# SCHEME OF INSTRUCTION
**M.TECH (PARALLEL AND DISTRIBUTED SYSTEMS)**
Proposed from the Academic year 2016-17

## SEMESTER - I

<table>
<thead>
<tr>
<th>S.No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Scheme of Instruction</th>
<th>Contact Hrs/Wk</th>
<th>Scheme of Examination</th>
<th>Credits</th>
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### Departmental Requirements

<table>
<thead>
<tr>
<th>S.No</th>
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<td>CS 5221</td>
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**Total** 18 6 24 280 420 22

## SEMESTER - II

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**Total** 18 6 24 280 420 22

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L: Lecture T: Tutorial P:Practical
CIE: Continuous Internal Evaluation SEE: Semester End Examination
SCHEME OF INSTRUCTION
M.TECH (PARALLEL AND DISTRIBUTED SYSTEMS)
Proposed from the Academic year 2016-17

SEMESTER III

<table>
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<tr>
<th>S.No</th>
<th>Course Code</th>
<th>Course Title</th>
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<th>Contact Hrs/Wk</th>
<th>Scheme of Examination</th>
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**Project Seminar Evaluation:** 50 marks to be awarded by Supervisor and 50 marks to be awarded by Viva-Voce committee comprising Head, Supervisor and an Examiner.

SEMESTER – IV

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<tr>
<th>S. No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Scheme of Instruction</th>
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**Note:** Six Core subjects, Six Elective subjects, Two Laboratory Courses and Two Seminars must be offered in Semester I and II.
# List of Core Subjects:

<table>
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<tr>
<th>S.No</th>
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<tr>
<td>1</td>
<td>CS 5201</td>
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<tr>
<td>2</td>
<td>CS 5202</td>
<td>Parallel Computer Architecture</td>
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<tr>
<td>3</td>
<td>CS 5203</td>
<td>Web Services</td>
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<td>4</td>
<td>CS 5204</td>
<td>Distributed Computing</td>
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<td>CS 5205</td>
<td>Parallel Programming</td>
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<td>CS 5206</td>
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*List of Elective Subjects:

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<tr>
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<td>2</td>
<td>CS 5052</td>
<td>Real Time Systems</td>
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<tr>
<td>3</td>
<td>CS 5053</td>
<td>Web Engineering</td>
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<td>CS 5062</td>
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<td>CS 5256</td>
<td>Performance Evaluation of Computing</td>
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<td>27</td>
<td>CS 5304</td>
<td>Real Time Operating Systems</td>
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<td>28</td>
<td>CS 5305</td>
<td>Simulation and Modeling</td>
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CS 5201  DISTRIBUTED ALGORITHMS

Credits: 3

Instruction: (3L) hrs per week  Duration of SEE: 3 hours
CIE: 30 marks  SEE: 70 marks

UNIT-I


Leader Election in a Synchronous Ring: The Problem, Impossibility Result for Identical Processes, A Basic algorithm, An algorithm with $O(n \log n)$ communication Complexity, Non-Comparison-Based Algorithms, Lower Bound for Comparison-Based algorithms, Lower-Bound for Non-Comparison-Based algorithms.


UNIT-II

Distributed Consensus with Process Failures: The Problem, algorithms for Stopping Failures, Algorithms for Byzantine Failures, Number of processes for Byzantine Agreement, Byzantine Agreement in General Graphs, Weak Byzantine Agreement, Number of Rounds with Stopping Failures.


UNIT-III


UNIT-IV

**Resource Allocation**: The Problem, Nonexistence of symmetric Dining Philosophers Algorithm, Right-Left Dining Philosophers Algorithm, Randomized Dining Philosophers Algorithm.

**UNIT-V**

**Consensus**: The Problem, Agreement Using Read/Write Shared Memory, Agreement Using Read-Modify-Write Shared Memory, Other Types of Shared Memory, commutability in Asynchronous Shared Memory Systems.

**Atomic Objects**: Definitions and Basic Results, Implementing Read-Modify-Write Atomic Objects in Terms, atomic Snapshots of Shared Memory, Read/Write Atomic Objects.

**Suggested Reading**:

CS 5202  PARALLEL COMPUTER ARCHITECTURE

Credits: 3

Instruction: (3L) hrs per week  Duration of SEE: 3 hours
CIE: 30 marks  SEE: 70 marks

UNIT I

Instruction Level Parallelism: Concepts and challenges, Instruction Pipeline Design, Hardware and software approaches, Dynamic scheduling, Speculation, Compiler techniques for exposing ILP, Branch Handling Techniques.

UNIT-II

Advanced Processor Technologies: CISC and RISC Architectures, Superscalar Processors, and VLIW Architectures.

Memory Hierarchy Design: Cache basics and Cache performance, Reducing miss rate and Miss penalty, Multilevel cache hierarchies, Main memory organizations, and Design of Memory Hierarchies.

UNIT-III

Parallel Computer Models: Classification of Parallel Computers, Multiprocessors and Multicomputer, and Multi-vector and SIMD computers.

Shared Memory Multiprocessors: Cache Coherence, Memory Consistency, Snoopy-based Cache coherence protocols – Write-Invalidate protocols (MSI, MESI, MOESI), and Write-update protocols.

UNIT-IV


UNIT -V

**Interconnection Network Design:** Basic Definitions, Basic Communication Performance, Organizational Structure, Interconnection Topologies, Routing, Switch Design, and Flow Control.

**Latency Tolerance:** Overview of Latency Tolerance, Latency Tolerance in Explicit Message Passing, Latency Tolerance in a Shared Address Space - Block Data Transfer, Proceeding Past Long-Latency Events, Pre communication in a Shared Address Space, and Multithreading.

**Suggested Reading:**

CS 5203 WEB SERVICES

Credits: 3

Instruction: (3L) hrs per week
CIE: 30 marks
Duration of SEE: 3 hours
SEE: 70 marks

UNIT -I

SOA and Web Services Fundamentals: Introduction to SOA, The Evolution of SOA, Web Services and Primitive SOA.

UNIT-II


UNIT-III

SOA and Service-Orientaion: Principles of Service-Orientaion, and Service Layers.

UNIT-TV

Building SOA (Planning and Analysis): SOA Delivery Strategies, Service-Oriented Analysis (I:Introduction), Service-Oriented Analysis (II: Service Modeling).

UNIT-V


Suggested Reading:

CS 5204  DISTRIBUTED COMPUTING  
Credits: 3

Instruction: (3L) hrs per week  
CIE: 30 marks

Duration of SEE: 3 hours  
SEE: 70 marks

UNIT -I

Introduction: Definition of Distributed Systems, Goals: Connecting Users and Resources, Transparency, Openness, Scalability, Hardware


UNIT II


UNIT -III


Software Agents: Software Agents in Distributed Systems, Agent Technology,

Naming: Naming Entities, Names, Identifiers, and Address, Name Resolution, The Implementation of a Name System, Locating Mobile Entities: Naming verses Locating Entities, Simple Solutions, Home-Based Approaches, and Hierarchical Approaches.
UNIT -IV


UNIT-V

**Distributed Multimedia Systems:** Introduction, Characteristics of Multimedia Data, Quality of Service Management, Quality of Service negotiation, Admission Control, Resource Management Resource Scheduling.

Suggested Readings:


CS 5205  PARALLEL PROGRAMMING  
*Credits: 3*

*Instruction: (3L) hrs per week  
CIE: 30 marks  
Duration of SEE: 3 hours  
SEE: 70 marks*

**UNIT - I**


**UNIT-II**

**Communication Operations** - One-to-All Broadcast and All-to-one Reduction, All-to-all Broadcast and Reduction, All-Reduce and Prefix-sum Operations, All-to-all Personalized Communication, Circular Shift, Improving the Speed of Some Communication Operations.

**UNIT-III**


**UNIT-IV**

**Introduction to Parallel Programming:** Introduction to Parallel Programming, Introduction to OpenCL, OpenCL Device Architectures, Basic OpenCL Examples, Parallel programming using OpenCL/C++ AMP/CUDA.

**UNIT-V**

**Introduction to OpenCL:** Understanding OpenCL’s Concurrency and Execution Model, Dissecting a CPU/GPU OpenCL Implementation.
With effect from the Academic Year 2016 – 2017

Suggested Reading:

CS 5206 GRID COMPUTING

Credits: 3

Instruction: (3L) hrs per week
CIE: 30 marks

Duration of SEE: 3 hours
SEE: 70 marks

UNIT-I


Job Submission: Introduction, Globus Job Submission. Transferring Files.

UNIT-II

Schedulers: Scheduler Features, Scheduler Examples, Grid Computing Meta-Schedule Distributed Resource Management Application (DRMAA)


UNIT-III

System Infrastructure I: Web Services: Service-Oriented Architecture, Web Services and Service Implementation

System Infrastructure II: Grid Computing Services: Grid Computing and Standardization Bodies Interacting Grid Computing Components, Open Grid Services Architecture (OGSA), WSRF.

User-Friendly Interfaces: Introduction Grid Computing Workflow Editors, Grid Portals

UNIT-IV

Grid-Enabling Applications: Introduction, Parameter Sweep, Using an Existing Program on Multiple Grid Computers, Writing an Application Specifically for a Grid, Using Multiple Grid Computers to Solve a Single Problem

UNIT-V

Case Studies: Globus-Overview of Globus Toolkit 4, Installation of Globus, GT4 Configuration; Main Components and programming Model, Using Globus
gLite: Introduction, Internal Workings of gLite, Logging and Bookkeeping (LB), Security Mechanism Using gLite Resource management using Gridway and Gridbus Scheduling using Condor, SGE, PBS, LSF Grid scheduling with QoS.
Suggested Reading:

CS 5211  SOFTWARE LAB-I
Credits: 2

Instruction: (3L) hrs per week
CIE: 50 marks


I. Implement the following using C/C++:
   1. Single Source Shortest Path algorithms
   2. All pairs shortest path algorithms
   3. Minimal Spanning Tree algorithms
   4. String and Pattern matching algorithms
   5. Maximum Flow/ Minimum cut algorithms
   6. Binary Search Tree- insertion and deletion
   7. AVL trees

II. Object Oriented Software Engineering

   1. As a case study select any two projects and do the following:
      a) Write the problem statement, Software Requirement Specification, entity relationship diagram,
      b) dataflow diagrams for level 0 and level 1,
      c) Draw use-case diagram
      d) Draw the activity diagram of all use cases.
      e) Draw sequence diagram of all use cases
      f) Draw collaboration diagram of all use cases, and Assign objects in Sequence diagram to classes and make class diagrams

Suggested Reading:


Note: The students have to submit a report at the end of the semester.
CS 5222 SEMINAR - I
Credits: 2

Instruction: (3L) hrs per week
CIE: 50 marks

Oral presentation is an important aspect of engineering education. The objective of the seminar is to prepare the student for systematic independent study of state of the art topics in broad area of his/her specialization.

Seminar topics can be chosen by the students with the advice from the faculty members. Students are to be exposed to following aspects of seminar presentations.

- Literature survey
- Organization of material
- Preparation of Power point Presentation slides
- Technical writing

Each student is required to

1. Submit one page of synopsis of the seminar talk two days before for display on notice board.
2. Give 20 minutes presentation through MS-PowerPoint Presentation Slides followed by 10 minutes discussion.
3. Submit a report on the seminar topic with a list of references and slides used within a week.

Seminars are to be scheduled from the 3rd week of the last week of the semester and any change in schedule should be discouraged.
The CIE marks will be awarded to the students by atleast 2 faculty members on the basis of oral presentation and report as well as their involvement in the discussion.
CS 5223  SOFTWARE LAB – II

Credits: 2

Instruction: (3L) hrs per week
CIE: 50 marks

DISTRIBUTED COMPUTING:

1. Design a Distributed Application using RMI for remote computation
2. Design a Distributed Application using Message passing Interface for remote computation
3. Design a Distributed application which consist of a server and client using threads
4. Design a Distributed application which consist of a stateless server using socket primitives.
5. Installation & Configuration of Hadoop.
6. Using Hadoop for counting word frequency with Map Reduce.
7. Write a Map Reduce Application which processes a log file of a system. List out the users
   Who have logged for max period on the system. Use sample Log file from the internet and
   process it using a pseudo distribution mode on Hadoop platform.

Advanced Databases: An application involving above technologies and database has to be
developed

Note: The students have to submit a report using LateX at the end of the semester.
CS 5224 SEMINAR –II
Credits: 2

Instruction: (3L) hrs per week
CIE: 50 marks

Oral presentation is an important aspects of engineering education. The objective of the seminar is to prepare the student for systematic independent study of state of the art topics in broad area of his/her specialization.

Seminar topics can be chosen by the students with the advice from the faculty members.

Students are to be exposed to following aspects of seminar presentation.

Literature Survey
Organization of material
Preparation of Power point Presentation slides and Technical Writing.

Each Student is required to:

1. Submit one page of synopsis of the seminar talk two days before for display on notice board.
2. Give 20 minutes presentation through MS-Power Point presentation slides followed by 10 minutes discussion.
3. Submit a report on the seminar topic with a list of references and slides used within a week.

Seminar are to be scheduled from the 3rd week to the last week of the semester and any change in schedule should be discouraged.

The CIE marks will be awarded to the students by atleast 2 faculty members on the basis of oral and a written presentation as well as their involvement in the discussion.
CS 5051 MOBILE COMPUTING

Credits: 3

Instruction: (3L) hrs per week
CIE: 30 marks

Duration of SEE: 3 hours
SEE: 70 marks

UNIT-I


UNIT-II

Telecommunication Systems: GSM, GPRS, Satellite Networks, Basics, Parameters and Configurations, Capacity Allocation, FAMA and DAMA, Broadcast Systems, DAB, DVB, CDMA and 3G.

UNIT-III


UNIT-IV


Mobile IP - Dynamic Host Configuration Protocol.

Traditional TCP - Classical TCP Improvements – WAP, WAP 2.0.

UNIT-V


File System Support for Mobility: Distributed File Sharing for Mobility support, Coda and other Storage Manager for Mobility Support.


Suggested Reading:
With effect from the Academic Year 2016 – 2017

CS 5052  REAL TIME SYSTEMS
Credits: 3

Instruction: (3L) hrs per week  Duration of SEE: 3 hours
CIE: 30 marks  SEE: 70 marks

UNIT-I


UNIT-II

Real Time Scheduling: Different Approaches- Clock Driven, Priority Driven, Scheduling of Periodic and Sporadic Jobs in Priority- Driven Systems.

UNIT-III


UNIT-IV


UNIT-V

Case Studies: Vx – Works, and RT Linux.

Suggested Reading:

CS 5053 WEB ENGINEERING
Credits: 3

Instruction: (3L) hrs per week Duration of SEE: 3 hours
CIE: 30 marks SEE: 70 marks

UNIT-I


UNIT-II


UNIT-III


UNIT-IV

Web Resource Management: Models and Techniques, Ontology Supported Web Content Management, Design Principles and Applications of XRML.

UNIT-V


Suggested Reading:

CS 5054  MULTIMEDIA TECHNOLOGIES  
Credits: 3

Instruction: (3L) hrs per week  Duration of SEE: 3 hours
CIE: 30 marks  SEE: 70 marks

UNIT-I

Media and Data Streams: Properties of multimedia systems, Data streams characteristics: Digital representation of audio, numeric instruments digital interface Bark concepts, Devices, Messages, Timing Standards Speech generation, analysis and transmission.

UNIT-II

Digital Image: Analysis, recognition, transmission, Video: Representation, Digitalization transmission Animations: Basic concepts, animation languages, animations control transmission

UNIT-III

Data Compression Standards: JPEG, H-261, MPEG DVI

Optical storage devices and Standards: WORHS, CDDA, CDROM, CDWO, CDMO.

Real Time Multimedia, Multimedia file System.

UNIT-IV

Multimedia Communication System: Collaborative computing session management, transport subsystem, QOS, resource management.

Multimedia Databases: Characteristics, data structures, operation, integration in a database model. A Synchronization: Issues, presentation requirements, reference to multimedia synchronization, MHEG

UNIT-V

Multimedia Application: Media preparation, Composition, integration communication, consumption, entertainment.

Suggested Reading:

CS5055 DATA MINING
Credits: 3

Instruction: (3L) hrs per week  Duration of SEE: 3 hours
CIE: 30 marks  SEE: 70 marks

UNIT-I

Introduction: Challenges – Origins of Data Mining and Data mining Tasks

Data: Types of Data Quality – Data Preprocessing – Measures of similarity and Dissimilarity
OLAP and Multidimensional Data Analysis.

UNIT-II

Classification: Preliminaries – General Approach to Solving a Classification Problem –
Decision Tree Induction- Model Overfitting – Evaluating the Performance of a Classifier -
Methods of Comparing Classifiers- Rule – Based Classifier.

UNIT-III

Classification: Nearest-Neighbor classifiers – Bayesian Classifiers – Artificial Neutral Networks
– Support Vector Machine – Ensemble Methods – Class Imbalance Problem – Multiclass
Problem.

UNIT-IV

Association Analysis: Problem Definition – Frequent Item Set Generation – Rule Generation –
Compact Representation of frequent Item Sets – Alternative Methods for Generating Frequent
Support Distribution – Handling Categorical Attributes a Handling Continuous Attributes -
Handling a concept Hierarchy.

UNIT-V

Cluster Analysis: Overview – k-means –Agglomerative Hierarchical Clustering – DBSCAN
Cluster evaluation on Characteristics of Data, Clusters, and Clustering Algorithms.

Suggested Reading:

1. Pang-Ning Tan, Michael Steinbach, Vipin kumar, Introduction to Data Mining, Pearson
2. K.P. Soman, Shyam Diwakar, V.Ajay, Insight into Data Mining Theory and Practice,
PHI.2010.
CS 5056  NETWORK SECURITY
Credits: 3

Instruction: (3L) hrs per week
CIE: 30 marks
Duration of SEE: 3 hours
SEE: 70 marks

UNIT-I

Introduction: Attributes of Security, Integrity, Authenticity, Non-repudiation, Confidentiality
Authorization, Anonymity, Types of Attacks, DoS, IP Spoofing, Replay, Man-in-the-Middle
attacks General Threats to Computer Network, Worms, Viruses, -Trojans

UNIT-II

Secret Key Cryptography: DES, Triple DES, AES, Key distribution, Attacks

Public Key Cryptography: RSA, ECC, Key Exchange (Diffie-Hellman), Java Cryptography
Extensions, Attacks

UNIT-III

Integrity, Authentication and Non-Repudiation: Hash Function (MD5, SHA5), Message
Authentication Code (MAC), Digital Signature (RSA, DSA Signatures), Biometric
Authentication.

UNIT-IV

PKI Interface: Digital Certificates, Certifying Authorities, POP Key Interface, System Security
using Firewalls and VPN's.

Smart Cards: Application Security using Smart Cards, Zero Knowledge Protocols and their use
in Smart Cards, Attacks on Smart Cards

UNIT-V

Applications: Kerberos, Web Security Protocols (SSL), IPSec, Electronic Payments, E-cash,
Secure Electronic Transaction (SET), Micro Payments, Case Studies of Enterprise Security
(.NET and J2EE)

Suggested Reading:

CS 5057  MACHINE LEARNING  
Credits: 3

Instruction: (3L) hrs per week  
Duration of SEE: 3 hours  
CIE: 30 marks  
SEE: 70 marks

UNIT-I  

Introduction: Learning, Types of Machine Learning.  
Concept learning: Introduction, Version Spaces and the Candidate Elimination Algorithm.  
Learning with Trees: Constructing Decision Trees, CART, Classification Example

UNIT-II  

Linear Discriminants: The Perceptron, Linear Separability, Linear Regression  
Multilayer Perceptron (MLP): Going Forwards, Backwards, MLP in practices, Deriving back Propagation  
Support Vector Machines: Optimal Separation, Kernels

UNIT-III  


UNIT-IV  

Evolutionary Learning: Genetic Algorithms, Genetic Operators, Genetic Programming  
Ensemble learning: Boosting, Bagging  
Dimensionality Reduction: Linear Discriminant Analysis, Principal Component Analysis

UNIT-V  

Clustering: Introduction, Similarity and Distance Measures, Outliers, Hierarchical Methods, Partitional Algorithms, Clustering Large Databases, Clustering with Categorical Attributes, Comparison
Suggested Reading:

CS 5058 INFORMATION RETRIEVAL SYSTEMS
Credits: 3

Instruction: (3L) hrs per week Duration of SEE: 3 hours
CIE: 30 marks SEE: 70 marks

Course Objectives:
- To understand indexing and querying in information retrieval systems
- To learn the different models for information retrieval
- To expose the students to text classification and clustering
- To learn about web searching

Course Outcomes:
On completion of the course the students will be able to
- Understand the algorithms and techniques for information retrieval (document indexing and retrieval, query processing)
- Quantitatively evaluate information retrieval systems
- Classify and cluster documents
- Understand the practical aspects of information retrieval such as those in web search engines.

UNIT-I

Boolean Retrieval: An example information, Building an inverted index, Processing Boolean queries, The extended Boolean model versus ranked retrieval.

The term vocabulary and postings lists: Document delineation and character sequence decoding, determining the vocabulary of terms, Faster postings list intersection via skip pointers, Positional postings, and Phrase queries.

Dictionaries and tolerant retrieval: Search structures for dictionaries, Wildcard queries, Spelling correction.

Index Construction: Hardware basics, Blocked sort-based indexing, Single-pass in-memory indexing, Distributed indexing, Dynamic indexing, Other types of indexes.

UNIT-II

Index Compression: Statistical properties of terms in information retrieval, Dictionary compression, Postings file compression.

Scoring, term weighting and the vector space model: Parametric and zone indexes, Term frequency and weighting, The vector space model for scoring, and Variant tf-idf functions.

Computing scores in a complete search system: Efficient scoring and ranking, Components of an information retrieval system, Vector space scoring and query operator interaction.

UNIT-III

Relevance feedback and query expansion: Relevance feedback and pseudo relevance feedback, Global methods for query reformulation.


Language models for information retrieval: Language models, The query likelihood model.

UNIT-IV


Vector space classification: Document representations and measures of relatedness in vector spaces, Rocchio classification, k-nearest neighbor, Linear versus nonlinear classifiers.

Flat clustering: Clustering in information retrieval, Problem statement, Evaluation of clustering, k-means.

Hierarchical clustering: Hierarchical agglomerative clustering, Single-link and complete-link clustering, Group-average agglomerative clustering, Centroid clustering, Divisive clustering.

UNIT-V


Web search basics: Background and history, Web characteristics, Advertising as the economic model, The search user experience, Index size and estimation, Near-duplicates and shingling.

Web crawling and Indexes: Overview, Crawling, Distributing indexes, Connectivity servers.

Link analysis: The Web as a graph, Page Rank, Hubs and Authorities.

Suggested Reading:

CS 5059  
NATURAL LANGUAGE PROCESSING  
Credits: 3

Instruction: (3L) hrs per week  
Duration of SEE: 3 hours  
CIE: 30 marks  
SEE: 70 marks

UNIT-I
Introduction of Elementary Probability Theory, Essential Information Theory

UNIT-II
Linguistic Essentials Corpus-Based Work Collocations.

UNIT-III
Word Sense Disambiguation: Methodological Preliminaries, Supervised and unsupervised learning, Pseudo words, Upper and lower bounds on performance, Supervised Disambiguation, Bayesian classification.

UNIT-IV

UNIT-V
Probabilistic Context Free Grammars: Introduction of Clustering Information Retrieval:  
Background, The Vector Space Model.

Suggested Reading:

CS 5060 SOFTWARE QUALITY AND TESTING

Credits: 3

Instruction: (3L) hrs per week
CIE: 30 marks

Duration of SEE: 3 hours
SEE: 70 marks

UNIT-I

UNIT - II
Quality tools in Software Development, Seven Basic Tools, Check List, Pareto Diagram, Histogram, Run Charts, Scatter Diagram, Control Chart, Cause and Effect Diagram, Defect Removal, Effect Removal Effectiveness, Quality Planning, Cost Effectiveness of Phase Effect Removal.

UNIT – III

UNIT - IV

UNIT - V
Planning Your Test Effort, Writing and Tracking Test Cases, Reporting Measuring SQA.

Suggested Reading:

CS 5061  
CLOUD COMPUTING
Credits: 3

*Instruction: (3L) hrs per week*  
*Duration of SEE: 3 hours*

*CIE: 30 marks*  
*SEE: 70 marks*

UNIT-I


**Cloud Formations:** From One Computer to the Grid of Many, Server Virtualization, Parallel Processing, Symmetric Multiprocessing Systems, Massively Parallel Processing Systems.

UNIT II

**Web services and the cloud:** Communication-as-a-Service(CaaS), Infrastructure-as-a-Service(IaaS), Monitoring-as-a-Service(MaaS), Platform-as-a-Service(PaaS), Software-as-a-Service(SaaS)

**Building Cloud Networks:** The Evolution from the MSP Model to cloud, Computing and Software-as-a-Service, The cloud Data Center, Collaboration i. Service-Oriented Architectures as a Step Toward Cloud Computing, Basic Approach to a Data Center-Based SOA

The Role of Open Source Software in Data Centers, Where Open Source Software Is Used Case Studies: Amazon web services, Google App Engine.

UNIT III

**Virtualization:** Introduction, types and technologies, Accomplishing Virtualization, importance of virtualization in Cloud Computing,

**Case studies:** Xen Virtual machine monitor-Xen API, VMware- VMware products- VMware Features, Microsoft Virtual Server-Features of Microsoft Virtual server

UNIT IV

UNIT V


**Mobile Internet Devices and the Cloud:** Mobile Operating Systems for Smartphones. Mobile Platform Virtualization I Collaboration Applications for Mobile Platforms.

**Suggested Reading:**

2. Ivanka Menken, *Cloud Computing Specialist Certification kit Virtualization*,

**Web Resources:**

CS 5062  SOFT COMPUTING  

Credits: 3

Instruction: (3L) hrs per week  
Duration of SEE: 3 hours

CIE: 30 marks  
SEE: 70 marks

UNIT-I


UNIT II


UNIT III


UNIT IV


UNIT V


Suggested Reading:

With effect from the Academic Year 2016 – 2017

CS 5063  NEURAL NETWORKS  
Credits: 3

Instruction: (3L) hrs per week  
CIE: 30 marks  
Duration of SEE: 3 hours  
SEE: 70 marks  
30 Marks

UNIT -I


UNIT-II


UNIT-III


UNIT-IV


UNIT -V


Suggested Reading :

With effect from the Academic Year 2016 – 2017

CS 5064  SOFTWARE PROJECT MANAGEMENT
Credits: 3

Instruction: (3L) hrs per week  Duration of SEE: 3 hours
CIE: 30 marks  SEE: 70 marks

UNIT-I

UNIT-II
Life – Cycle phases, Artifacts of the process, Model Based Software Architectures, Workflows of the Process, Checkpoints of the process.

UNIT-III

UNIT-IV
Modern Project profiles, Next Generation Software Economics, Modern process Transitions, Managing Contacts, Managing People & Organizing Terms.

UNIT-V
Process improvement & mapping to the CMM, ISO 12207 – an overview, programme management.

Suggested Reading:

UNIT I

Image Processing: Introduction, Examples, Fundamental steps, Components, Elements of visual perception, Light and Electromagnetic Spectrum, Image sensing and Acquisition, Image Sampling and Quantization, Basic relationships between pixels.

Intensity Transformations and Spatial Filtering: Background, Some basic intensity transformation functions, Histogram processing, Fundamentals of Spatial filtering, Smoothing spatial filters, Sharpening spatial filters, Combining Spatial Enhancement Methods.

UNIT II


Image Restoration: Noise Models, Restoration in the presence of noise only-Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering.


UNIT III


UNIT IV


UNIT V


Object Recognition: Patterns and Pattern Classes, Recognition based on Decision-theoretic Methods, Structural Methods.

Suggested Reading:


CS 5066 SOFTWARE REUSE TECHNIQUES

Credits: 3

Instruction: (3L) hrs per week Duration of SEE: 3 hours
CIE: 30 marks SEE: 70 marks

UNIT-I

Software Reuse Success Factors, Reuse Driven Software Engineering Business, Object Oriented Software Engineering, Applications and Component Subsystem, Use case Components, Object Components

UNIT-II


UNIT-III

Structural Patterns: Adapter, Bridge, Composite, Decorator, Fiacade, Flyweight, Proxy.

Behavioral Patterns: Chain of Responsibility, Command, Interpreter.

UNIT-IV

Behavioral Patterns: Iterator, Mediator, Momento, Observer, Stazte, Strategy, Template, Visitor, Other Design Pattern: Whole Part, Master-Slave, View Handler-reciever, Client-Dispatcher-Server, Publisher-Subscriber.

UNIT-V

Architectural Patterns: Layers, Pipes and Filters, Black Board, Broker, Model View Controller.

Presentation: Abstraction-Control, Micro Kernet, Reflection.

Suggested Reading:

CS 5067  RELIABILITY AND FAULT TOLERANCE

Credits: 3

Instruction: (3L) hrs per week  Duration of SEE: 3 hours
CIE: 30 marks  SEE: 70 marks

UNIT-I

Introduction to Reliability Engineering: Reliability, Repairable and Non-repairable Systems, Maintainability and Availability, Designing, Reliability, Repairable and Non-repairable Systems, MTBF, MTTF, MDT, k out of n systems.

UNIT-II


UNIT-III

Software Reliability Modeling: Introduction to Software Reliability Modeling, Parameter Determination and Estimation, Model Selection, Markovian Models, Finite and Infinite failure category Models, Comparison of Models, Calendar Time Modeling.

UNIT-IV


UNIT-V


Suggested Reading:

With effect from the Academic Year 2016 – 2017

CS 5068 WEB MINING
Credits: 3

Instruction: (3L) hrs per week Duration of SEE: 3 hours
CIE: 30 marks SEE: 70 marks

Course Objectives:

- To have a foundation in data mining
- To understand information retrieval and web search
- To expose the students to the applications of web mining

UNIT-I

Introduction: The World Wide Web, History of the Web and the Internet, Web Data Mining

Association Rules and Sequential Patterns: Basic Concepts, Apriori Algorithm, Data Formats for Association Rule Mining, Mining with Multiple Minimum Supports, Mining Class Association Rules

Supervised Learning: Basic Concepts, Decision Tree Induction, Classifier Evaluation, Naïve Bayesian Classification, Naïve Bayesian Text Classification, K-Nearest Neighbor Learning, Ensemble of Classifiers

UNIT-II

Unsupervised Learning: Basic Concepts. K-means Clustering, Representation of Clusters, Hierarchical Clustering, Distance Functions, Data Standardization, Handling of Mixed Attributes, Which Clustering Algorithm to Use? Cluster Evaluation

Information Retrieval and Web Search: Basic Concepts, Relevance Feedback, Evaluation Measures, Text and Web Page Pre-Processing, Inverted Index and Its Compression

UNIT-III

Information Retrieval and Web Search: Web Search, Meta-Search: Combining Multiple Rankings, Web Spamming

Link Analysis: Social Network Analysis, Co-Citation and Bibliographic Coupling, PageRank, HITS, Community Discovery
UNIT-IV

**Web Crawling:** A Basic Crawler Algorithm, Implementation Issues, Evaluation, Crawler Ethics and Conflicts

**Structured Data Extraction: Wrapper Generation:** Preliminaries, Wrapper Induction, Instance-Based Wrapper Learning, Automatic Wrapper Generation, String Matching and Tree Matching, Building DOM Trees.

**Information Integration:** Introduction to Schema Matching, Pre-Processing for Schema Matching, Schema-Level Match, Domain and Instance-Level Matching, Combining Similarities, 1: Match.

UNIT-V

**Opinion Mining and Sentiment Analysis:** Sentiment Classification, Feature-Based Opinion Mining and Summarization, Comparative Sentence and Relation Mining, Opinion Search, Opinion Spam.

**Web Usage Mining:** Data Collection and Pre-Processing, Data Modeling for Web Usage Mining.

**Suggested Reading:**

CS 5069  HUMAN COMPUTER INTERACTION

Credits: 3

Instruction: (3L) hrs per week  Duration of SEE: 3 hours
CIE: 30 marks  SEE: 70 marks

UNIT- I


UNIT- II

Discovery: Discovery Phase Framework, Collection, Interpretation, Documentation

UNIT- III

Interaction Design Models: Model Human Processor, Keyboard Level Model, GOMS, Modeling Structure, Modeling Dynamics, Physical Models
Usability Testing: Usability, Usability Test, Design the Test, Prepare for the Test, Perform the Test, Process the Data

UNIT- IV

Interface Components: The WIMP Interface, Other Components

UNIT- V

Speech and Hearing: The Human Perceptual System, Using Sound in Interaction Design, Technical Issues Concerning Sound
Suggested Reading:

CS5104 OBJECT ORIENTED SOFTWARE ENGINEERING

Credits: 3

Instruction: (3L) hrs per week
Duration of SEE: 3 hours
CIE: 30 marks
SEE: 70 marks

UNIT-I


UNIT-II

Requirement Capture, Requirement Analysis, Refining the Requirement Models, Object Interaction.

UNIT-III

Operations, Control, Design, System Design.

UNIT-IV

Object design, Design Patterns, Human Computer Interaction, Designing Boundary Classes.

UNIT-V


Suggested Reading:

CS 5154  PARALLEL ALGORITHMS  
Credits: 3

Instruction: (3L) hrs per week  
Duration of SEE: 3 hours
CIE: 30 marks  
SEE: 70 marks

UNIT-I


UNIT-II


UNIT-III


UNIT-IV


UNIT-V


Suggested Reading:


CS 5251  ADVANCED COMPUTER NETWORKS
Credits: 3
Instruction: (3L) hrs per week  Duration of SEE: 3 hours
CIE: 30 marks  SEE: 70 marks

UNIT I

History of Computer Networks and the Internet: Protocol Layers and Their Service Models
Review of OSI and TCP/IP Delay, Loss, and Throughput in Packet-Switched Networks

UNIT II

Wireless and Mobile Networks: Introduction, Wireless Links and Network Characteristics,
WiFi:802.11 Wireless LANs, Cellular Internet Access, Mobility Management: Principles
Managing Mobility in Cellular Networks, Wireless and Mobility: Impact on Higher-layer
Protocols, Bluetooth, Securing Wireless LANs

UNIT III

The Network Layer: Virtual Circuit and Datagram Networks, The Internet Protocol (IP):
Forwarding and Addressing in the Internet Routing in the Internet Broadcast and Multicast
Routing, Congestion Control QOS Label Switching and MPLS, Mobile IP, Voice over IP, IPv6,
Network-Layer Security: IPsec

UNIT IV

Transport Layer: Introduction and Transport-Layer Services, Multiplexing and
Demultiplexing, Connectionless Transport: UDP, Principles of Reliable Data Transfer,
Connection-Oriented Transport: TCP, Principles of Congestion Control, TCP Congestion
Control, Securing TCP Connections: SSL, Application Layer: Principles of Network
Application, The Web and HTTP, HTTPS, File Transfer: FTP, Electronic Mail in the Internet,
Securing E-mail DNS—The Internet’s Directory Service, Peer-to-Peer Applications

UNIT V

Network Management: The Infrastructure for Network Management, The Internet-Standard
Management Framework, ASN.1, Multimedia Networking, Multimedia Networking
Applications, Streaming Stored Audio and Video, Making the Best of the Best-Effort Service,
Protocols for Real-Time Interactive Applications, Providing Multiple Classes of Service,
Providing (QOS) Quality of Service Guarantees.
Suggested Reading:

With effect from the Academic Year 2016 – 2017

CS 5253  PARALLEL AND DISTRIBUTED DATABASES

Credits: 3

Instruction: (3L) hrs per week  Duration of SEE: 3 hours
CIE: 30 marks  SEE: 70 marks

UNIT- I


UNIT-II

Query Processing: Overview, Measures of query cost, Selection operation, sorting, Join operation, Other operations, Evaluation of Expressions.


UNIT-III

Parallel Systems: Speedup and Scaleup, Interconnection Networks, Parallel Database Architectures.


UNIT-IV

Distributed Databases: Reference architecture for DDB, Types of Data Fragmentation, Distribution Transparency for Read-only applications, Distribution Transparency for Update applications, Distributed Database Access Primitives, Integrity Constraints in DDB.


UNIT-V
Translation of Global Queries to Fragment Queries: Equivalence transformations for queries, Transforming global queries into fragment queries, Distributed grouping and aggregate function evaluation, Parametric queries.


Suggested Reading:

CS5254  ADHOC AND SENSOR NETWORKS

Credits: 3

Instruction: (3L) hrs per week  
Duration of SEE: 3 hours
CIE: 30 marks  
SEE: 70 marks

UNIT-I


UNIT-II


UNIT-III


UNIT-IV


UNIT-V

Suggested Reading:


CS5255  STORAGE MANAGEMENT  
Credits: 3

Instruction: (3L) hrs per week  
CIE: 30 marks  
Duration of SEE: 3 hours  
SEE: 70 marks

UNIT -I  
Introduction to Information Storage and Management, Storage System Environment, Intelligent Storage System.

UNIT-II  
Direct-Attached Storage and Introduction to SCSI, Storage Area Networks, Network-Attached Storage.

UNIT-III  
IP SAN, Content-Addressed Storage, Storage Virtualization.

UNIT-IV  
Introduction to Business Continuity, Backup and Recovery, Local Replication.

UNIT -V  
Remote Replication, Securing the Storage Infrastructure, Managing the Storage Infrastructure.

Suggested Reading:
CS5256 PERFORMANCE EVALUATION OF COMPUTER SYSTEMS

Credits: 3

Instruction: (3L) hrs per week
CIE: 30 marks
Duration of SEE: 3 hours
SEE: 70 marks

UNIT -I

Fundamental Concepts and Performance Measures


UNIT –II


UNIT -III

Queuing Theory: Networks of Queues, Estimating Parameters and Distributions

Computational Methods for Queuing Network Solutions, Simulation Analysis

Simulation Process, Time Control, Systems and Modeling, Simulation Languages, Applications of Simulation.

UNIT -IV


Hardware Testbeds, Instrumentation, Measurement, Data Extraction, and Analysis


System Performance Evaluation Tool Selection and Use: Validation of Results, Conducting Experiments, Performance Metrics, Evaluation

UNIT -V

Analysis of Computer Architectures: Case I: Central Server Computer System

Case II: Multiple Server Computer System

Case III: Petri Net Example
Analysis of Operating System Components
System Architectures, Workloads, Experimental Design and Simulation, Experimental Analysis and Conclusion.

Database Systems Performance Analysis

Analysis of Computer Networks Components
Analytical Modeling Examples, Simulation Modeling of Local Area Networks.

Suggested Reading:


CS 5304  REAL TIME OPERATING SYSTEMS  
Credits: 3

Instruction: (3L) hrs per week  
CIE: 30 marks  
Duration of SEE: 3 hours  
SEE: 70 marks

UNIT I


Portable Operating System Interface (POSIX) – IEEE Standard 1003.13 & POSIX real time profile. POSIX versus traditional Unix signals, overheads and timing predictability.

UNIT II


UNIT III


UNIT IV

VxWorks – POSIX Real Time Extensions, timeout features, Task Creation, Semaphores (Binary, Counting), Mutex, Mailbox, Message Queues, Memory Management – Virtual to Physical Address Mapping.

UNIT V

Debugging Tools and Cross Development Environment – Software Logic Analyzers, ICEs. 

Comparison of RTOS – VxWorks, µC/OS-II and RT Linux for Embedded Applications.

Suggested Reading:

CS 5305  SIMULATION AND MODELING  
Credits: 3  

Instruction: (3L) hrs per week  

Duration of SEE: 3 hours  

CIE: 30 marks  

SEE: 70 marks  

UNIT-I  


UNIT-II  

Overview of Statistical Models and Queuing Systems, Programming languages for Simulation: Continuous and Discrete Simulation Languages – FORTAN, GPSS, SIMAN, SIMSCRIPT, SLAM and MODSIM.  

UNIT-III  


UNIT-IV  

Input Data Analysis: Data Collection: Identify the Distribution, Parameter and Estimation.  

Goodness of fit tests: Chi-Square Test – KS Test; Multivariate and time series input models, Verification and Validations of Simulation Models, Model Building, Verification and Validation: Verification of Simulation Models, Calibration and Validation of Models, face validity, Validation of Model Assumptions, Validation Input/output Transformations, Input/output Validation using Historical Input Data, Input/output Validation Sing Turning Test.  

UNIT-V  

Suggested Reading: