

Objectives
- To learn the concepts of Artificial Intelligence
- To learn the methods of solving problems using Artificial Intelligence
- To introduce the concepts of Expert Systems and machine learning

Outcomes
- Ability to identify problems that are amenable solution by AI methods to solve a given problem
- Ability to design and carry out an empirical evaluation of different algorithms

Unit – I
Introduction to AI, Control strategies, Search strategies, Production system characteristics - Specialized production system- Problem solving methods - Problem graphs, Matching, Indexing and Heuristic functions - Hill Climbing-Depth first and Breath first, Constraints satisfaction - Related algorithms, Measure of performance and analysis of search algorithms.

Unit – II
Game playing - Knowledge representation, Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic-Structured representation of knowledge.

Unit – III
Knowledge representation - Production based system, Frame based system. Inference - Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning - Certainty factors, Bayesian Theory-Bayesian Network-Dempster - Shafer theory.

Unit – IV

Unit – V

Text Books

Reference Books
Objectives
- To understand basics of embedded system programming
- To know how the intricacies of Embedded programming

Outcomes
- Ability to design and develop application Specific embedded System
- Ability to comprehend the importance of Embedded programming for real time systems

Unit – I Introduction to Embedded System Programming

Unit – II Getting Started with Embedded Programming
Assembly verses High Level language, Integrated Development Environment, Building Process for Embedded System, Types of Memory for Embedded System, Memory Management methods and Bug Handling, Interrupts and ISRs handling in Embedded Systems, Simulators and Debuggers for Embedded System

Unit – III Designing Elements of Embedded System Program
Basic Input Output Device Interface Programming, Developing Programmable Interrupt Controller, Timers and Counters, LCD hardware and Programming, Analog to Digital Clock, Introduction to data EEPROM

Unit – IV Real Time Programming for Embedded System
Scheduling in Real Time Environment, Real Time Clock Designing, Real Time Operating System Support for Programming, Task Management in Real Time Environment, Semaphores handling, Message Queuing: States, Content, Storage, Introduction to Kernel Objects

Unit – V Case Study on Embedded System Programming

Reference Books
CS421 Advanced Cryptography

Objectives
- To study the concepts of applied cryptography
- To understand the application of cryptographic techniques in real world applications
- To comprehend the notion of provable security and its implication with improved security guarantees

Outcomes
- Ability to break cryptosystems that are not provably secure
- Ability to derive simple provable security proofs for cryptographic schemes
- Ability to design and implement cryptographic protocols

Unit – I
Review of number theory, group, ring and finite fields, quadratic residues, Legendre symbol, Jacobi symbol,

Unit – II

Unit – III
Public key cryptography, RSA cryptosystem, probabilistic encryption, homomorphic encryption, Elliptic curve cryptosystems, Blum-Goldwasser cryptosystems, identity based encryption, Cryptographic hash functions.

Unit – IV
Digital signatures and the notion of existential unforgability under chosen message attacks, ElGamal digital signature scheme, Schnorr signature scheme, blind signature, electronic voting.

Unit – V
Zero Knowledge Proofs and Protocols, lattice based cryptography

Reference Books
   Thomas Koshy, “Elementary Number Theory with applications”, Elsevier India, 2005
CS402 Randomized Algorithms

Objectives
- To introduce randomized algorithms at undergraduate level
- To introduce the concepts of probabilistic analysis of algorithms

Outcomes
- Ability to apply basics of probability theory in the analysis of algorithms
- Ability to design and implement randomized techniques in solving real world problems

Unit – I
Elements of probability theory, Verification of strings, poly identities, matrix multiplication Las Vegas and Monte Carlo algorithms, Expectations, Jensen's Inequality, Coupon collector's problem, geometric distribution

Unit – II
Randomized Quick Sort and its expected run-time, Variance and moments, Chebyshev's inequality, Coupon collector's problem, randomized median finding, analysis, moment generating functions

Unit – III
Derivation and application of Chernoff's bounds, Sum of Poisson Trials, Coin flips, Set balancing, Packet routing in sparse networks, permutation routing on the hypercube, butterfly

Unit – IV
Birthday paradox, balls and bins model, application to bucket sort, Poisson distribution, Application to hashing, random graph models, Hamiltonian cycles in random graphs

Unit – V
Markov chains, representations, randomized algorithm for 2-satisfiability and 3-satisfiability, classification of states, gambler's ruin, random walks on undirected graphs, s-t connectivity algorithm.

Text book
- M. Mitzenmacher and E. Upfal, “Probability and computing: Randomized algorithms and Probabilistic analysis”, Cambridge, 2005
CS404 Natural Language Processing

Objectives
- To understand the application of computational methods in linguistics
- To apply statistical and probabilistic methods for parameter estimation and inference
- To know how the computational methods give insight into observed human language phenomena

Outcomes
- Ability to compare and contrast approaches to natural language processing
- Ability to comprehend and analyze the various elements speech
- Ability to design and develop machine learning techniques in the area of NLP

Unit – I
Sound: Biology of Speech Processing; Place and Manner of Articulation; Word Boundary Detection; Argmax based computations; HMM and Speech Recognition.

Unit – II
Words and Word Forms: Morphology fundamentals; Morphological Diversity of Indian Languages; Morphology Paradigms; Finite State Machine Based Morphology; Automatic Morphology Learning; Shallow Parsing; Named Entities; Maximum Entropy Models; Random Fields.

Unit – III
Structures: Theories of Parsing, Parsing Algorithms; Robust and Scalable Parsing on Noisy Text as in Web documents; Hybrid of Rule Based and Probabilistic Parsing; Scope Ambiguity and Attachment Ambiguity resolution.

Unit – IV
Meaning: Lexical Knowledge Networks, Wordnet Theory; Indian Language Wordnets and Multilingual Dictionaries; Semantic Roles; Word Sense Disambiguation; WSD and Multilinguality; Metaphors; Coreferences.

Unit – V
Web 2.0 Applications: Sentiment Analysis; Text Entailment; Robust and Scalable Machine Translation; Question Answering in Multilingual Setting; Cross Lingual Information Retrieval (CLIR).

Text books/Reference books
CS406 Network Processor Design

Objectives
- To understand the basics of networking and network processor architecture
- To understand basic concepts of processor scheduling and various parameters used for measuring performance of the network processor

Outcomes
- Ability to comprehend the network processor and its communication mechanisms
- Ability to design and implement various programming aspects of network processors

Unit – I

Unit – II
Processor scheduling- Fibre channel/ Infiniband Implementation. Performance And Analysis Packet Processing-Framing-parsing and classification- search , Lookup and Forwarding-Compression and encryption- Queueing and Traffic Management-Packet flow handling-NP Peripherals

Unit – III

Unit – IV

Unit – V

Text Books

Reference Books
CS408 Image Processing

Objectives
- To understand the fundamentals of Digital imaging and Image Processing techniques
- To be familiar with image compression and segmentation

Outcomes
- Ability to design and apply image enhancement and restoration techniques
- Ability to apply image compression and segmentation Techniques

Unit – I

Unit – II

Unit – III

Unit – IV
Recognition of Image Patterns : Introduction, Decision Theoretic Pattern Classification, Baesian Decision Theory, Nonparametric Classification, Linear Discriminant Analysis, Unsupervised Classification Strategies-clustering, K-means clustering algorithm, Syntactic Pattern Classification, Syntactic Inference, Symbolic Projection method. Texture and Shape Analysis

Unit – V

Text Book

Reference Book
CS410 Software Quality Assurance

Objectives
- To understand software quality management process and quality management models
- To learn software quality metrics, assurance and various software standards

Outcome
- Ability to apply basic software quality assurance practices to ensure software quality and standards

Unit – I

Unit-II

Unit-III
Software Quality Infrastructure Components- Procedures and Work Instructions - Supporting Quality Devices - Staff Training, Instructing and Certification - Preventive and Corrective Actions - Configuration Management - Documentation and Quality Records Controls

Unit-IV
Management Components Software Quality - Project Progress Control- Components, Internal & External Participants, Progress control regimes, Computerized tools, Software Quality Metrics – Objective, Classification, Process & Product Metrics, Implementation & Limitation of Software Metrics - Software Quality Costs – Objective, Classification Model of cost, Extended Model and Applications

Unit-V

Text Books
CS412 Advanced Database Management Systems

Objectives
- To understand the different database models and language queries to access databases
- To understand the normalization forms in building an effective database tables
- To protect the data and the database from unauthorized access and manipulation

Outcomes
- Ability to write complex queries including full outer joins, self-join, sub queries, and set theoretic queries.
- Technical knowhow of the file organization, Query Optimization, Transaction management, and database administration techniques

Unit – I Relational Model Issues
ER Model - Normalization – Query Processing – Query Optimization – Transaction Processing - Concurrency Control – Recovery - Database Tuning

Unit – II Distributed Databases

Unit – III Object Oriented Databases

Unit – IV Emerging Systems
Enhanced Data Models - Client/Server Model - Data Warehousing and Data Mining – Web Databases – Mobile Databases- XML and Web Databases

Unit – V Current Issues

Text Books

References
Honors Elective

CS451 Distributed Algorithms

Objectives
- To understand the fundamental algorithms and protocols that are commonly used in distributed computing
- To learn the basics about synchronous and asynchronous models

Outcomes
- Ability to design and develop distributed algorithms for specific problems
- Ability to design and develop distributed algorithms for real world problems

Unit - I
Introduction, Synchronous Network Model, Leader election in a synchronous ring, Algorithms in general synchronous networks, Distributed consensus with link failures, Distributed consensus with process failures.

Unit - II
Asynchronous system model, Asynchronous shared memory model, mutual exclusion, resource allocation, consensus and atomic objects

Unit - III
Asynchronous network model, basic asynchronous network algorithms and synchronizers

Unit - IV
Shared memory versus networks, logical time, global snapshots and stable properties, network resource allocation, partially synchronous system models.

Unit - V
Fault Tolerance in distributed systems, Fault Tolerance in asynchronous systems, Fault Tolerance in asynchronous systems, failure detection - stabilization

Text Books
CS452 High Speed Networks

Objectives
- To understand up-to-date survey of developments in High Speed Networks
- To know how techniques involved to support real-time traffic and congestion control
- To understand different levels of quality of service (QoS) to different applications

Outcomes
- Ability to design and develop protocols for high speed networks
- Ability to analyze various parameters of high speed networks
- Ability to compare various high speed network architectures

Unit – I

Unit – II

Unit – III

Unit – IV
Integrated Services Architecture – Approach, Components, Services- Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ – Random Early Detection, Differentiated Services

Unit – V

Text Book

Reference Books
CS453 Software Defined Networking

Objectives
- To know the reduced Complexity of Network Operation
- To understand the concepts of minimize Layer and maximize Network Resources
- To understand the Faster Time to Revenue for New Applications

Outcomes
- Ability to comprehend Software Defined Networks
- Ability to design and implement software defined network as per requirements

Unit – I

Unit – II
VMware, Nicira, Mininet, NOX/POX, Trema, Ryu, Big Switch Networks/Floodlight, Layer 3 Centric – L3VPN, Path Computation Element Server, Plexxi Affinity, Cisco OnePK, Management Interface, Network Divide, Modern Programmatic Interfaces, Modern Orchestration.

Unit – III
Multitenant Data Center, Virtualized Multitenant Data Center, SDN Solutions for Data Center Network, VLANs, EVPN, VxLan, NVGRE, Virtualization and Data Plane I/O, Services Engineered Path, Service Locations and Chaining, NEV at ETSI, Non-ETSI NEV Work.

Unit – IV
Network Topology, Traditional Methods, LLDP, BGP-TE/LS, ALTO, I2RS, Build Code First, The Juniper SDN Framework(s), Open Daylight Controller/Framework, Policy.

Unit – V

Textbook
CS454 Transaction Processing Systems
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Objectives
- To knowhow in processing data generated by and about transactions that maintain high
degree of accuracy and integrity
- To understand and recognize fraudulent transactions and produce timely user responses
and reports

Outcomes
- Ability to develop solutions that addresses all of the information processes
- Ability to design and develop techniques where information systems shall meet emerging
needs
- Ability to analyze situations, identify needs, propose and develop solutions

Unit – I
Consistency, Atomicity, Durability, Isolation, Flat Transactions, Providing Structure within a
Transaction, Structuring an Application as Multiple Transactions.

Unit – II
Schedules and Schedule Equivalence, Recoverability, Cascaded Aborts and Strictness, Models
for Concurrency Control, A Strategy for Immediate-Update Pessimistic Concurrency Controls,
Design of an Immediate-Update Pessimistic Concurrency Control, Objects and Semantic
Commutativity, Atomicity, Recoverability and Compensating Operations, Isolation in Structured
Transaction Models, Conflicts in a Relational Database, Locking and the SQL Isolation Levels,
Granular Locking: Intention Locks and Index Locks, Tuning Transactions, Multiversion
Concurrency Controls.

Unit – III
Crash, Abort and Media Failure, Immediate-Update Systems and Write-Ahead Logs, Recovery
in Deferred-Update Systems, Recovery from Media Failure.

Unit – IV
Transaction Processing in a Centralized System, Transaction Processing in a Distributed System,
The TP Monitor: An Overview, Global Atomicity and the Transaction Manager, Remote
Procedure Call, Peer-to-Peer Communication, Event Communication, Storage Architectures,
Transaction Processing on the Internet, Implementing the ACID Properties, Atomic Termination,
Transfer of Coordination, Distributed Deadlock, Global Serialization, When Global Atomicity
cannot be Guaranteed, Replicated Databases, Distributed Transactions in the Real world.

Unit – V
Authentication, Authorization and Encryption, Digital Signatures, Key Distribution and
Authentication, Authorization, Authenticated Remote Procedure Call, Electronic Commerce, The
Secure Sockets Layer Protocol: Certificates, Passport: Single Sign-On, Keeping Credit Card
Atomicity, Certified Delivery, and Escrow, Electronic Cash: Blind Signatures.
Textbook
CS455 Pervasive Computing

Objectives
- To understand the characteristics and principles of Pervasive computing and the solutions that are in use of everywhere computing and invisible computing
- To design and implement pervasive application that are embedded into cars, airplanes, ships, bikes, posters, signboards, walls and even clothes

Outcomes
- Ability to analyze and compare the performance of different data dissemination techniques
- Ability to develop solutions with comparisons for problems related to pervasive computing system through investigation

Unit – I Introduction
Pervasive Computing- Principles, Characteristics- interaction transparency, context aware, automated experience capture, Vision and challenges of pervasive computing, Pervasive computing infrastructure- Architecture for pervasive computing- Pervasive devices-embedded controls.- smart sensors and actuators -Context communication and access services

UNIT – II Technologies

UNIT – III Sensor Networks and RFID

UNIT – IV Web based Applications

UNIT – V Programming And Applications
Server-side programming (Java) for pervasive computing: Java 2 Enterprise Edition (Overview), Servlets, Enterprise Java Beans, Java Server Pages, Extensible Markup Language, Web Services, Model-View-Controller pattern, Application Examples of Pervasive Computing: Retail, Airline Check-in and booking, Sales force automation, Healthcare, Tracking, Car Information Systems, Email Access via WAP and voice
Text Books

CS456 Programming for Multi-Core Systems

Objectives

- To understand the fundamentals of multi-core architecture
- To be able to know the basic concepts of multi core programming using threads
- To be able to understand various programming constructs in multi-core architecture

Outcomes

- Ability to exploit the benefit of parallel programming
- Ability to design and develop APIs for Multithreaded Applications

Unit – I Fundamentals of Multi core

Unit – II Introduction to Threads
Defining threads-System View of threads-Threading above the OS-Inside the OS-Threads inside the Hardware-What happened When a thread is created-Application Programming models and threading-VMs and Platforms-Run time Virtualization, System Virtualization.

Unit – III Thread Programming Types and APIs
Synchronization-Critical Section-Deadlock-Synchronization Primitives-Semaphores-Locks-Condition Variables-Flow Control based Concepts-Implementation based Threading Features-Threading APIs for Microsoft Windows-Threading API for .NET framework, POSIX Threads-Programming With Pthreads, OpenMP-Challenges in threading a loop-Minimizing threading overhead-Performance oriented programming- JavaThreads

Unit – IV Thread Handling and Debugging
Too many threads-Data Races, Deadlock and Live locks-Heavily Contended Locks-Non-blocking algorithms-Thread safe functions and libraries-Memory Issues –Cache Related Issues-Avoiding Pipeline Stalls in IA-32-Data Organization for High Performance, Multithreaded Debugging Techniques: General Debugging Techniques

Unit – V Implementation of the Programming Constructs
Foundations of Shared Memory, Spin Locks and Contention- Monitors and Blocking Synchronization- Concurrent Queues and the ABA Problem- Concurrent Stacks and Elimination-Counting, Sorting, and Distributed Coordination Concurrent Hashing and Natural Parallelism-Skip lists and Balanced Search- Futures, Scheduling, and Work Distribution- Barriers-Transaction Memory - Software Transactional Memory-hardware Transactional Memory – Threading on Intel Multicore Processors.
Text Books

Reference Books
CS457 Soft Computing

Objectives
- To understand the concepts of feed forward & feedback neural networks
- To understand the concept of fuzziness involved in various systems
- To expose the ideas about genetic algorithm
- To provide adequate knowledge about of FLC and NN toolbox

Outcomes
- Ability to use the concepts of machine learning and soft computing techniques in solving real world applications
- Ability to make use of MATLAB in solving soft computing techniques

Unit – I

Unit – II

Unit – III

Unit – IV
Basic concept of Genetic algorithm and detail algorithmic steps-adjustment of free Parameters- Solution of typical control problems using genetic algorithm- Concept on some other search techniques like tabu search and ant colony search techniques for solving optimization problems.

Unit – V
GA application to power system optimization problem- Case studies: Identification and control of linear and nonlinear dynamic systems using Matlab-Neural Network toolbox. Stability analysis of Neural Network interconnection systems- Implementation of fuzzy logic controller using Matlab fuzzy logic toolbox-Stability analysis of fuzzy control systems
Text Books
CS458 Digital System Testing and Verification

Objectives
- To design the Models at various levels and detects the faults in modeling
- To learn the testability techniques and to learn the Verilog for building the systems
- To test and verify the validity of the Model

Outcomes
- Ability to design the modeling of systems
- Ability to write the test bench to test the validity of the model
- Ability to write Verilog code to build the systems

Unit I

Unit II

Unit III

Unit IV
Design for Testability: Testability, Ad Hoc Design for Testability Techniques, Controllability and Observability by means of Scan Registers, Generic Scan-Based Designs, Storage cells for Scan designs, Classical scan designs, Scan Design Costs, Board level and system level DFT Approaches, Advanced scan concepts, Boundary Scan Standards.

Unit V
Basics of Test and Role of HDLs: Design and Test, Test Concerns, HDLs in Digital System Test. Verilog HL for Design and Test: HDL for developing test methods, Using verilog in design, Using verilog in test, Basic structures of verilog, Combinational Circuits, Sequential circuits. Fault and detectiona modeling using verilog
Text Books

Reference Book
CS459 CAD for VLSI

Objectives
- To provide experience designing integrated circuits using Computer Aided Design (CAD) Tools
- To introduce the concepts and techniques of modern integrated circuit design and testing (CMOS VLSI)
- To understand the programming paradigms of Hardware Description language (HDL)

Outcomes
- Ability to acquire hands-on skills of using CAD tools in VLSI design
- Ability to design and develop VLSI project having a set of objective criteria and design constraints.

Unit I
Introduction to CAD tools, Evolution of Design Automation, Basic Transistor Fundamentals, CMOS realizations of basic gates.

Unit II
Modelling techniques, Types of CAD tools and Introduction to logic simulation

Unit III
Verilog: Syntax, Hierarchical modelling and Delay modelling, Verilog constructs, Memory modelling

Unit IV
Logic Synthesis: Introduction synthesis of different Verilog constructs.

Unit V
Introduction to Reconfigurable computing, FPGAs, the Altra Quartus II flow.

Text Books
CS460 Middleware Technologies

Objectives
- To understand the essence of client-server and middleware architectures
- To learn the basics of CORBA and C#.NET technologies

Outcomes
- Ability to comprehend of Middleware tools
- Ability to build real time applications based on .Net and C#

Unit – I
Introduction to client server computing- client server models, Benefits of client server computing, pitfalls of client server programming, Middleware – Client / server building blocks, RPC, RMI

Unit – II
Middleware – Objects, Elements, Architecture, Middleware distributed applications, middleware types, transaction oriented middleware

Unit – III
CORBA with Java - Client/Server CORBA-style, The object web CORBA with Java, The static CORBA, first CORBA program, ORBlets with Applets, Dynamic, CORBA Beans, CORBA initialization protocol, CORBA activation services, CORBA java- to- IDL mapping

Unit – IV
EJBs and CORBA - Object transaction monitors CORBA OTM’s, EJB and CORBA OTM’s, EJB container frame work, Session and Entity Beans, The EJB client/server development Process The EJB container protocol, support for transaction EJB packaging EJB design Guidelines.

Unit – V
Introducing C# and the .NET Platform- Understanding .NET Assemblies, Object Oriented Programming with C#, Callback Interfaces, Delegates, and Events, Type Reflection, Late Binding, and Attribute-Based Programming, Object Serialization and the .NET Remoting Layer

Text Books

Reference Books