# VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM

## SCHEME OF TEACHING AND EXAMINATION FOR

M.TECH. COMPUTER SCIENCE and ENGINEERING

### I Semester

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Name of the Subject</th>
<th>Teaching hours/week</th>
<th>Duration of Exam in Hours</th>
<th>Marks for Total Marks</th>
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<td></td>
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<td>Lecture</td>
<td>Practical / Field Work / Assignment / Tutorials</td>
<td>I.A.</td>
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<tr>
<td>12SCS11</td>
<td>Computer Networks</td>
<td>04</td>
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<tr>
<td>12SCS12</td>
<td>Advances in Operating Systems</td>
<td>04</td>
<td>02*</td>
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<td>Advances in Database Management Systems</td>
<td>04</td>
<td>02*</td>
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<td>Computer Systems Performance Analysis</td>
<td>04</td>
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<td>12SCS15x</td>
<td>Elective – I</td>
<td>04</td>
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<td>12SCS16</td>
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### Elective I

- **12SCS151** Advances in Digital Image Processing
- **12SCS152** Computer Graphics & Visualization
- **12SCS153** Optical Networks
- **12SCS154** Embedded Systems
## VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM

**SCHEME OF TEACHING AND EXAMINATION FOR M.TECH. COMPUTER SCIENCE and ENGINEERING**

### II Semester

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<td>Formal Models in Computer Science</td>
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<td>12SCS22</td>
<td>Advanced Algorithms</td>
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<td>12SCS23</td>
<td>Advances in Computer Architecture</td>
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<td>12SCS24</td>
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<td>12SCS25x</td>
<td>Elective – II</td>
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<td><strong>Project Phase-I (6 Week Duration)</strong></td>
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<td>12SCS26</td>
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**Elective – II**
- 12SCS251 Topics in Multimedia Communications
- 12SCS252 Artificial Intelligence and Agent Technology
- 12SCS253 Protocols Engineering

**Between the II Semester and III Semester after availing a vocation of 2 weeks.**
III Semester

<table>
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<th>Subject Code</th>
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<td>12SCS33x</td>
<td>Elective-IV</td>
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<td>12SCS34</td>
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<td>12SCS35</td>
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Elective –III
12SCS321 Wireless and Cellular Networks
12SCS322 Advances in Storage Area Networks
12SCS323 Advances in Pattern Classification
12SCS324 Multicore Architecture & Programming

Elective – IV
12SCS331 Analysis of Computer Networks
12SCS332 Data Mining and Warehousing
12SCS333 Advances in VLSI

$ 3 Days Course work and 3 days for Project work
**VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM**

**SCHEME OF TEACHING AND EXAMINATION FOR M.TECH. COMPUTER SCIENCE and ENGINEERING**

IV Semester

<table>
<thead>
<tr>
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<td>12SCS42</td>
<td>Evaluation of Project work – III</td>
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<tr>
<td>12SCS43</td>
<td>Project work evaluation and Viva-voce</td>
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<td>03</td>
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</table>

**Grand Total (I to IV Sem.) : 2400**

*Note: Project work shall be continuously evaluated for phase I, phase II and after completion of the project.*
Note:

* Lab Classes for any two core subjects are compulsory (practical will be evaluated for 20 marks and internal assessment for 30 marks. Lab journals should be maintained).

# For the remaining two core subjects, it can be field work, assignment, tutorials.

1) Project Phase – I: 6 weeks duration shall be carried out between II and III Semesters. Candidates in consultation with the guides shall carry out literature survey / visit to Industries to finalise the topic of dissertation. Evaluation of the same shall be taken up during beginning of III Semester. Total Marks shall be 50. Colleges have to send the synopsis after Phase – I.

2) Project Phase – II: 16 weeks duration. 3 days for project work in a week during III Semester. Evaluation shall be taken during the first two weeks of the IV Semester. Total Marks shall be 50.

3) Project Phase – III: 24 weeks duration in IV Semester. Evaluation shall be taken during the middle of IV Semester. Total Marks shall be 50. At the end of the Semester Project Work Evaluation and Viva-Voce Examinations shall be conducted. Total Marks shall be 50 + 50 + 100 = 200 (50 marks for guide, 50 marks for external and 100 for viva-voce).

**Marks of Evaluation of Project:**

- The Marks of Project Phase – I shall be sent to the University along with III Semester I.A. Marks of other subjects.
- The I.A. Marks of Project Phase – II & III shall be sent to the University along with Project Work report at the end of the Semester.

4) During the final viva, students have to submit all the reports.

5) The Project Valuation and Viva-Voce will be conducted by a committee consisting of the following:

a) Head of the Department (Chairman)

b) Guide

c) Two Examiners appointed by the university. (out of two external examiners at least one should be present).
M. Tech in Computer Science and Engineering

I SEMESTER

COMPUTER NETWORKS

Subject Code: 12SCS11       I.A. Marks : 50
Hours/Week : 04             Exam Hours: 03
Total Hours : 52             Exam Marks: 100


2. Direct link networks: Hardware Building Blocks - nodes, links; error Detection - Two-Dimensional Parity, Internet checksum Algorithm, cyclic Redundancy Check; reliable Transmission - Stop-and-Wait, Sliding Window, Concurrent Logical Channels; Rings (802.5, FDDI) – Token Ring Media Access Control, Token Ring Maintenance, FDDI.

3. Packet Switching: Switching and forwarding – Datagrams, Virtual Circuit Switching, Source Routing; Bridges and LAN Switches – Learning Bridges, Spanning Tree Algorithm, Broadcast and Multicast, Limitations of Bridges; cell switching (ATM) – Cells, Segmentation and Reassembly, Virtual Paths, Physical Layers for ATM.

4. Internetworking: Simple internetworking (IP) – What Is an Internetwork?, Service Model, Global Address, Datagram Forwarding in IP, Address Translation (ARP), Host Configuration (DHCP), Error Reporting (ICMP), Virtual Networks and Tunnels; Routing – Network as a Graph, distance Vector (RIP), Link State (OSPF), Metrics, Routing for Mobile Hosts, Global Internet – Subnetting, Classless Routing (CIDR), Interdomain Routing (BGP), Routing Areas, IP Version 6 (IPv6).


7. Applications: Traditional applications – Electronic Mail (SMTP, MIME, IMAP), World Wide Web (HTTP), Name Service (DNS), Network management (SNMP); Web services – Custom APPLICATION Protocols (WSDL, SOAP), A Generic application Protocol (REST).

Laboratory Work:
Using any Protocol Analyzer like Ethereal, perform the following experiments:

1. Capture the packets that are transmitted after clicking on the URL of the web site of your college. Analyze the packets at the highest level and prepare a brief report of your analysis.
2. Analyze the data captured above at lower levels and demonstrate the layering of the protocols.
3. Capture the packets in the LAN, & filter for a unique subscriber
4. Capture the ARP packets and find the MAC addresses in the LAN in your laboratory.

Using either NS228/OPNET or any other suitable simulator, perform the following experiments:

1. Simulate an Ethernet LAN using 10 node , change error rate and data rate , and compare throughput
2. Simulate a three nodes point – to – point network with duplex links between them. Set the queue size and vary the bandwidth and find the number of packets dropped.
3. Simulate the transmission of ping messages over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.
4. Simulate an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination.

Implement the following in C/C++:

1. Write a program for distance vector algorithm to find suitable path for transmission.
2. Write a program for error detecting code using CRC-CCITT (16-bit)
3. Write a program for congestion control using leaky bucket algorithm.

TEXT BOOKS:


REFERENCE BOOKS:


Advances in Operating Systems

Subject Code : 12SCS12  
No of Lecture Hrs/Week : 4  
Total No of Lecture Hours : 52  
IA Marks : 50  
Exam hours : 3  
Exam Marks : 100

1. Introduction, Review Operating Systems Strategies: User’ perspectives, technologies and examples of Batch Systems, Timesharing Systems, Personal computer systems, Embedded systems, and small communicating computers; The genesis of modern operating systems.
2. Using the Operating Systems The programmer’s abstract machine; Resources; Processes and threads; Writing concurrent programs.

3. Operating Systems Organization Basic functions; General implementation considerations; Contemporary OS kernels.

4. Design Strategies Design considerations; Monolithic kernels; Modular organization; Microkernel; Layered organizations; Operating Systems for distributed system.


6. Distributed Systems: Networking; The Need for a Protocol Architecture; The TCP/IP Sockets; Linux Networking; Client/Server Computing; Distributed Message Passing; Remote Procedure Calls; Clusters; Windows Vista Cluster Server; Linux Clusters; Distributed Process Management; Process Migration; Distributed Global States; Distributed Mutual Exclusion; Distributed Deadlock.

**Laboratory Work:** (The following programs can be executed on any available and suitable platform)

1. Design, develop and execute a program using any thread library to create the number of threads specified by the user; each thread independently generates a random integer as an upper limit, and then computes and prints the number of primes less than or equal to that upper limit along with that upper limit.

2. Rewrite above program such that the processes instead of threads are created and the number of child processes created is fixed as two. The program should make use of kernel timer to measure and print the real time, processor time, user space time and kernel space time for each process.

3. Design, develop and implement a process with a producer thread and a consumer thread which make use of a bounded buffer (size can be prefixed at a suitable value) for communication. Use any suitable synchronization construct.

4. Design, develop, and execute a program to solve a system of n linear equations using Successive Over-relaxation method and n processes which use Shared Memory API. 5. Design, develop, and execute a program to demonstrate the use of RPC.

**Text Books:**


**Reference Books:**


1. Review of Relational Data Model and Relational Database Constraints: Relational model concepts; Relational model constraints and relational database schemas; Update operations, transactions and dealing with constraint violations.

2. Object and Object-Relational Databases: Overview of Object-Oriented Concepts – Objects, Encapsulation, Type and class hierarchies, complex objects; Object model of ODMG, Object definition Language ODL; Object Query Language OQL; Overview of C++ language binding; Conceptual design of Object database. Overview of object relational features of SQL; Object-relational features of Oracle; Implementation and related issues for extended type systems; The nested relational model.


4. Parallel and Distributed Databases: Architectures for parallel databases; Parallel query evaluation; Parallelizing individual operations; Parallel query optimizations; Introduction to distributed databases; Distributed DBMS architectures; Storing data in a Distributed DBMS; Distributed catalog management; Distributed Query processing; Updating distributed data; Distributed transactions; Distributed Concurrency control and Recovery.

5. Data Warehousing, Decision Support and Data Mining: Introduction to decision support; OLAP, multidimensional model; Window queries in SQL; Finding answers quickly; Implementation techniques for OLAP; Data Warehousing; Views and Decision support; View materialization; Maintaining materialized views. Introduction to Data Mining; Counting co-occurrences; Mining for rules; Tree-structured rules; Clustering; Similarity search over sequences; Incremental mining and data streams; Additional data mining tasks.

6. More Recent Applications: Mobile databases; Multimedia databases; Geographical Information Systems; Genome data management.

Laboratory Work:

(The following tasks can be implemented on Oracle or any other suitable RDBMS with support for Object features)

1. Develop a database application to demonstrate storing and retrieving of BLOB and CLOB objects.

2. Develop a database application to demonstrate the representation of multivalued attributes, and the use of nested tables to represent complex objects. Write suitable queries to demonstrate their use.
3. Design and develop a suitable Student Database application. One of the attributes to be maintained is the attendance of a student in each subject for which he/she has enrolled. Using TRIGGERS, write active rules to do the following:

a. Whenever the attendance is updated, check if the attendance is less than 85%; if so, notify the Head of the Department concerned.

b. Whenever, the marks in an Internal Assessment Test are entered, check if the marks are less than 40%; if so, notify the Head of the Department concerned.

4. Design, develop, and execute a program in a language of your choice to implement any one algorithm for mining association rules. Run the program against any large database available in the public domain and discuss the results.

TEXT BOOKS:


REFERENCE BOOKS:


Computer Systems Performance Analysis

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<td>Total No of Lecture Hours: 52</td>
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3. Monitors, Program Execution Monitors and Accounting Logs: Monitors: Terminology and classification; Software and hardware monitors, Software versus hardware monitors, Firmware and hybrid
monitors, Distributed System Monitors, Program Execution Monitors and Accounting Logs, Program Execution Monitors, Techniques for Improving Program Performance, Accounting Logs, Analysis and Interpretation of Accounting log data, Using accounting logs to answer commonly asked questions.

4. Capacity Planning and Benchmarking: Steps in capacity planning and management; Problems in Capacity Planning; Common Mistakes in Benchmarking; Benchmarking Games; Load Drivers; Remote-Terminal Emulation; Components of an RTE; Limitations of RTEs.


6. Queuing Models: Introduction: Queuing Notation; Rules for all Queues: Little’s Law, Types of Stochastic Process. Analysis of Single Queue: Birth-Death Processes; M/M/1 Queue; M/M/m Queue; M/M/m/B Queue with finite buffers; Results for other M/M/1 Queuing Systems. Queuing Networks: Open and Closed Queuing Networks; Product form networks, queuing Network models of Computer Systems. Operational Laws: Utilization Law; Forced Flow Law; Little’s Law; General Response Time Law; Interactive Response Time Law; Bottleneck Analysis; Mean Value Analysis and Related Techniques; Analysis of Open Queuing Networks; Mean Value Analysis; Approximate MVA; Balanced Job Bounds; Convolution Algorithm, Distribution of Jobs in a System, Convolution Algorithm for Computing G(N), Computing Performance using G(N), Timesharing Systems, Hierarchical Decomposition of Large Queuing Networks: Load Dependent Service Centers, Hierarchical Decomposition, Limitations of Queuing Theory.

Text Book:

Reference Books:

Advances in Digital Image Processing

Subject Code : 12SCS151 IA Marks : 50
No of Lecture Hrs/Week : 4 Exam hours : 3
Total No of Lecture Hours : 52 Exam Marks : 100


10. Image Segmentation and Object Recognition: Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation, Patterns and Pattern Classes, Recognition Based on Decision-Theoretic Methods, Structural Methods.

TEXT BOOKS

REFERENCES:
1. Introduction: Applications of computer graphics; A graphics system; Images: Physical and synthetic; Imaging systems; The synthetic camera model; The programmer’s interface; Graphics architectures; Programmable pipelines; Performance characteristics. Graphics Programming: The Sierpinski gasket; Programming two-dimensional applications.

2. The OpenGL: The OpenGL API; Primitives and attributes; Color; Viewing; Control functions; The Gasket program; Polygons and recursion; The three-dimensional gasket; Plotting implicit functions.

3. Input and Interaction: Interaction; Input devices; Clients and servers; Display lists; Display lists and modeling; Programming event-driven input; Menus; Picking; A simple CAD program; Building interactive models; Animating interactive programs; Design of interactive programs; Logic operations.

4. Geometric Objects and Transformations: Scalars, points, and vectors; Three-dimensional primitives; Coordinate systems and frames; Modeling a colored cube; Affine transformations; Rotation, translation and scaling. Transformations in homogeneous coordinates; Concatenation of transformations; OpenGL transformation matrices; Interfaces to three-dimensional applications; Quaternions.

5. Viewing: Classical and computer viewing; Viewing with a computer; Positioning of the camera; Simple projections; Projections in OpenGL; Hidden-surface removal; Interactive mesh displays; Parallel-projection matrices; Perspective-projection matrices; Projections and shadows.

6. Lighting and Shading: Light and matter; Light sources; The Phong lighting model; Computation of vectors; Polygonal shading; Approximation of a sphere by recursive subdivisions; Light sources in OpenGL; Specification of materials in OpenGL; Shading of the sphere model; Global illumination.

7. Curves and surfaces: Representation of curves and surfaces; Design criteria; Parametric cubic polynomial curves; Interpolation; Hermite curves and surfaces; Bézier curves and surfaces; Cubic B-Splines; General B-Splines; Rendering curves and surfaces; Curves and surfaces in OpenGL.

Text Book:

Reference Books:
**OPTICAL NETWORKS**

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1. **Client Layers of the Optical Layer**


2. **WDM Network Elements**


3. **Control and Management**


4. **Basic Concepts**


5. **WDM Network Design**

Text Book

Embedded Systems

Subject Code : 12SCS154        IA Marks : 50
No of Lecture Hrs/Week : 4        Exam hours : 3
Total No of Lecture Hours : 52       Exam Marks : 100

1. Custom single-purpose processor design; RT level custom single-purpose processor design, optimizing custom single-purpose processors: Optimizing the original program, optimizing the FSMD, Optimizing the data path, optimizing the FSM.

2. Timers, counters, and watchdog timers. State machine models: introduction; An introductory example, A basic state machine model: finite-state machines(FSM);finite-state machines with data path model (FSMD);using state machines: Describing a system as a state machine, Comparing state machine and sequential program models, Capturing a state machine model in a sequential programming language; hierarchical/concurrent state machine model (HCFSM) and the state charts language; program state machine model(PSM);The role of an appropriate model and language.


4. Survey of Software Architecture: Round Robin, Round Robin with interrupts, Function queue scheduling architecture, Real time operating system architecture, selecting architecture. Introduction to RTOS: Tasks and task states, tasks and Data, semaphores and shared data.

5. Operating systems services: Message queues, mailboxes, and pipes; Timer functions; Events; memory management, Interrupt routines in an RTOS environment. Basic design using an RTOS; Overview, principles, an example, encapsulating semaphores and queues, Hard Real-time scheduling considerations, saving power.


7. An example system: what the program does, environment in which the program operates.

Text Books :

1. **Embedded system design : A unified Hardware/software introduction** – Frank Vahid, Tony Givargis, John Wiley and Sons, Inc. 2002 (Articles : 2.4, 2.5, 2.6; 4.2, 8.3 to 8.13)

2. **An Embedded software Primer** – David E. Simon; Pearson Education, 1999. (Chapters: 4, 5, 6, 7, 8, 9, 10 and 11)

Reference books:


**II Semester**

**Formal Models in Computer Science**

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1. **Propositional Logic**

   Declarative sentences, Natural deduction, Propositional logic as a formal language, Semantics of propositional logic, Normal forms.

2. **Predicate Logic**

   The need for a richer language, Predicate logic as a formal language, Proof theory of predicate logic, Semantics of predicate logic, Undecidability of predicate logic, Micromodels of software.

3. **Verification by Model Checking**

   Motivation for verification, Linear-time temporal logic, Model checking, Branching-time logic, CTL* and the expressive powers of LTL and CTL.

4. **Program Verification**

   Need for specifying and verifying code, A framework for software verification, Proof calculus for partial correctness and total correctness, Programming by contract.

5. **Introduction to Z:** Basic concepts; Z notation in Propositional logic and Predicate logic.

**Laboratory Work:**

1. Design, develop and run a program in ALLOY (or in any equivalent system) to model a Software Package Dependency System. Make suitable assumptions regarding the system. The model should allow checking to see if prerequisites in the form of libraries or other packages are present for all components in the system.

2. Design, develop and run a program in NuSMV (or in any equivalent system) to model and solve the Mutual Exclusion problem.

3. Design, develop and run a program in NuSMV (or in any equivalent system) to model and simulate the Alternate Bit Protocol.

4. Design, develop and run a program in NuSMV (or in any equivalent system) to model and solve the planning problem of Ferry Man.

5. Design, develop and run a program in NuSMV (or in any equivalent system) to model and solve the Dining Philosophers Problem.

**Text Books:**


Advanced Algorithms

Subject Code : 12SCS22
No of Lecture Hrs/Week : 4
Total No of Lecture Hours : 52
IA Marks : 50
Exam hours : 3
Exam Marks : 100


2. Graph Algorithms: Bellman - Ford Algorithm; Single source shortest paths in a DAG; Johnson’s Algorithm for sparse graphs; Flow networks and Ford-Fulkerson method; Maximum bipartite matching.

3. Polynomials and the FFT: Representation of polynomials; The DFT and FFT; Efficient implementation of FFT.

4. Number -Theoretic Algorithms: Elementary notions; GCD; Modular Arithmetic; Solving modular linear equations; The Chinese remainder theorem; Powers of an element; RSA cryptosystem; Primality testing; Integer factorization.

5. String-Matching Algorithms: Naïve string Matching; Rabin - Karp algorithm; String matching with finite automata; Knuth-Morris-Pratt algorithm; Boyer – Moore algorithms.

6. Probabilistic and Randomized Algorithms: Probabilistic algorithms; Randomizing deterministic algorithms, Monte Carlo and Las Vegas algorithms; Probabilistic numeric algorithms.

Laboratory Work:

1. Design, develop, and run a program in any language to implement the Bellman-Ford algorithm and determine its performance.

2. Design, develop, and run a program in any language to implement Johnson’s algorithm and determine its performance.

3. Design, develop, and run a program in any language to implement a Monte Carlo algorithm to test the primality of a given integer and determine its performance.

4. Design, develop, and run a program in any language to solve the string matching problem using naïve approach and the KMP algorithm and compare their performances.

5. Design, develop, and run a program in any language to solve modular linear equations.

6. Design, develop, and run a program in any language to implement the FFT algorithm efficiently.

TEXT BOOKS:


REFERENCE BOOKS:

**Advances in Computer Architecture**

**Subject Code : 12SCS23**

**IA Marks : 50**

**No of Lecture Hrs/Week : 4**

**Exam hours : 3**

**Total No of Lecture Hours : 52**

**Exam Marks : 100**

1. Introduction and Review of Fundamentals of Computer Design: Introduction; Classes computers; Defining computer architecture; Trends in Technology; Trends in power in Integrated Circuits; Trends in cost; Dependability, Measuring, reporting and summarizing Performance; Quantitative Principles of computer design; Performance and Price-Performance; Fallacies and pitfalls; Case studies.

2. Some topics in Pipelining, Instruction –Level Parallelism, Its Exploitation and Limits on ILP: Introduction to pipelining, ILP; Crosscutting issues, fallacies, and pitfalls with respect to pipelining; Basic concepts and challenges of ILP; Case study of Pentium 4, Fallacies and pitfalls. Introduction to limits in ILP; Performance and efficiency in advanced multiple-issue processors.

3. Memory Hierarchy Design, Storage Systems: Review of basic concepts; Crosscutting issues in the design of memory hierarchies; Case study of AMD Opteron memory hierarchy; Fallacies and pitfalls in the design of memory hierarchies. Introduction to Storage Systems; Advanced topics in disk storage; Definition and examples of real faults and failures; I/O performance, reliability measures, and benchmarks; Queuing theory; Crosscutting issues; Designing and evaluating an I/O system – The Internet archive cluster; Case study of NetAA FAS6000 filer; Fallacies and pitfalls.

4. Hardware and Software for VLIW and EPIC


5. Large-Scale Multiprocessors and Scientific Applications


6. Computer Arithmetic

   Introduction, Basic Techniques of Integer Arithmetic, Floating Point, Floating-Point Multiplication, Floating-Point Addition, Division and Remainder, More on Floating-Point Arithmetic, Speeding Up Integer Addition, Speeding Up Integer Multiplication and Division, Fallacies and Pitfalls.

**Text Book:**


**Reference Books:**

Cloud Computing

Subject Code : 12SCS24        IA Marks : 50
No of Lecture Hrs/Week : 4        Exam hours : 3
Total No of Lecture Hours : 52       Exam Marks : 100

1. **Introduction**: Business and IT perspective, Cloud and virtualization, Cloud services requirements, cloud and dynamic infrastructure, cloud computing characteristics, cloud adoption.

2. **Cloud models**: Cloud characteristics, Measured Service, Cloud models, security in a public cloud, public versus private clouds, cloud infrastructure self service.

3. **Cloud at a service**: Gamut of cloud solutions, principal technologies, cloud strategy, cloud design and implementation using SOA, Conceptual cloud model, cloud service demand.

4. **Cloud solutions**: Cloud ecosystem, cloud business process management, cloud service management, cloud stack, computing on demand, cloud sourcing.

5. **Cloud offerings**: Cloud analytics, Testing under cloud, information security, virtual desktop infrastructure, Storage cloud.

6. **Cloud management**: Resiliency, Provisioning, Asset management, cloud governance, high availability and disaster recovery, charging models, usage reporting, billing and metering.

7. **Cloud virtualization technology**: Virtualization defined, virtualization benefits, server virtualization, virtualization for x86 architecture, Hypervisor management software, Logical partitioning, VIO server, Virtual infrastructure requirements. Storage virtualization, storage area networks, network attached storage, cloud server virtualization, virtualized data center.

8. **Cloud and SOA**: SOA journey to infrastructure, SOA and cloud, SOA defined, SOA defined, SOA and IAAS, SOA based cloud infrastructure steps, SOA business and IT services.

**TEXT BOOKS:**

1. Cloud Computing by Dr. Kumar Saurabh, Wiley India, 2011.

**Reference Books**

1. Michael Miller, Cloud Computing: Web based applications that change the way you work and collaborate online, Que publishing, August 2009


**Topics in Multimedia Communications**

Subject Code : 12SCS251        IA Marks : 50
No of Lecture Hrs/Week : 4        Exam hours : 3
Total No of Lecture Hours : 52       Exam Marks : 100


2. Framework for Multimedia Standardization: Introduction, Standardization activities, Standards to build a new global information infrastructure, Standardization processes on multimedia communications, ITU-


TEXT BOOKS:


REFERENCE BOOKS:


Artificial Intelligence and Agent Technology

Subject Code: 12SCS252  
IA Marks : 50
No of Lecture Hrs/Week : 4  
Exam hours : 3
Total No of Lecture Hours : 52  
Exam Marks : 100


2. **Solving problems by searching**: Problem-solving Agents, Example problems, Searching for solutions, Uninformed Search Strategies, Avoiding Repeated States, Searching with Partial Information, **Constraint Satisfaction Problems**: Constraint Satisfaction Problems, Backtracking Search for CSPs, Local Search for Constraint Satisfaction Problems, The Structure of Problems.


5. **Learning from Observations**: Forms of Learning, Inductive Learning, Learning Decision Trees, Ensemble Learning, Why Learning Works: computational Learning Theory, Statistical Learning Methods, **Statistical Learning**: Learning with complete data, Learning with Hidden Variables, Instance based Learning, Neural Networks, Kernal Machines, Case Study: Handwritten Digit Recognition, **Philosophical Foundations**: Weak AI, Strong AI, The Ethics and Risks of Developing Artificial Intelligence.

**Text Book:**

Reference Books:

PROTOCOLS ENGINEERING

Subject Code: 12SCS253       L.A. Marks : 50
Hours/Week : 04                Exam Hours: 03
Total Hours : 52               Exam Marks: 100


2. Error Control, Flow Control: Type of Transmission Errors, Linear Block Code, Cyclic Redundancy Checks, Introduction to Flow Control, Window Protocols, Sequence Numbers, Negative Acknowledgments, Congestion Avoidance


7. Protocol Conformance and Performance Testing: Conformance Testing Methodology and Framework, Local and Distributed Conformance Test Architectures, Test Sequence Generation Methods: T, U, D and W methods, Distributed Architecture by Local Methods, Synchronizable Test Sequence, Conformance testing with Tree and Tabular Combined Notation (TTCN), Conformance Testing of RIP, Testing
Multimedia Systems, quality of service test architecture (QOS), Performance Test methods, SDL Based Performance Testing of TCP, OSPF, Interoperability testing, Scalability testing protocol synthesis problem


TEXT BOOKS:


REFERENCE BOOKS:

Semester 3

Information Security

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<th>Subject Code</th>
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<th>Exam Marks: 100</th>
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5. Introduction to Network Security: Attacks, Services, and Mechanisms; Security Attacks; Security Services; A model for Internetwork Security; Internet Standards and RFCs; Wireless network security.

6. Cryptography: Conventional Encryption Principles and Algorithms; Cipher Block Modes of Operation; Location of encryption devices; Key distribution; Approaches to message authentication; Secure Hash functions and HMAC; Public Key Cryptography Principles and Algorithms; Digital Signatures; Key management.


8. Electronic Mail Security: Pretty Good Privacy (PGP), S/MIME.


11. Software: Introduction; Software flaws; Malware; Software-based attacks; Digital Rights Management.
TEXT BOOKS:


REFERENCE BOOKS:


Wireless and Cellular Networks

Subject Code : 12SCS321
No of Lecture Hrs/Week : 4
Total No of Lecture Hours : 52

IA Marks : 50
Exam hours : 3
Exam Marks : 100


2. Modern Wireless Communications Systems: Second generation (2G), Cellular Networks, evolution of 2.5G, TDMA Standards, Third Generation (3G) Wireless Networks, Wireless Local Loop (WLL) and LMDS, Wireless Local Area Networks (WLANs), Bluetooth and Personal Area Networks (PANS)

3. The Cellular Concept: System Design Fundamentals, Introduction, Frequency reuse, channel assignment strategies, handoff strategies – prioritizing handoffs, Practical Handoff considerations. Interference and system capacity, co-channel interference and system capacity, channel planning for wireless systems, adjacent channel interference, power control for reducing interference.


6. Multiple Access Techniques for Wireless Communications: Introduction to Multiple access, Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Spread Spectrum Multiple Access, Space Division Multiple Access (SDMA), Packet Radio. Protocols,
Reservation Protocols – Reservation ALOHA, Packet Reservation Multiple Access (PRMA), Capacity of cellular systems.


**TEXT BOOKS:**


**REFERENCE BOOKS:**


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**Storage Area Networks**

**Subject Code : 12SCS322**  
**IA Marks : 50**

**No of Lecture Hrs/Week : 4**  
**Exam hours : 3**

**Total No of Lecture Hours : 52**  
**Exam Marks : 100**

1. Introduction: Server Centric IT Architecture and its Limitations; Storage – Centric IT Architecture and its advantages. Case study: Replacing a server with Storage Networks The Data Storage and Data Access problem; The Battle for size and access.


3. I/O Techniques: The Physical I/O path from the CPU to the Storage System; SCSI; Fibre Channel Protocol Stack; Fibre Channel SAN; IP Storage.


5. File System and NAS: Local File Systems; Network file Systems and file servers; Shared Disk file systems; Comparison of fibre Channel and NAS.

6. Storage Virtualization: Definition of Storage virtualization ; Implementation Considerations; Storage virtualization on Block or file level; Storage virtualization on various levels of the storage Network; Symmetric and Asymmetric storage virtualization in the Network.

7. SAN Architecture and Hardware devices: Overview, Creating a Network for storage; SAN Hardware devices; The fibre channel switch; Host Bus Adaptors; Putting the storage in SAN; Fabric operation from a Hardware perspective.
8. Software Components of SAN: The switch’s Operating system; Device Drivers; Supporting the switch’s components; Configuration options for SANs.

9. Management: Planning Business Continuity; Managing availability; Managing Serviceability; Capacity planning; Security considerations.

Text Book:

Reference Books:

Advances in Pattern Classification

Subject Code : 12SCS323       IA Marks : 50
No of Lecture Hrs/Week : 4      Exam hours : 3
Total No of Lecture Hours : 52      Exam Marks : 100

1. Introduction: Polynomial Curve Fitting, Probability Theory, Probability Distributions, Model Selection, Decision Theory, Information Theory

2. Linear Models for Regression: Linear Basis Function Models, The Bias Variance Decomposition, Bayesian Linear Regression, Bayesian Model Comparison, The Evidence Approximation, Limitations of Fixed Basis Functions


4. Kernel Methods: Dual Representations, Constructing Kernels, RBF Networks, Gaussian Processes, Sparse Kernel Machines: SVMs, Multiclass SVMs, Relevance Vector Machines


7. High-Dimensional Problems: The Curse of Dimensionality, Diagonal Linear Discriminant Analysis and Nearest Shrunken Centroids, Linear Classifiers with Quadratic Regularization, Linear Classifiers with L1 Regularization, Classification when Features are Unavailable, High-Dimensional Regression: Supervised Principal Components, Feature Assessment and the Multiple-Testing Problem.

Text Books:

Reference Books:

MULTI-CORE ARCHITECTURE & PROGRAMMING

Subject Code : 12SCS324       IA Marks : 50
No of Lecture Hrs/Week : 4     Exam hours : 3
Total No of Lecture Hours : 52  Exam Marks : 100

1. Introduction to Multi-core Architecture


2. System Overview of Threading

Defining Threads, System View of Threads, Threading above the Operating System, Threads inside the OS, Threads inside the Hardware, What Happens When a Thread Is Created, Application Programming Models and Threading, Virtual Environment: VMs and Platforms, Runtime Virtualization, System Virtualization.

3. Fundamental Concepts of Parallel Programming


4. Threading and Parallel Programming Constructs

5. Threading APIs

Threading APIs for Microsoft Windows, Win32/MFC Thread APIs, Threading APIs for Microsoft .NET Framework, Creating Threads, Managing Threads, Thread Pools, Thread Synchronization, POSIX Threads, Creating Threads, Managing Threads, Thread Synchronization, Signaling, Compilation and Linking.

6. OpenMP: A Portable Solution for Threading


7. Solutions to Common Parallel Programming Problems


Text Book


Analysis of Computer Networks

Subject Code: 12SCS331  IA Marks: 50
No of Lecture Hrs/Week: 4  Exam hours: 3
Total No of Lecture Hours: 52  Exam Marks: 100

1. Introduction: Two examples of analysis: Efficient transport of packet voice calls, Achievable throughput in an input-queuing packet switch; The importance of quantitative modeling in the Engineering of Telecommunication Networks.

3. Stream Sessions: Deterministic Network Analysis: Events and processes in packet multiplexer models: Universal concepts; Deterministic traffic models and Network Calculus; Scheduling; Application to a packet voice example; Connection setup: The RSVP approach; Scheduling (continued).

3. Stream Sessions: Stochastic Analysis: Deterministic analysis can yield loose bounds; Stochastic traffic models; Additional notation; Performance measures; Little’s theorem, Brumelle’s theorem, and applications; Multiplexer analysis with stationary and ergodic traffic; The effective bandwidth approach for admission control; Application to the packet voice example; Stochastic analysis with shaped traffic; Multihop networks; Long-Range-Dependent traffic.

4. Adaptive Bandwidth Sharing for Elastic Traffic: Elastic transfers in a Network; Network parameters and performance objectives; Sharing a single link; Rate-Based Control; Window-Based Control: General Principles; TCP: The Internet’s Adaptive Window Protocol; Bandwidth sharing in a Network.

TEXT BOOKS:

REFERENCE BOOKS:

Data Mining & Warehousing

Subject Code : 12SCS332
No of Lecture Hrs/Week : 4
Total No of Lecture Hours : 52
IA Marks : 50
Exam hours : 3
Exam Marks : 100

1. INTRODUCTION:
What is a Data Warehouse?, A Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Data cube Technology, From Data warehousing to Data Mining, Data Mining Functionalities, Data cleaning, Data Integration and Transformation, Data Reduction.

12 HOURS.

2. DATA MINING PRIMITIVES, LANGUAGES AND SYSTEM ARCHITECTURES: Data Mining primitives, Presentation and Visualization of Discovered patterns, A Data Mining Query Language.

07 HOURS.
3 MINING ASSOCIATION RULES IN LARGE DATABASES: Association Rule Mining Single – Dimensional Boolean Association Rules From Transactional Databases, Mining Multilevel Association Rules from Transactional Databases. 07 HOURS.

4 CLASSIFICATION AND PREDICTION: Issues regarding Classification and Prediction, classification by Decision tree induction, Bayesian classification, Classification by back propagation, Classification Based on the concepts from association rule mining. Other classification methods, prediction. 08 HOURS.


6 APPLICATIONS AND TRENDS IN DATA MINING: Data mining application, Data mining system Products research Prototypes, Additional Themes on Data Mining, Data Mining and Intelligent Query Answering, Tends in Data Mining. 06 HOURS.

Text Books:
Advances in VLSI Design and Algorithms

Subject Code : 12SCS333        IA Marks : 50
No of Lecture Hrs/Week : 4        Exam hours : 3
Total No of Lecture Hours : 52        Exam Marks : 100

   Integrated Circuit Design Techniques; IP-Based Design.

2. Fabrication and Devices: Introduction; Fabrication processes; Fabrication theory and practice; Reliability.

3. Sequential Machines: Introduction; Latches and Flip-flops; Sequential systems and clocking disciplines; Performance analysis; Clock generators; Sequential systems design, Power optimization, Design validation, Sequential testing.

4. Subsystem Design: Introduction; Combinational shifters; Adders; ALUs; Multipliers; High-density memory; Image sensors; FPGAs; PLA; Buses and networks on chips; Data paths; Subsystems as IP.

5. Architecture Design: Introduction; Hardware description languages; Register Transfer design; Pipelining; High-level synthesis; Architecture for low power; GALS systems; Architecture testing; IP components; Design methodologies; Multiprocessor system-on-Chip design.

6. Simulations: General remarks; Gate-level modeling and simulations; Switch-level modeling and simulation.

TEXT BOOKS:
