# DEPARTMENT:
COMPUTER SCIENCE & ENGINEERING

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Qualification</th>
<th>Position</th>
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<tbody>
<tr>
<td>1</td>
<td>Dr. Niranjan.N. Chiplunkar</td>
<td>Ph.D.</td>
<td>Professor/Principal</td>
</tr>
<tr>
<td>2</td>
<td>Dr. K C Shet</td>
<td>Ph.D.</td>
<td>Professor</td>
</tr>
<tr>
<td>3</td>
<td>Dr. Sarojadevi H</td>
<td>Ph.D.</td>
<td>Prof. and HOD</td>
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<tr>
<td>4</td>
<td>Mrs. Sharada U Shenoy</td>
<td>M.Tech(PhD)</td>
<td>Asst. Prof Gd III</td>
</tr>
<tr>
<td>5</td>
<td>Mr. Venugopala P.S.</td>
<td>M.Tech(PhD)</td>
<td>Asst. Prof Gd III</td>
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<tr>
<td>6</td>
<td>Mr. Roshan Fernandes</td>
<td>M.Tech(PhD)</td>
<td>Asst. Prof Gd III</td>
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<tr>
<td>7</td>
<td>Mrs. Neelima B</td>
<td>M.Tech(PhD)</td>
<td>Asst. Prof Gd III</td>
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<tr>
<td>8</td>
<td>Ms. Shalini P.R</td>
<td>M.Tech</td>
<td>Asst. Prof Gd III</td>
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<tr>
<td>9</td>
<td>Mr. Radhakrishna Dodmane</td>
<td>M.Tech</td>
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<tr>
<td>10</td>
<td>Mr. Raju K</td>
<td>M.Tech(PhD)</td>
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<td>11</td>
<td>Mr. Pradeep Kanchan</td>
<td>M.Tech</td>
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<tr>
<td>12</td>
<td>Mr. Sudeepa K B</td>
<td>M.Tech(PhD)</td>
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<tr>
<td>13</td>
<td>Mr. Ravi B</td>
<td>M.Tech(PhD)</td>
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<td>14</td>
<td>Mr. Vijaya Murari T</td>
<td>M.Tech</td>
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<tr>
<td>15</td>
<td>Mr. Chandra Naik</td>
<td>M.Tech</td>
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<td>16</td>
<td>Mr. Manjunath Kamath</td>
<td>M.Tech</td>
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<td>17</td>
<td>Mrs. Pallavi K N</td>
<td>M.Tech</td>
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<td>18</td>
<td>Mrs. Reeva S.R</td>
<td>M.Tech(PhD)</td>
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<td>19</td>
<td>Mr. Hemanth Kumar G</td>
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<td>20</td>
<td>Mr. Pradeep Nazareth</td>
<td>M.Tech</td>
<td>Asst. Prof Gd II</td>
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<td>21</td>
<td>Mr. Ranjan Kumar H S</td>
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<td>22</td>
<td>Mrs. Anisha P Rodrigues</td>
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<td>23</td>
<td>Mr. Ramesha Shettigar</td>
<td>M.Tech</td>
<td>Asst. Prof Gd I</td>
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<td>24</td>
<td>Ms. Grantha K.N</td>
<td>M.Tech</td>
<td>Asst. Prof Gd I</td>
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<tr>
<td>25</td>
<td>Ms. Savitha Shetty</td>
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<td>26</td>
<td>Ms. Sharmila Shanthi Sequeira</td>
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<td>27</td>
<td>Mr. Sannidhan M.S</td>
<td>M.Tech</td>
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<td>28</td>
<td>Mr. Naveen Chandaverkar</td>
<td>M.Tech</td>
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<td>29</td>
<td>Mr. Pawan Hegde</td>
<td>M.Tech</td>
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<tr>
<td>30</td>
<td>Mrs. Keerthana B. Chigateri</td>
<td>M.Tech</td>
<td>Asst. Prof Gd I</td>
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<td>31</td>
<td>Mrs. Asmita Poojari</td>
<td>M.Tech</td>
<td>Asst Prof Gd-I</td>
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<td>32</td>
<td>Mr. Raghunandan K R</td>
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<td>Asst Prof Gd-I</td>
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<td>33</td>
<td>Mrs. Minu P. Abraham</td>
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<td>34</td>
<td>Mrs. Shabari Shedthi. B</td>
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<tr>
<td>35</td>
<td>Mr. H R Manjunath Prasad</td>
<td>M.Tech(PhD)</td>
<td>Asst. Prof Gd I</td>
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</table>
Department of Computer Science & Engineering

Vision: To become a hub of academic activities of the Computer Science & Engineering and a center of excellence in the field of computer science education.

Mission: To transform the students into Computer Science graduates who would be ready to take up any challenge in the field of computer science as well informed, attuned, adapted and responsible, by imparting the state of the art concepts and technologies

Program: B.E. Computer Science & Engineering
PEO’s (Program Educational Objectives)

1. Graduates must gain the ability to identify, formulate & solve challenging Computer science and Engg. problems both theoretically and practically.
2. Graduates must develop professional and communication skills that prepare them for immediate employment or for adapting to emerging trends by engaging in life-long learning in Computer science and related disciplines.
3. Graduates be provided with an educational foundation that prepares them for leadership roles along diverse career paths and work in a team.
4. Graduates must develop an understanding of the social and human context in which their engineering contribution will be utilized.

Program Outcomes (PO’s):

a. An ability to apply knowledge of mathematics, science and engineering
b. An ability to design and conduct experiments, as well as to analyze and interpret data
c. An ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability

d. An ability to function on multidisciplinary teams

e. An ability to identify, formulate and solve engineering problems

f. An understanding of professional and ethical responsibility

g. An ability to communicate effectively

h. The broad education necessary to understand the impact of engineering solutions in global, economic environmental and societal context

i. A recognition of the need for and an ability to engage in lifelong learning

j. An ability to apply engineering and project management principles.

k. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

l. An ability to understand and apply the concepts of programming and computer design & technology

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<tr>
<th>PO’s</th>
<th>Graduate Attributes</th>
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<tr>
<td>a</td>
<td>Engineering Knowledge</td>
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<td>b</td>
<td>Conduct investigations of complex problems</td>
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<td>c</td>
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## DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

### SCHEME OF TEACHING

V Semester

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Code</th>
<th>Subject</th>
<th>Hours/week</th>
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**Elective –I**

- 12CS511. Advanced Unix Programming
- 12CS512. Signals & Systems Theory
- 12CS513. Digital Signal Processing
- 12CS514. Data Compression
- 12CS515. Operations Research
## SCHEME OF TEACHING

### VI Semester

<table>
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<tr>
<th>Sl. No.</th>
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**Elective –II** | **Elective-III**
---|---
12CS611. Pattern Recognition | 12CS621. VLSI Design
12CS613. Software Testing | 12CS623. Microcontrollers
12CS614. Advanced DBMS | 12CS624. Embedded and Real Time Systems
12CS615. Cloud Computing and Infrastructure Management | 12CS625. Programming Languages

* These classes will be held only during the first week of the semester.

Note: Where ever there is a combined theory and lab, students must score minimum passing marks in each of the component.
COMPILER DESIGN

Subject Code : CS501 Credits : 04
Hrs / Week : 4 Total Hours : 52

UNIT - I
Lexical Analysis:
Lexical Analysis - The Role of Lexical Analyzer, Input Buffering, Specifications of Tokens, Recognition of Tokens, A Language for Specifying Lexical Analyzer, LEX programming. 11 Hrs

UNIT - II
Syntax Analysis:
The Role of the Parser, Context-free Grammars, Top-down Parsing, Bottom-up Parsing, Operator-Precedence Parsing. 11 Hrs

UNIT - III
Syntax Analysis:
LR Parsers –Simple LR (SLR), Canonical LR (CLR), Look Ahead LR (LALR) Parsers, YACC programming. 11 Hrs

UNIT - IV
Syntax-Directed Translation:
Syntax-Directed definitions, Constructions of Syntax Trees, Bottom-up Evaluation of S-attributed definitions, L-attributed definitions.
Intermediate Code Generation:
Intermediate Languages, Declarations, Assignments, Boolean Expressions. 11 Hrs

UNIT - V
Code Generation:
Issues in the design of Code Generator, The Target Machine, Run-time Storage Management, Basic blocks and Flow graphs, Next-use
information, A Simple Code Generator, Register Allocation and Assignment, The DAG representation of Basic Blocks.

**Code Optimization:**
Introduction, The Principle of Optimization, Optimization of Basic Blocks, Loops in flow graphs  

**TEXT BOOKS:**
2. Leland L Beck, System Software

**REFERENCE BOOKS:**
3. Internet resources for advanced compilation  
4. Language Processing Tools by John R Levine, O’Reilly Publication

**COMPILER DESIGN LAB**

<table>
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<th>Hrs / Week</th>
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<td>02</td>
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</table>

1. Students have to carry out experiments based on LEX and YACC  
2. The following mini projects need to be carried out by the students in groups  
   a. Implementing the SIC assembler  
   b. Writing a mini compiler for a hypothetical language (e.g. a subset of C), generating the 8086 compatible assembly code. This code may be assembled and executed using MASM and debug to check for the correctness.
RELATIONAL DATABASE MANAGEMENT SYSTEM

Subject code : 12CS502  Credits : 04  
Hrs/Week : 04  Total Hours : 52

UNIT - I

Introduction to database systems
Introduction, Characteristics of the Database approach, Actors on the scene, Advantages of using the DBMS approach, Data models, Schemes and Instances, Three Schema Architecture and Data Independence.

Entity-Relationship Model
Using High-Level Conceptual Data Models for Database Design; An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; Refining the ER Design for the COMPANY Database; ER Diagrams, Naming Conventions and Design Issues. 10 Hrs

UNIT - II

Relational Model And Relational Algebra
Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations and Dealing with Constraint Violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations: JOIN and DIVISION; Additional Relational Operations; Examples of Queries in Relational Algebra; Relational Database Design Using ER- to-Relational Mapping. 11 Hrs

UNIT - III

SQL-The Relational Database Standard
SQL Data Definition and Data Types, Specifying Basic Constraints in SQL, Schema Change Statements in SQL; Basic Queries in SQL; More Complex SQL Queries; Insert, Delete and Update Statements in SQL; Additional Features of SQL; Views (Virtual Tables) in SQL; Database Programming: Issues and Techniques; Embedded SQL. 10 Hrs
UNIT - IV

Database Design
Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form; Properties of Relational Decompositions; Algorithms for Relational Database Schema Design; Multivalued Dependencies and Fourth Normal Form; Join Dependencies and Fifth Normal Form. **10Hrs**

UNIT - V

Transaction Management
The ACID Properties; Transactions and Schedules; Concurrent Execution of Transactions; Lock- Based Concurrency Control; Performance of Locking; Transaction Support in SQL ;Introduction to Crash Recovery; 2PL,Serializability and Recoverability; Introduction to Lock Management; Lock Conversions; Dealing with Deadlocks; Specialized Locking Techniques; Concurrency Control without Locking; Introduction to recovery: Recovery Concepts, Recovery Techniques Based on Deferred Update, Recovery Techniques Based on Immediate Update, Shadow Paging, The Aries Recovery Algorithm. **11 Hrs**

TEXT BOOKS:

REFERENCE BOOK:
RDBMS LABORATORY

Subject Code : 12CS502
Credits : 01
Hrs / Week : 02

Student must carry out experiments using some RDBMS package (like MS-SQL/Oracle/DB2..) at the back end and some visual programming tool at the front end (like VB/VC++/D2K..). Typical experiments must include query processing applications. All SQL statements must be made use of by the student in developing the application.

MICROPROCESSORS AND PERIPHERALS

Subject Code : 12CS503
Credits : 05
Hrs/Week : 4
Total Hours : 52

UNIT - I
Microprocessor and 8086 Architecture.
- 8086 internal architecture
- 8086 Instruction Descriptions and Assembler Directives
- 8086 Addressing modes and Instruction Formats

8086 / 8088 Hardware Specifications.
- Pin Functions
- Basic 8086 Configurations: (Min. and Max. Modes)

8086 Instruction Set

10 Hrs

UNIT - II
Programming the Microprocessor
Programming based on instruction set, Modular Programming, Using the Key Board and Video Display, DOS & BIOS interrupts, Data Conversions, Disk files, Example Programs.

Memory interface to 16bit and 32 bit & 64 bit Microprocessors, examples

10 Hrs
MICROPROCESSORS AND PERIPHERALS

Subject Code : 12CS503  Credits : 05
Hrs/Week : 4  Total Hours : 52

UNIT - I
Microprocessor and 8086 Architecture.
8086 internal architecture
8086 Instruction Descriptions and Assembler Directives
8086 Addressing modes and Instruction Formats
8086 / 8088 Hardware Specifications.
Pin Functions
Basic 8086 Configurations: (Min. and Max. Modes)
8086 Instruction Set  10 Hrs

UNIT - II
Programming the Microprocessor
Programming based on instruction set, Modular Programming, Using the Key Board and Video Display, DOS & BIOS interrupts, Data Conversions, Disk files, Example Programs.
Memory interface to 16bit and 32 bit & 64 bit Microprocessors, examples  10 Hrs

UNIT - III
Arithmetic Co Processor
Data formats for the arithmetic co-processor, 80 x 87 architecture, Instruction set.
Interrupt Controller and DMA Controller
8259 A Programmable Interrupt Controller, Basic DMA Operation,
8237 DMA Controller  10 Hrs

UNIT - IV
Introduction to Advanced Microprocessors
Salient features of 80186,80286,80386,80486 and Pentium Family processors up to P-IV, special registers, MMX and SSE, Overview of Protected Mode and Address translation  11 Hrs
UNIT - V
Interfacing
Programmable Parallel Ports and Handshake Input/Output, Interfacing a Microprocessor to Keyboards, 7-segment Displays, stepper motor, Logic controller, Elevator, DAC interface for waveform generation, ADC interface.  11 Hrs

TEXT BOOKS:
1. Microprocessors- Douglas V.Hall, Revised 2nd Edition
5. 8051 Microcontroller- Kenneth Ayala

MICROPROCESSOR LABORATORY
Subject Code : 12CS503  Credits : 01
Hrs / Week : 02
Student must use MASM/TASM, appropriate linker and debug utility to carry out 8086 assembly language program experiments. Typical programmes include
1. Searching
2. Sorting
3. String manipulation
4. usage of Macros and subroutines
5. DOS interrupt usage
6. BIOS interrupt usage
7. Keyboard interface
8. Display interface
9. Logic controller interface
10. DAC interface
11. Stepper Motor control interface
12. Elevator interface
13. Some examples of Real Mode programming in Pentium.
14. Student must be encouraged to do some chip level interfacing with 8086.
SOFTWARE ENGINEERING

Subject Code : 12CS504  
Credits : 04
Hrs/ week : 04  
Total Hours : 52

UNIT - I

Overview

Requirements
Software Requirements: Functional and Non-functional requirements; User requirements; System requirements; Interface specification; The software requirements document. Requirements Engineering Processes: Feasibility studies; Requirements elicitation and analysis; Requirements validation; Requirements management.  

UNIT - II

System models, Project Management
System Models: Context models; Behavioral models; Data models; Object models; Structured methods.
Project Management: Management activities; Project planning; Project scheduling; Risk management.

UNIT - III

Software Design
Architectural Design: Architectural design decisions; System organization; Modular decomposition styles; Control styles.
Object-Oriented design: Objects and Object Classes; An Object-Oriented design process; Design evolution.

UNIT - IV

Development
Rapid Software Development: Agile methods; Extreme programming; Rapid application development.
Software Evolution: Program evolution dynamics; Software maintenance; Evolution processes; Legacy system evolution.
Verification and Validation
Verification and Validation: Planning; Software inspections; Automated static analysis; Verification and formal methods. Software testing: System testing; Component testing; Test case design; Test automation. **11 Hrs**

**UNIT - V**

Management
Managing People: Selecting staff; Motivating people; Managing people; The People Capability Maturity Model. Software Cost Estimation: Productivity; Estimation techniques; Algorithmic cost modeling, Project duration and staffing. **10 Hrs**

**TEXT BOOKS:**

**REFERENCE BOOKS:**

**OPERATING SYSTEMS**

<table>
<thead>
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<th>Subject Code</th>
<th>Credits</th>
<th>Hrs/ week</th>
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<td>12CS505</td>
<td>04+01</td>
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**UNIT – I**

Introduction to Operating Systems, System structures: Operating System structure; Operating System operations(functions), Operating System Services; User - Operating System interface; System calls; Types of system calls; System programs; Operating System design and implementation; Operating System structure; Virtual machines; Operating System generation; System boot.
Process Management: Process concept; Process scheduling; Operations on processes; Inter-process communication.

Multi-Threaded Programming: Overview; Multithreading models; Thread Libraries; threading issues. Process - thread comparison. 10 Hrs

UNIT – II

Process Scheduling: Basic concepts; Scheduling criteria; Scheduling algorithms; Multiple-Processor scheduling; thread scheduling.

Process Synchronization
Synchronization: The Critical section problem; Peterson’s solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors.

Deadlocks
Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock. 10 Hrs

UNIT – III

Memory Management: Memory Management Strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation. Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing. 10 Hrs

UNIT – IV

File System, Implementation of File System File System: File concept; Access methods; Directory structure; File system mounting; File sharing; Protection.
Implementing File System: File system structure; File system implementation;
Directory implementation; Allocation methods; Free space management. 11 Hrs

UNIT – V

Secondary Storage Structures, Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Swap space management.
Self Study Component: The Linux & Windows Operating System:
- History;
- Design principles;
- Kernel modules;
- Process management;
- Scheduling;
- Memory management;
- File systems, Input and output;
- Inter-process communication - Comparison.

Tutorials: Students may be asked to go through the LINUX kernel code to understand the OS design. Students may be asked to implement a few algorithms related to operating system. 11 Hrs

Note: Students must submit a report for the studies conducted & programs implemented at the end of semester.

TEXT BOOKS:

REFERENCE BOOKS:

ADVANCED UNIX PROGRAMMING

Subject Code : 12CS511  
Credits : 03  
Hrs/Week : 03  
Total Hours : 39

UNIT - I
The POSIX standards. File types. General File APIs, File handling programs. 7 Hrs

UNIT - II
Makefile – introduction, creation and execution of make file.
THE PROCESS: Introduction, Mechanism for creating process. The UNIX Kernel support for process.
THE ENVIRONMENT OF A UNIX PROCESS: Introduction, main function, Process Termination, Command line arguments, Environment List, Memory layout Of a C program, Memory allocation, Environment variables, functions. 8 Hrs

UNIT - III
Set jmp and long jmp functions, getrlimit, setrlimit
SIGNALS: The UNIX Kernel Support for signals, Signal, 8 Hrs

UNIT - IV
Signal mask, Sigaction, The SIGCHLD Signal and waitpid functions, The sigset jmp and sig long jmp Functions, Kill, Alarm, Interval Timers, POSIX .1b Timers.
DAEMON PROCESSES: Introduction, Daemon Characteristics, Coding Rules. 8 Hrs

UNIT - V
INTERPROCESS COMMUNICATIONS: Overview of IPC Methods, Pipes, popen, Pclose functions, FIFOs, Message Queues, Semaphores, Shared Memory.
SOCKETS: Introduction, functions, Client/Server Message Handling Example. 8 Hrs

TEXT BOOKS:

REFERENCE BOOKS:
3. R. Stones, N. Matthew, Beginning Linux Programming, Wrox publication.

SIGNALS AND SYSTEMS THEORY

Subject Code : 12CS512 Credits : 03
Hrs/Week : 3 Total Hours : 39

UNIT - I

Introduction
Definitions of a signal and a system, classification of signals, basic operations on signals, elementary signals, systems viewed as interconnections of operations, properties of systems. 7 Hrs

UNIT - II

Time-domain representations for LTI systems
Convolution, impulse response representation, properties of impulse response representation, differential and difference equation representations, block diagram representations. 8 Hrs

UNIT - III

Fourier representation for signals
Introduction, Fourier representations for four signal classes, orthogonality of complex sinusoidal signals, DTFS representations, continuous-time-Fourier-series representations, DTFT and FT representations, properties of Fourier representations. 8 Hrs

UNIT - IV

Application of Fourier representations
Frequency response of LTI systems, solution of differential and difference equations using system function, Fourier transform
representations for periodic signals, sampling of continuous time signals and signal reconstruction.  8 Hrs

UNIT- V

Z-Transforms
Introduction, Z-transform, properties of ROC, properties of Z-transforms, inversion of Z-transforms, transforms analysis of LTI systems, transfer function, stability and causality, unilateral Z-transforms and its application to solve difference equations.  8 Hrs

TEXT BOOK:

   Chapters : 1.1 to 1.8, 2.2 to 2.5, 3.1 to 3.6, 4.2 to 4.3, 4.7, 7.1 to 7.6, 7.8

REFERENCE BOOKS:


**DIGITAL SIGNAL PROCESSING**

<table>
<thead>
<tr>
<th>Subject code</th>
<th>Credits</th>
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<tr>
<td>12CS513</td>
<td>03</td>
<td>3</td>
<td>39</td>
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</table>

UNIT - I

The Discrete Fourier Transform:
Its Properties and Applications
Frequency Domain Sampling: The Discrete Fourier Transform: Frequency Domain Sampling and Reconstruction of Discrete-Time Signals, The Discrete Fourier Transform (DFT), The DFT as a Linear
Transformation, Relationship of the DFT to other Transforms.
Properties of the DFT: Periodicity, Linearity and Symmetry
Properties, Multiplication of Two DFT’s and Circular Convolution,
Additional DFT Properties. Linear Filtering Methods Based on the
DFT: Use of the DFT in Linear Filtering, Filtering of Long Data
Sequences. Frequency Analysis of Signals using the DFT.

8 Hrs

UNIT - II

Efficient Computation of the DFT: Fast Fourier Transform Algs
Efficient Computation of the DFT: FFT Algorithms:
Direct Computation of the DFT, Divide-and-Conquer Approach to
Computation of the DFT, Radix-2 FFT Algorithms, Radix-4 FFT
Algorithms, Split-Radix FFT Algorithms, Implementation of FFT
Algorithms. Applications of FFT Algorithms: Efficient computation
of the DFT of Two Real Sequences, Efficient computation of the DFT
of a 2N-Point Real Sequence, Use of the FFT Algorithm in Linear
filtering and Correlation. A Linear filtering approach to Computation
of the DFT: The Goertzel Algorithm, The Chirp-Z Transform
Algorithm. Quantization Effects in the Computation of the DFT:
Quantization Errors in the Direct Computation of the DFT, Quantization Errors in FFT Algorithms.

8 Hrs

UNIT - III

Implementation of Discrete-Time Systems
Structures for FIR Systems: Direct-Form Structures, Cascade-Form
Structures, Frequency-Sampling Structures, Lattice Structure.
Structures for IIR Systems: Direct-Form Structures, Signal Flow
Graphs and Transposed Structures, Cascade-Form Structures, Parallel-
Form Structures, Lattice and Lattice-Ladder Structures for IIR
Systems.
State-Space System Analysis and Structures: State-Space Descriptions
of Systems Characterized by Difference Equations, Solution of the
State-Space Equations, Relationships between Input-Output and State-
Space Descriptions, State-Space Analysis in the Z-Domain,
Additional State-Space Structures.

8 Hrs
UNIT - IV

**Representation of Numbers**
Fixed-Point Representation of Numbers, Binary Floating-Point Representation of Numbers, Errors Resulting from Rounding and Truncation.
Quantization of Filter Coefficients: Analysis of Sensitivity to Quantization of Filter Coefficients, Quantization of Coefficients in FIR Filters.

8 Hrs

UNIT - V

**Digital Signal Processors**
Architecture, features and instructions of Fixed and Floating point Processors.  (TMS320c25 and TMS32067)  

7 Hrs

**TEXT BOOKS :**

**REFERENCE BOOKS:**
6. Digital Signal Processors: by B.Venkataramini&M.Bhaskar

**DATA COMPRESSION**

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<th>Subject Code</th>
<th>Credits</th>
<th>Hrs/Week</th>
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<tr>
<td>12CS514</td>
<td>03</td>
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<td>39</td>
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**UNIT - I**

*Introduction, Lossless Compression -1*

Compression techniques; Modeling and Coding.
Mathematical preliminaries for lossless compression: Overview; Basic concepts of Information Theory; Models; Coding; Algorithmic information theory; Minimum description length principle.
Huffman coding: Overview; The Huffman coding algorithm, Minimum variance Huffman codes; Application of Huffman coding for text compression.  

**UNIT - II**

*Lossless Compression -2*

Dictionary Techniques: Overview; Introduction; Static dictionary; Adaptive dictionary; Applications: UNIX compress, GIF, PNG, V.42.
Lossless image compression: Overview; Introduction; Basics; CALIC; JPEG-LS; Multiresolution approaches; Facsimile encoding: Run-length coding, T.4 and T.6.

**UNIT - III**

*Basics of Lossy Coding*

Some mathematical concepts: Overview; Introduction; Distortion criteria; Models. Scalar quantization: Overview; Introduction; The quantization problem; Uniform quantizer; Adaptive Quantization.

*Vector Quantization, Differential Encoding*

Vector quantization: Overview; Introduction; Advantages of vector quantization over scalar quantization; The LBG algorithm.
Differential Encoding: Overview; Introduction; The basic algorithm; Prediction in DPCM; Adaptive DPCM. 8 Hrs

UNIT - IV

Some mathematical Concepts, Transform coding
Some mathematical concepts: Linear Systems; Sampling; Discrete Fourier Transform; Z-transform.
Transform coding: Overview; Introduction; The transform; Transforms of interest; Quantization and coding for transform coefficients.

Subband Coding, Audio Coding
Subband coding: Overview; introduction; Filters; The basic subband coding algorithm; Bit allocation. Audio coding: Overview; introduction; MPEG audio coding. 8 Hrs

UNIT - V

Wavelet- Based Compression
Overview; Introduction; Wavelets; Multiresolution and the scaling function; Image compression; JPEG 2000.

Video Compression
Overview; Introduction; Motion compensation; Video signal representation; H.261; Model-based coding; Asymmetric applications; MPEG-1 and MPEG-2; H.263; H.264; MPEG-4 and advanced video coding 8 Hrs

TEXT BOOK:
   (Chapters1,2 (excluding 2.2.1 and 2.4.3), 3.1, 3.2, 3.2.1, 3.8.2, 5, 7.1 to 7.5, 7.6, 7.6.1, 7.6.2, 8.1 to 8.3, 8.6, 9.1 to 9.5, 10.1 to 10.4, 11.1 to 11.5, 12.6 to 12.9, 13.1 to 13.5, 14.1 to 14.4, 14.9, 15.1 to 15.4, 15.6, 15.9, 16.1 to 16.3, 18.1 to 18.12)

REFERENCE BOOK:
OPERATIONS RESEARCH

Subject Code : 12CS515  Credits : 03
Hrs/Week : 03  Total Hours : 39

UNIT - I
Introduction
Introduction to OR, nature and meaning, applications, modeling in OR, phases of OR study
Linear Programming
Introduction to Linear Programming through an example, graphical method, formulation of LP model from practical problems, assumptions and properties of linear programming, simplex method 7 Hrs

UNIT – II
Revised simplex method, Big M method, 2 phase method, Duality theory, Primal and dual relationship, Dual simplex method. 8 Hrs

UNIT - III
Transportation Problems:
Special types of main programming, transportation problems, methods to find initial feasible solution and modification to obtain optimal solution (Degeneracy in transportation problems, unbalanced transportation problems 8 Hrs

UNIT - IV
Assignment problem
Mathematical formulation of an assignment problem, unbalanced assignment problem, TSP, Hungarian method. 8 Hrs

UNIT - V
CPM, PERT
Representation of a project by a network, activities and events, starting times, finishing times, floats, slacks, CPM, Idea of crashing probabilistic times and PERT analysis. 8 Hrs

TEXTBOOKS:

REFERENCE BOOKS:
1. Operation research, Kantiswaroop, Manmohan and Gupta
2. Introduction to operation research, a computer oriented algorithmic approach, Gillelt B G, McGraw Hill, 1976

COMPUTER GRAPHICS AND MULTIMEDIA

Subject Code : 12CS601
Crédits : 04
Hrs/Week : 04
Total Credits : 52

UNIT – I
2 Hrs

Raster Graphics Algorithms:
Scan converting lines & circles: Midpoint algorithm, Filling rectangles, Filling Polygons, Clipping lines: Cohen Sutherland, Liang Barsky algorithms, Clipping polygons: Sutherland-Hodgeman algorithm, Antialiasing.
8 Hrs

UNIT – II
2 Hrs

Geometrical Transformations (3D): Matrix representation of 3D Transformations, Transformations as change in coordinate system
3 Hrs

5 Hrs
UNIT - III
Curves, Fractals and Shading: Polygon surfaces, curved lines and surfaces, Quadratic surfaces, Spline Representation, Bezier & B-Spline Curves & Surfaces, Fractal Geometry methods, Illumination models, Shading models for polygons, surface details and shadows. 10 Hrs

UNIT - IV

UNIT - V

TEXT BOOKS:

REFERENCE BOOK:
COMPUTER GRAPHICS & MULTIMEDIA LABORATORY

Subject Code : 12CS601  Credit : 01
Hrs / Week : 02

A. Student has to write and execute programs in C/C++ using OPENGL on Windows/Linux platform to implement a few graphics applications like:
   1. Transformations in both 2D and 3D
   2. Clipping
   3. 3D viewing
   4. Hidden line removal
   5. Fractal generation

B. Student may also be asked to implement one or two graphics algorithms like Line drawing or Circle drawing or Filling by using only graphic primitives

C. Graphics Mini project implementation using Open GL.

COMPUTER NETWORKS

Subject Code : 12CS602  Credits : 04
Hrs/Week : 04  Total Hours : 52

UNIT – I

Introduction to Computer Networks
UNIT – II

Network Layer (Part-I)

UNIT – III

Network layer (Part – II)

UNIT – IV

Network layer (Part – III)

UNIT – V

The Transport Layer
The Transport Service: Services Provided to the Upper Layers, Transport Service Primitives, Elements of Transport Protocols: Addressing, Connection Establishment, Connection Release, Flow Control and Buffering, Multiplexing, Crash Recovery; The Internet

The Application Layer: DNS - Domain Name System, The WWW, Static Web documents, Dynamic Web documents. 11 Hrs

TEXT BOOKS:

REFERENCE BOOKS:

COMPUTER NETWORKS LABORATORY
Subject Code: 12CS602 Credits: 01
Hrs / Week: 2
A. Student must carry out socket programming based experiments for file transfer and message transfer using TCP and UDP
B. Use of any one Network Simulator (Like NS2/Etheral) to simulate some networking scenario and performance evaluation. Tcl/Tk programs also may be included
C. Study of Router/Firewall configuration, Use of Network Monitoring tool, study of Proxy settings
JAVA AND INTERNET TECHNOLOGIES

Subject Code : 12CS603 Credits : 04
Hrs/Week : 4 Total Hours : 52

UNIT - I
Introducing Classes – Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, this keyword, Method overloading, Using objects as parameters, Argument passing, Returning objects, Access control, static, final, Using command line arguments, variable length arguments.
Inheritance – Inheritance Basics, Using super, creates a Multilevel Hierarchy, When constructors are called? Method Overriding, Using abstract classes, Using final with Inheritance.
Packages and Interfaces – Packages, Access protection, Importing Packages, Interfaces.
Exception Handling – Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, multiple catch Clauses, Nested try statements, throw, throws, finally. 10 Hrs

UNIT - II
Multithreaded Programming – The Java Thread Model, The Main Thread, Creating a Thread, Creating Multiple Threads, Using isAlive() and join(), Thread Priorities, Synchronization, Inter-thread Communication.

UNIT - III
Introducing Swings – component and container, Event handling, Painting,Exploring Swings, Swings UI components.
File Handling - Serial Access Files, File Methods, Redirection, Command Line Parameters, Random Access Files.
UNIT - IV
Java Database Connectivity (JDBC) - The Vendor Variation Problem, SQL and Versions of JDBC, Creating an ODBC Data Source, Simple Database Access, Modifying the Database Contents, Transactions, Meta Data, Scrollable ResultSets in JDBC 2.0, Modifying Databases via Java Methods, Using the DataSource Interface
Concurrency Utilities, Synchronization objects. Collection framework, Collection interfaces, Collection classes. Legacy classes.

8 Hrs

UNIT - V

PHP
Overview of PHP, General Syntactic Characteristics, Primitives, Output, Arrays, Functions, Pattern Matching, Form Handling, Files. Database Access with PHP and MySQL.

11 Hrs

TEXT BOOKS:

REFERENCE BOOKS:
JAVA AND INTERNET TECHNOLOGIES
LABORATORY

Subject Code : 12CS603 Credits : 01
Hrs / Week : 02

1. Java programs that includes each of the topic discusses in the theory.
2. Programs on Java Script, Simple programs and programs to design simple user interface using HTML.
3. a) Simple programs on PHP to process user data.
   b) Developing a data base application using PHP, Mysql and Apache – HTML as GUI.

INSTRUCTIONS:
1. In exam two programs may be asked randomly in any combination.
2. Any number of programs can be practiced in lab under each section.
3. Programs should incorporate as many features as possible.
4. Program need may be based on various features of the technology being used.
5. It is mandatory to score minimum marks both in Theory and Lab.

DISTRIBUTED OPERATING SYSTEMS

Subject code : 12CS604 Credits : 03
Hrs/Week : 03 Total Hours : 39

UNIT - I

Introduction to Distributed Systems:
Fundamentals:- What is Distributed Computing Systems?, Distributed Computing System Models, What is DOS?, Issues in designing a DOS.
Remote Procedure Calls: The RPC model, Transparency of RPC, Implementing RPC mechanism, Stub generation, RPC messages, Marshaling Arguments and results. Server management, Parameter passing semantics, call semantics, communication protocols RPC’s. Complicated RPCs, Client – server binding, Exception handling, Security. 7 Hrs
UNIT - II
Synchronization in distributed Systems:
Clock synchronization – logical clocks – physical clocks – clock synchronization algorithms, Mutual exclusion – A centralized algorithm – A distributed algorithm – a token ring algorithm, Comparison of the three algorithms, Election algorithms – the Bully algorithm – ring algorithm, Dead locks in distributed systems – distributed deadlock avoidance algorithms – distributed deadlock prevention algorithms, distributed deadlock detection algorithms: Centralized approach, Hierarchical approach and Fully distributed approach. 8 Hrs

UNIT - III
Process Migration:
Naming: Introduction, Desirable Features of Good Naming System, System-Oriented Names, Object-Location Mechanism, Human Oriented Names, Name Caches. 8 Hrs

UNIT - IV
Distributed Shared Memory: General structure, Design and implementation issues of DSM, Granularity, Structure of shared memory space, Consistency Models, Replacement Strategy, Thrashing
Distributed File Systems:
Desirable features of a good distributed file system, file models, file accessing models, file sharing semantics, file Replication. 8 Hrs

UNIT - V
Resource Management: Desirable features, task management approach, load balancing approach, load sharing approach.
Security: Introduction, Cryptography, Authentication, Access Control, Digital Signatures. 8 Hrs
TEXT BOOK:

REFERENCE BOOKS:

ENTRY EDGE: IMMERSIVE GROUP WORKSHOP (IGW)

Subject Code: 12CS605
Duration: 5 Days
Timings : 9.00 AM to 12.30 PM, 1.15 PM to 4.45 PM

Syllabus
Module 1: Minds-on and hands-on simulation project

- Understanding Task environment – Goals, responsibilities, Task focus
- Working in Teams towards common goals
- Organizational performance expectations–technical and behavioural competencies.

Module 2: Re- enforcement of critical individual skills and behaviours

- Application of individual effectiveness skills in team and organizational context – improving self-awareness, goal setting, time management, communication and presentation skills.
Module 3: Etiquettes and Ethics
- Professional etiquettes at workplace – dressing, telephone, e-mail, meeting and general behaviour
- Basic honesty & respect for law / rules
- Conflict of interest
- Use of organizational resources
- Misrepresentation and misappropriation
- Intellectual property
- Whistle blowing

Module 4: Interpersonal Behaviour & relationship skills
- Establishing trust based relationships in team & organizational environment
- Trust equation – credibility, responsiveness, integrity, self-interest

Module 5: Dealing with Conflicts
Orientation towards conflicts in team and organizational environment
- Understanding sources of conflicts
- Conflict resolution styles and techniques

Pedagogical tools & techniques used in the workshop
- Organizational templates for simulating a organizational context- structures, units, roles and activities
- Metaphoric scenarios for simulating real –life tasks and dynamics in a team/project context
- LEGO™ building blocks for simulating last-mile technical activity in teams
- Case studies, Role play scenarios group learning activities, observation and feedback.

Note: Evaluation is done and a grade of P (pass) or NP (not pass) is awarded
PATTERN RECOGNITION

Subject Code : 12CS611
Credits : 03
Hrs/Week : 03
Total Credits : 39

UNIT - I
Introduction: Machine Perception, Pattern Recognition systems, Design cycle, learning and adaptation (1.1, 1.3, 1.4, 1.5 of Ref.1)
Bayesian Decision Theory: Introduction, Bayesian Decision theory – continuous features, classifiers, discriminant functions, and decision surfaces, normal density and discriminant functions, Bayes decision theory – discrete features (2.1, 2.2, 2.4, 2.5, 2.6, 2.9 of Ref. 1)

UNIT - II
Maximum likelihood and Bayesian parameter estimation: Introduction, maximum likelihood estimation, Bayesian Estimation, Bayesian parameter estimation, problem of dimensionality, sufficient and exponential family, complex analysis & discriminants, (3.1 to 3.8 of Ref.1)

UNIT - III
Nonparametric Techniques: Introduction, Density Estimation, Parzen Windows, k-n-nearest neighbour estimation, nearest neighbor rule, metrics and nearest-neighbor classification, fuzzy classification, reduced coulomb energy, approximations by series expansions (4.1 – 4.9 of Ref.1)

UNIT - IV
Linear discriminant functions: Introduction, linear discriminant functions, generalized linear discriminant functions, minimizing the Perceptron criterion function, relaxation procedures, nonseparablebehaviours, minimum squared-error procedures, Ho-Kashyap procedures (5.1 to 5.9 of Ref.1)

UNIT - V
Unsupervised learning and clustering: Mixture densities and identifiability, maximum-likelihood estimates, application to normal mixtures, unsupervised Bayesian learning, data decryption and clustering, criterion functions and clustering, hierarchical clustering, on-line clustering. Component analysis, low-dimensional representations and multidimensional scaling (10.1 to 10.14 except 10.8, 10.12 of Ref. 1)
Syntactic pattern Recognition: Overview, qualifying structure in pattern description and recognition, grammar based approach, elements of formal grammar (Chap. 3 of Ref. 2) 7 Hrs

TEXT BOOKS:

SYSTEM SIMULATION & MODELING
Subject Code : 12CS612 Credits : 03
Hrs/Week : 03 Total Hours :39

UNIT – I
1. Introduction To Simulation: 8 Hrs
When Simulation is the Appropriate Tool; When Simulation Is Not Appropriate; Advantages and Disadvantages of Simulation; Areas of Application; Systems and System Environment; Components of a System; Discrete and Continuous Systems; Model of a System; Types of Models; Discrete-Event System Simulation; Steps in a Simulation Study.

2. General Principles:

UNIT – II
3. Random-Number Generation: Properties of Random Numbers; Generation of Pseudo-Random Numbers; Techniques for Generating Random Numbers; Tests for Random Numbers. 6 Hrs

4. Random-Variate Generation:
Inverse Transform technique: Exponential Distribution, Uniform Distribution, Discrete Distributions; Acceptance-Rejection Technique: Poisson Distribution.
UNIT – III

5. Input Modeling: 8 Hrs
Data Collection; Identifying the distribution with Data; Parameter Estimation; Goodness of Fit Tests; Selecting Input Models without Data; Multivariate and Time-Series Input Models.

UNIT – IV

6. Verification And Validation Of Simulation Models: 8 Hrs
Model Building, Verification and Validation; Verification of Simulation Models; Calibration and Validation of Models

UNIT – V

7. Simulation Of Computer Systems: 8 Hrs
Introduction; Simulation Tools; Model Input; High-Level Computer-System Simulation; CPU Simulation; Memory Simulation.

TEXT BOOK:

REFERENCE BOOKS:

SOFTWARE TESTING

Subject Code :12CS613  Credits : 03
Hrs/Week : 03  Total Hours :39

UNIT - I

Software practice I:
Style : Names, Expressions and Statements, Consistency and Idioms, Function Macros, Comments. Interfaces: Comma-Separated Values, A

Software practice II :

4 Hrs

UNIT - II

Software practice III :

4 Hrs

Software practice IV :
Notation : Formatting data, Regular expressions, Programmable tools, Interpreters, Compilers and Virtual machines, Programs that write programs, Using Macros to generate code.
Debugging : Debuggers, Good Clues , Easy Bugs, No Clues, Hard Bugs, Last Resorts, Non Reproducible bugs, Debugging Tools, Other peoples bugs.  

4 Hrs

UNIT - III

Software Testing :
The six essentials of Software testing: The state of the art and state of the practice, The clean sheet approach to getting started, Establishing a practical perspective, Critical choices: What, When and how to test, Critical disciplines, Frameworks for testing.

Testing Methods :
Verification testing : Basic verification methods, Getting leverage on verification, Verifying documents at different phases, Getting the best from verification, Three critical success factors for implementing verification, Recommendation.
Validation Testing : Validation overview, validation methods, validation activities, Recommendation strategies for validation testing,
Controlling validation costs: Minimizing the cost performing tests, Minimizing the cost of maintaining the tests, Minimizing validation testware development costs, Recommendations, Testing tasks, deliverables and Chronology, Master test planning, Verification testing tasks and deliverables, Validation testing tasks and deliverables. A testing orphan – User manuals, Product release criteria, Summary of IEEE/ANSI test related documents.

Testing Tools: Categorizing testing tools, Tool acquisition, Measurements, Useful and other interesting measures, Recommendations.

**UNIT - V**

**Managing Testing Technology:**
Organizational approaches to testing: Organizing and Reorganizing testing, Structural design elements, Approaches to organizing the test functions, Selecting the right approach: Current practices, trends, challenges, GUIs: What is new here, Usage testing, tester to developer ratios, Software measures and practices benchmark study, Getting sustainable gains in place, Getting gains to happen, Getting help, Follow up, Standards relevant to software engineering and testing, Verification check lists

**TEXT BOOKS:**
   Chapters 1(except 1.5), 2 (except 2.4 & 2.5), 3(except 3.5, 3.6, 3.7), 4 (except 4.3, 4.4), 5, 7, 8, 9 (except 9.7)
   Chapters 1 to 15.

**REFERENCE BOOKS:**
ADVANCED DBMS

Subject Code : 12CS614
Credits : 03
Hrs/Week : 03
Total Hours : 39

UNIT – I

Overview of storage and indexing, disks and files:
Data on external storage; File organizations and indexing; Index data structures; Comparison of file organizations; Indexes and performance tuning. Memory hierarchy; RAID; Disk space management; Buffer manager; Files of records; Page formats and record formats.

Tree structured indexing: Intuition for tree indexes; Indexed Sequential Access Method (ISAM); B+ trees - Search, Insert, Delete, Duplicates; B+ trees in practice. 8 Hrs

UNIT – II

Hash based indexing: Static hashing; Extendible hashing, Linear hashing, comparisons.

External Sorting: When does a DBMS sort data? A simple two-way merge sort; External merge sort, Using B+ trees for sorting.

Evaluating Relational Operators: The Selection operation; General selection conditions; The Join operation; The Projection operation; The Set operations; Aggregate operations; The impact of buffering. 8 Hrs

UNIT – III


Physical Database Design and Tuning: Introduction; Guidelines for index selection, examples; Clustering and indexing; Indexes that enable index-only plans; Overview of database tuning; Choices in tuning the conceptual schema; Choices in tuning queries and views; Impact of concurrency; DBMS benchmarking. 7 Hrs

UNIT - IV

Object Databases:

Concepts for Object Databases: Overview of Object-Oriented Concepts, Object Identity, Object Structure, and Type Constructors,
Encapsulation of Operations, Methods, and Persistence, Type and Class Hierarchies and Inheritance, Complex Objects;

**Object Database Standards, Languages, and Design:** Overview of the Object Model of ODMG, The Object Definition Language ODL, The Object Query Language OQL, Overview of the C++ Language Binding, Object Database Conceptual Design;

**Object-Relational and Extended-Relational Systems:** Overview of SQL and its Object- Relational features, Object-Relational Features of Oracle 8.  

8 Hrs

**UNIT - V**

**Distributed Databases:**
Distributed Database concepts; Data Fragmentation, Replication, and Allocation Techniques for Distributed Database Design; Types of Distributed Database Systems; Query Processing in Distributed Databases; Overview of Concurrency Control and Recovery in Distributed databases; Distributed databases in Oracle.

**Security and Authorization:**

8 Hrs

**TEXT BOOKS:**


**REFERENCE BOOKS:**


CLOUD INFRASTRUCTURE AND SERVICE MANAGEMENT

Subject Code : 12CS615  Credits : 03
Hrs/Week : 03  Total Hours : 39

UNIT - I
Eras of computing, Parallel vs. Distributed Computing, Elements of Parallel Computing- (What is parallel computing, hardware architecture for Parallel processing, approaches to parallel programming, levels of parallelism, Laws of caution). Elements of Distributed Computing- (General concepts and definitions, components of a distributed system, Architectural styles for distributed computing, models for inter-process communication, Technologies for distributed computing-Remote procedure call, Service oriented computing).

UNIT - II
Classic data center, its elements, challenges and benefits. Data center management Steps in transitioning to cloud- consolidation, automation, IT as a service.
Cloud computing Architecture: - Introduction, Cloud reference models- (Architecture, Infrastructure/Hardware as a service, Platform as a service, Software as a service), Types of cloud – (Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds), Economics of cloud, Open challenges

UNIT - III
Virtualization: – Introduction, characteristics of virtualized environments, taxonomy of virtualization technique- (execution of virtualization, other types of virtualization-Compute, Storage, Network, Desktop, Application). Virtualization and cloud computing, Pros and Cons of virtualization, Technology examples- XEN, VMware, Microsoft Hyper-V.

UNIT - IV
Securing the Cloud: Key Strategies and Best Practices: - Overall Strategy: Effectively Managing Risk-Risk Management: Stages and

UNIT - V  9 Hrs


Text Books:

References:
VLSI DESIGN

Subject Code   : 12CS621  
Credits        : 03  
Hrs/Week       : 3  
Total Hours    : 39

UNIT - I

8 Hrs

UNIT - II

LOGIC GATES, COMBINATIONAL LOGIC NETWORKS

Introduction, Combinational Logic Functions, Static Complementary gates, Wires and delay, switch logic, layout design methods, Simulation, Combinational Network Delay, Crosstalk, Power Optimization, Switch Logic Networks, Combinational Logic Testing.  
8 Hrs

UNIT – III

Sequential machines, Subsystem Design

Sequential Machines: Introduction, latches and flipflops, sequential systems and clocking disciplines, Sequential System Design, Power Optimization, Design Validation, Sequential Testing, Sub-system Design: Introduction, Subsystem Design Principles, Combinational Shifters adders, High-Density Memory, FPGAs, PLAs,  
8 Hrs

UNIT - IV

Floor Planning , Architectural Design, Chip Design

7 Hrs

UNIT - V

8 Hrs
TEXT BOOKS:
2. VLSI CAD – NiranjanN.Chiplunkar&Manjunath Kothari, PHI Learning, 2011

MULTI-CORE ARCHITECTURE AND PROGRAMMING

Subject Code : 12CS622       Crédits : 03
Hrs/week      : 3            Total Hours : 39

UNIT - I
Introduction to Multi-core Architecture: Introduction, Moore’s law, Amdhal’s law, Gustafson’s law, Motivation for Multi-core processors, Types and levels of parallelism, Flynn’s classification of multi-processors, Introduction to parallelization and vectorization: Data dependencies, SIMD technology, Hardware Multithreading vs. Software multi-threading, Hyper threading, SMT, Case Study of multi-core processors: Intel, AMD, IBM/Sony 8 Hrs

UNIT - II
Concepts and Design of Parallel and Thread Programming: Definition of thread and process, Parallel programming models, Parallel Programming constructs: Synchronization, Deadlock, Critical sections, Threading APIs- Win 32, POSIX threads. 7 Hrs

UNIT - III
Parallel Programming: MPI Model: Collective communication, Data decomposition, Communicators and topologies, point-to-point communication, MPI Library, OpenMP: Directives and clauses, environment variables, Programs using OpenMP and MPI. Introduction to Intel TBB, Thread-Safeness, Cache related issues 7 Hrs
UNIT - IV
Multithreaded Program Debugging: Benchmarks, performance tools, VTune Performance analyzer, thread checker, thread profiler, hotspots, performance issues in algorithms, branch misprediction, cache organization, cache loads, efficiency, hardware and software prefetch. 7 Hrs

UNIT - V
Compiler Optimizations and Parallel Algorithms: Compilers for High performance Computing, compiler optimization, code and loop optimization, scalar and vector processing, temporal and spatial locality- matrix multiplication example. OS support to multi-core architectures. Parallel algorithms study and analysis- The Sieve of Eratosthenes, Floyd’s algorithm, Matrix-Vector multiplication, Monte Carlo methods, Matrix Multiplication, Parallel Quicksort Algorithm 9 Hrs

TEXT BOOKS & REFERENCE BOOKS:
1. Multicore programming- Increasing performance through software multithreading,-- Shameem Akhter and Jason Roberts, Intel press
3. Parallel Programming in C with MPI and OpenMP by Michael J. Quinn, Tata McGraw-Hill Edition
4. www.openmp.org
5. www tutorials on introduction to parallel computing
MICROCONTROLLERS

Subject code : 12CS623  
Credits : 03  
Hrs/Week : 3  
Total Hours : 39

UNIT - I
Differences between Microprocessors and Microcontrollers, RISC and CISC CPU architectures, Harvard and Von-Neumann CPU architectures, Commercially available 8, 16 and 32 bit Microcontrollers from Intel, ARM and others. Definition of Embedded system, Use of Microcontrollers in Embedded system, High level software development life cycle. ARM processor Architecture overview.  

UNIT - II
Introduction to ARMv7-M ISA and basic Programmer’s model; ARM/Thumb assembly instructions, addressing modes, processor mode, register set, basic assembly instructions, MDK-ARM simulator, Assembly language programming.  

UNIT - III
C programming overview, I/O, stack, subroutine, logical and shift operation, KEIL utility, debugging in MDK-ARM simulator, Arithmetic operations, ARM prediction and condition execution, timers, pointers and advanced debugging, Finite State Machines, I/O synchronization, stack frames, FSMs in C.  

UNIT - IV
Cortex-M3 exception and interrupt handling, Systick timer and periodic interrupts, Memory mapped peripherals, LCD interface, MDK-ARM C programming, Mixing C and assembly, UART, SPI, I2C, CAN, DAC and ADC on ARM MCU, Review of threads and thread communication.  

UNIT - V
Hands on sessions to carry out any 10 of the following exercises using simulator and ARM Kit STM32L-Discovery:
a. Digital I/O, MCU pin direction, and logical functions, written in assembly and simulation  
b. LEDs and switching, written in assembly & simulation  
c. Use switches and LEDs, and control LED intensity using switches written in C and simulation  
d. Traffic Light Controller with bits, written in assembly and simulation  
e. Reset system using watchdog timer in case of error.  
f. Simple FSM simulator in C  
g. MCU bring-up and initialization, M3 vector table, setting up dummy handlers  
h. LCD device driver and test, written in assembly and C (simulation and on board)  
i. UART echo test (simulation and on board), and control LED intensity based on UART parameters (simulation and on board)  
j. Display temperature on PC over UART (simulated and board)  
k. Sample sound and plot amplitude vs. time on PC  
l. Sample sound over microphone and display intensity through LEDs  
m. FIFO queue, threads, mixture of assembly and C (simulated and board)  
n. Real-time Position Monitor, ADC, interrupts, LCD, mixture of assembly and C (simulated and board)  
o. Digital Piano or pacemaker using a DAC, C (simulated and board)  
p. Generate RT clock using timers and output time over UART (simulation and board)  

**TEXT BOOKS AND RESOURCE BOOKS:**  
3. [www.arm.com/support/university/academic-resources.php](http://www.arm.com/support/university/academic-resources.php)  

10 Hrs
EMBEDDED AND REAL TIME SYSTEMS

Subject code : 12CS624  Credits : 03
Hrs/week : 3  Total Hours : 39

Prerequisite subjects:
- Computer Organization and Architecture (CS404)
- Microprocessors and Peripherals (CS503) – Intel 8086 to Pentium
- Operating Systems (CS505)

Course Objectives : To give an overview of Embedded systems, typical building blocks of Embedded system and Software aspects of embedded applications including features of Real time operating systems. Course gives an overview of Intel ATOM processor, highlighting its low power features which are desirable in low power embedded system design. Students will also work on Intel ATOM boards and interface the same to some peripheral devices – thus getting a feel of building typical embedded system.

UNIT - I
Embedded system definition, characteristics, design metrics; Processor, IC and design technologies; Embedded system examples, Digital Camera building blocks, Combinational and sequential building blocks. Use of DSP Processors, SoCs and Microcontrollers in embedded systems. Overview of 8051 microcontroller. 8 Hrs

UNIT - II
Timers, ADCs, Keypad controllers, LCD controllers, stepper motor and DC motor control, Custom Single Purpose processor design examples: GCD Generator, 4 bit multiplier, Communication bridge. Memory – Composing memory, memory hierarchy and Cache memory, interfacing-Serial, Parallel and Wireless Protocols. 7 Hrs

UNIT - III
Introduction to Real – Time Operating Systems, features, Examples of RTOS, typical RTOS functions. Interrupt handling and latency, Shared data problems, Tasks and Task States, Task scheduling, Inter-task communication and synchronization, Semaphores, Message Queues, Mailboxes and Pipes, Reentrant functions, Typical software
architectures, Embedded Software development and testing tools, JTAG debugger, typical system boot flow diagram. 9 Hrs

UNIT - IV
Intel ATOM Processor Architecture, Platform architecture and Micro architecture details, Overview of Assembly language programming of ATOM Processor, Low power issues of ATOM processor, ATOM processor series. 7 Hrs

UNIT - V
Intel ATOM Processor kit details, I/O options available, Keyboard and Mouse interface, GPS , GSM and RFID interface – Hands On, Overview of Device drivers. 8 Hrs

TEXT BOOKS & RESOURCE BOOKS :
1. Frank Vahid and Tony Givargis, Embedded Systems Design – A unified Hardware/Software Introduction, John Wiley, 2002 (Chapter 1, 2, 4)
2. David E.Simon, An Embedded Software Primer, Pearson Education Asia, First Indian Reprint 2000. (Chapter 6,7, 8, 9)
4. Lori Matassa and Max Domeika “ Break away with Intel Atom Processors: A guide to Architecture Migration” Intel Press, 2010 (Chapter 3, selected topics of Chapter 4 & 5)
6. Intel Websites
7. NPTEL videos on Embedded Systems
8. Lab Manual of “ Embedded system lab with ATOM Kit & Interfaces”
PROGRAMMING LANGUAGES

Subject code : 12CS625  Credits : 03
Hrs/week : 03  Total Hours : 39

UNIT - I
INTRODUCTION; NAMES, SCOPE, AND BINDINGS – 1:
Language design; Programming language spectrum; Why study programming languages? Compilation and interpretation; Programming environments. Names, scope, and bindings: Concept of binding time; Object lifetime and storage management; Scope rules and implementing scope. The binding of reference environments; Binding within a scope; Separate compilation.  7 Hrs

UNIT - II
Control Flow : Expression evaluation, Structured and unstructured flow; Sequencing; Selection; Iteration; Recursion; DATA TYPES – 1: Type systems; Type checking; Records and variants; Arrays.  8 Hrs

UNIT - III
DATA TYPES - 2: Strings; Sets; Pointers and recursive types; Lists; Files, and Input/Output; Equality testing and assignment.
Subroutines and Control Abstraction - 1: Review of stack layout; Calling, sequences; Parameter passing; Generic subroutines and modules; Exception handling.  8 Hrs

UNIT - IV
CONTROL ABSTRACTION – 2; DATA ABSTRACTION, OBJECT ORIENTATION: Control abstraction – 2: Coroutines. Data Abstraction, Object Orientation: Object oriented programming; Encapsulation and Inheritance; Multiple inheritance;  8 Hrs

UNIT - V
FUNCTIONAL LANGUAGES, LOGIC LANGUAGES, SCRIPTING LANGUAGES : Functional Languages: Origins; Concepts; An overview of scheme; Evaluation order revisited; Higher-order functions; Functional programming in perspective. Logic Languages: Concepts; Prolog: Logic programming in perspective. Scripting Languages: Common characteristics.  8 Hrs
TEXT BOOK:

REFERENCE BOOKS:

MULTICAST COMMUNICATIONS
Subject code : 12CS626 Credits : 03
Hrs/week : 3 Total Hours : 39

UNIT – I
The basics of group communications: Types of communications; Multicast vs Unicast; Scalability; Applications of group communication; characteristics of groups; Special aspects of group communication. 7 Hrs

UNIT – II
Multicast Routing: Basic Routing algorithms; Group dynamics; scoping and multicast address allocation; Concepts of multicast routing; Multicast routing on the internet. 8 Hrs

UNIT – III
Multicast in ATM networks: The switching technology ATM; ATM multicast. Transport protocols: UDP; XTP. 8 Hrs

UNIT – IV
Transport protocols: MTP; RMP; LBRM; SRM; RMTP 8 Hrs

UNIT – IV
Mbone- The Multicast Backbone of the Internet: Mbone architecture; Mbone applications; Mbone Tools; Outlook; Multicast Routing and Mobile Systems. 8 Hrs

TEXT BOOK: