CURRICULUM AND SYLLABI FOR AUTONOMOUS STREAM

M.TECH. (DISTRIBUTED SYSTEMS) COURSES
( FOR STUDENTS ADMITTED FROM ACADEMIC YEAR 2015-16 ONWARDS)

CURRICULUM

I SEMESTER

<table>
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<tr>
<th>Subject Code</th>
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<th>Periods</th>
<th>Marks</th>
<th>Credits</th>
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<tr>
<td>CS151</td>
<td>Design of Distributed Systems</td>
<td>TY</td>
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<td>High Performance Networks</td>
<td>TY</td>
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Total Credits 26

II SEMESTER

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<td>CS157</td>
<td>Service Oriented Architecture and Web Services</td>
<td>TCM</td>
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Total Credits 27
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**Total Credits**: 9

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**Total Credits**: 16

A representative list of **Professional Development Courses** is given below:

- a) Industrial Training (*Limited to one credit*)
- b) Specific Field Knowledge Training
- c) Seminar related with directed study
- d) Paper Publication in SCI Journals (*Limited to one credit*)

#CA - Continuous Assessment, SE - Semester Examination, TM - Total Marks

*TY - Theory, TCM - Theory with a Mini Project, LB – Laboratory, PR - Practice
# LIST OF ELECTIVES

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<tr>
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<td>CSE51</td>
<td>Mobile Computing Systems</td>
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<td>CSE52</td>
<td>Information Retrieval Techniques</td>
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<td>CSE53</td>
<td>Advanced Distributed System Architectures</td>
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<td>4.</td>
<td>CSE54</td>
<td>Machine Learning</td>
<td>TY</td>
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<td>Agent Technology</td>
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<td>Optical Communication Networks</td>
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<td>CSE59</td>
<td>Data Mining and Warehousing Techniques</td>
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<td>CSE60</td>
<td>Multi core Programming</td>
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<td>CSE61</td>
<td>Ad hoc and Sensor Networks</td>
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<td>CSE64</td>
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<td>CSE67</td>
<td>Internals of Operating System</td>
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SYLLABUS (Core Subjects)
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<td>M.Tech. (Distributed Systems)</td>
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<th>Credit</th>
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<tr>
<td>CS151</td>
<td>Design of Distributed Systems</td>
<td>3</td>
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</table>

Prerequisite:

- To introduce the Architecture, and types and design issues of Distributed Systems

Objectives:

- To Learn the Fundamental Principles of Distributed Operating Systems
- To Learn the Design of Distributed Fault Tolerant Systems

Outcome:

On successful completion of the course, students will be able to:

- Design Middleware Components for Distributed Systems
- Create a Distributed System through the integration of Heterogeneous Applications and Web services
- Design of Fault Tolerant Distributed Systems

UNIT – I

Distributed Systems Architecture, Types and Remote Procedure Call

| Hours: 09 |


UNIT – II

Distributed Operating Systems

| Hours: 09 |


UNIT – III

Distributed Resource Management

| Hours: 09 |


UNIT – IV

Failure Recovery and Fault Tolerance

| Hours: 09 |


UNIT – V

Naming, Security and Real Time Operating System

| Hours: 09 |


Total contact Hours: 45

Total Tutorials: 15

Total Practical Classes: -

Total Hours: 60

Text Books:


Reference Books:


Websites:

1. http://nptel.ac.in
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<thead>
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<th>Programme</th>
<th>M.Tech. (Distributed Systems)</th>
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<tr>
<td><strong>Objectives</strong></td>
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<tr>
<td>• To introduce the concepts, techniques and applications of Computer Networks.</td>
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<tr>
<td>• To educate about layered communication architecture, routing algorithms, congestion control algorithms.</td>
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<tr>
<td>• To give ideas and insights on important design issues associated with computer networks.</td>
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<tr>
<td><strong>Outcome</strong></td>
<td>At the end of the course the students will be able to:</td>
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<tr>
<td>• Understand the advanced topics in the field of computer networks</td>
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<tr>
<td>• Gain knowledge about routing, switching and network configuration management</td>
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<tr>
<td><strong>UNIT – I</strong></td>
<td>Introduction to Networks</td>
<td>Hours: 09</td>
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<td><strong>UNIT – II</strong></td>
<td>SONET and ATM</td>
<td>Hours: 09</td>
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<td><strong>UNIT – III</strong></td>
<td>Congestion Control and Traffic Management</td>
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<td><strong>UNIT – IV</strong></td>
<td>QoS and Introduction to Cisco</td>
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<td><strong>UNIT – V</strong></td>
<td>Optical Networks</td>
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<td><strong>Total Tutorials: 15</strong></td>
<td><strong>Total Practical Classes: -</strong></td>
<td><strong>Total Hours: 60</strong></td>
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**Text Books:**

2. Todd Lammle, Sybex, CCNA Intro – Study Guide.

**Reference Books:**

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<tr>
<td>CS153</td>
<td>Distributed Database Management Systems</td>
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<td>40 60 100</td>
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**Prerequisite**
- 

**Objectives**
- Understand the need for the Distributed Database Systems.
- Knowledge on Distributed Database Architecture.
- Need to get the knowledge regarding different Database paradigms like Web Data Management, Parallel Databases etc.

**Outcome**
On successful completion of the course students will be able to:
- Design the applications that includes Distributed Databases.
- Perform Distributed Query Processing and Optimization.
- Have knowledge on Integrity Control.

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<tr>
<th>UNIT – I</th>
<th>Introduction of DDBMS</th>
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<th>Data and Access Control</th>
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<th>UNIT – III</th>
<th>Optimization of Queries and Transaction Management</th>
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<th>Distributed Concurrency Control &amp; Replication</th>
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<tr>
<th>UNIT – V</th>
<th>Database Systems – Various Models</th>
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**Total contact Hours:** 60  **Total Textbooks:** 1. M.Tamer Ozsu, Patrick Valduriez, Principles of Distributed Database Systems, Springer, 2011

**Reference Books:**

**Websites:**
2. http://docs.oracle.com/
Department: Computer Science and Engineering

Programme: M.Tech. (Distributed Systems)

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<td>L T P C CA SE TM</td>
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Prerequisite
- None

Objectives
- To understand the architecture of parallel systems and identify the scope for parallelism in present day’s processors.
- To understand the various parallel programming models and the challenges involved in parallel programming and learn the parallel programming techniques with OpenMP and MPI.
- To study the complexity behind parallel algorithms.

Outcome
At the end of the course the students will be able to:
- Acquire the skills to implement software effectively and efficiently on parallel hardware platforms.
- Have a keen knowledge in multithreading techniques.

UNIT – I
Introduction
Hours: 09

Need of high speed computing – increase the speed of computers – history of parallel computers and recent parallel computers; solving problems in parallel – temporal parallelism – data parallelism – comparison of temporal and data parallel processing – data parallel processing with specialized processors – inter-task dependency- The need for parallel computers - models of computation - analyzing algorithms – expressing algorithms.

UNIT – II
Parallel Algorithm Design and Communication Operations
Hours: 09


UNIT – III
Parallel Programming Models
Hours: 09


UNIT – IV
Parallel Algorithms
Hours: 09


UNIT – V
Parallel Algorithms
Hours: 09


Total contact Hours: 45  Total Tutorials: 15  Total Practical Classes: -  Total Hours: 60

Text Books:
2. V. Rajaraman and C. Siva Ram Murthy, Parallel Computers – Architecture and Programming , Prentice-
Hall of India, 2003.

**Reference Books:**

3. Michael Jay Quinn, Parallel Programming in C with MPI and OpenMP, McGraw-Hill, 2003

**Websites:**

1. [http://www.openmp.org](http://www.openmp.org)
2. [http://www.nptel.ac.in](http://www.nptel.ac.in)
3. [http://www/aparallel.com](http://www/aparallel.com)
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<table>
<thead>
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<tbody>
<tr>
<td>- To impart basic working knowledge on distributed system concepts.</td>
</tr>
<tr>
<td>- To understand the intricacies of distributed architecture environment.</td>
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<table>
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<tbody>
<tr>
<td>- After doing the lab students are able to understand the distributed systems concepts.</td>
</tr>
<tr>
<td>- Able to implement time, event relationships and understand the concepts of distributed deadlocks and mutual exclusion.</td>
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<tr>
<td>- To gain in depth understanding of distributed architecture environment.</td>
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<tr>
<th>CYCLE - I</th>
<th>Any experiments from the chosen elective course may be included.</th>
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<tbody>
<tr>
<td>1. Inter-process communication using socket programming/ RPC mechanism .</td>
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<tr>
<td>2. Threads clock synchronization.</td>
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<tr>
<td>3. Simulation of election algorithms (Ring and Bus Topology)</td>
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<tr>
<td>4. a. Bully b. Ring</td>
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<tr>
<td>5. Distributed/Hierarchical deadlock detection algorithms.</td>
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<tr>
<td>6. Clock synchronization: NTP / Lamports clock.</td>
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<td>1. Load distributing algorithms, Performance comparison.</td>
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<tr>
<td>2. Error recovery in concurrent systems</td>
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<tr>
<td>3. Design and implement client server application using RMI (Remote Method Invocation)</td>
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<td>4. Design and implement an application using EJB (Entity Java Beans) session bean business logic and service using stub, i.e., client side proxy object.</td>
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<td>5. Design and implement an offline database communication system using JMS (Java Message Service) to service the client request.</td>
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<tr>
<td>6. Develop a simple task manage application that keeps track of tasks execution maintaining which tasks have been executed in eclipse JAVA environment using XML and JAVA servlets/JSP</td>
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### Course Information

**Department:** Computer Science and Engineering  
**Programme:** M.Tech. (Distributed Systems)  
**Semester:** Two  
**Category:** TY

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<td>CS156</td>
<td>Cloud Computing</td>
<td>3 1 - 4</td>
<td>4 40 60 100</td>
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</table>

**Prerequisite:** -

**Objectives:**
- To introduce the basics of Cloud Computing.
- To educate the cloud working function.
- To allow computer system resources to be used in an efficient manner.
- Makes the environment to the cloud.

**Outcome:**
On successful completion of the course, students will be able to:
- Understand the concepts of cloud computing and its related techniques.
- Provide a pleasant and effective user interface.

---

**UNIT – I**  
Hours: 09


---

**UNIT – II**  
Hours: 09

Federation in the Cloud - Presence in the Cloud - Privacy and its Relation to Cloud-Based Information Systems – Security in the Cloud - Common Standards in the Cloud – End-User Access to the Cloud Computing

---

**UNIT – III**  
Hours: 09


---

**UNIT – IV**  
Hours: 09


---

**UNIT – V**  
Hours: 09


**Total contact Hours:** 45  
**Total Tutorials:** 15  
**Total Practical Classes:** -  
**Total Hours:** 60

**Text Books:**

**Reference Books:**

**Websites:**
-
**Department**: Computer Science and Engineering  
**Programme**: M.Tech. (Distributed Systems)  
**Semester**: Two  
**Category**: TCM

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS157</td>
<td>Service Oriented Architecture and Web Services</td>
<td>3 L - 2 T - 4 P</td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>

**Prerequisite**: -

**Objectives**
- To gain understanding of the basic principles of service orientation.
- To learn advanced concepts such as service discovery, service composition, and service-oriented analysis techniques.
- To practice web service development and deployment in J2EE and .NET environment.

**Outcome**
On successful completion of the course, students will be able to:
- Apply Service Oriented Design principles and techniques for E-Commerce application development.
- Experience advanced web service standards and APIs available in J2EE and .NET platform.
- Apply recent programming techniques such as Ajax, JSON and JQuery for Web Application Development.

**UNIT – I**  
**Hours**: 09  

**UNIT – II**  
**Hours**: 09  

**UNIT – III**  
**Hours**: 09  
Platform for Web Services Development, Web services - .NET and J2EE Architecture, J2EE Components & Containers, Java API for XML-based web services (JAX-WS), Java API for XML based RPC (JAX-RPC), ASP.Net Web Service, SOA support in .NET and J2EE, MVC Architecture, Struts.

**UNIT – IV**  
**Hours**: 09  

**UNIT – V**  
**Hours**: 09  

**MINI PROJECT**  
**Hours**: 30  
The students are to be made of batches of two or three members in a team. Each team should select an appropriate project in the realm of cloud computing. At the end of the project each team should prepare a report which consists of at least the following.  

**Total contact Hours**: 45  
**Total Tutorials**: -  
**Total Practical Classes**: 30  
**Total Hours**: 75

**Text Books**:

**Reference Books**:

**Websites**: 

<table>
<thead>
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<th>Hours / Week</th>
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<tbody>
<tr>
<td>CS158</td>
<td>Advance Software Laboratory II</td>
<td>L  T  P  C  CA  SE  TM</td>
<td>3  2  60  40  100</td>
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</tr>
<tr>
<td>Prerequisite</td>
<td>-</td>
<td></td>
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</tbody>
</table>

**Objectives**
- To understand the main ideas and concepts on web services.
- Working on distributed applications using Integrated development environment.
- To understand and get hands on experience in distributed environment.

**Outcome**
- To gain knowledge on developing and deploying web services.
- To gain knowledge on the flexibility of IDEs.
- To realize the importance of reengineering.

**CYCLE - I**
Any experiments from the chosen elective courses may be included.

1. Create a web application using dream weaver/Microsoft Express Editor.
3. Scientific computing with MapReduce.
4. Distributed job management systems with cloud computing.

**CYCLE - II**
Any experiments from the chosen elective courses may be included.

1. Application design using UML.
2. Implementation of cryptographic algorithms.
5. Attribute relevance analysis in WEKA and Data classification in WEKA.

Total contact Hours: -
Total Tutorials: -
Total Practical Classes: 45
Total Hours: 45
Department: Computer Science and Engineering  
Programme: M.Tech. (Distributed Systems)  
Semester: Two  
Category: PR

<table>
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<th>Hours/week</th>
<th>Credit</th>
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<tr>
<td>CS159</td>
<td>Research Methodology</td>
<td>L T P C CA SE TM</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Prerequisite | -                        |

Objectives
- To educate students to methods of selection of research problems
- To expose students to different research methods

Outcomes
- Students will be capable to identify and narrow down to the area of research on the basis of the requirements of industrial and global requirements
- Students will exhibit the domain skill to choose suitable research methods to execute research effectively
- Students will possess knowledge to further their academic program, namely, Ph.D. program.


- **Characteristics of research:** Various functions that describe characteristics of research such as systematic, valid, verifiable, empirical and critical approach.

- **Types of research:** Pure and applied research. Descriptive and explanatory research. Qualitative and quantitative approaches.

- **Research procedure:** Formulating the Research Problem, Literature Review, Developing the objectives, Preparing the research design including sample. Design, Sample size.

- **Considerations in selecting research problem:** Relevance, interest, available data, choice of data, Analysis of data, Generalization and interpretation of analysis.

- **Outcome of research:** Significance of report writing – Layouts of the research report – Types of reports – Oral presentation – Mechanics of writing research report – Precautions for writing research reports – Plagiarism and copy right violation – Patent writing and filing.

Total contact hours: -  
Total tutorials: -  
Total practical classes: 15  
Total hours: 15

Reference books:
1. Dawson, Catherine, Practical Research Methods, UBS Publishers and Distributors, New Delhi, 2002
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Course Name</th>
<th>Hours / Week</th>
<th>Credit</th>
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<tr>
<td>CS160</td>
<td>Project Work (Phase I)</td>
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<td>9</td>
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</table>

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<thead>
<tr>
<th>Prerequisite</th>
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</table>

**Objectives**

- To expose students with project-product development cycle using state-of-art technologies.
- To understand the Product Development Cycle through Project.
- To plan for various activities of the project.

**Outcome**

- Exposure to Learning and knowledge access techniques using Conferences, Journal papers and participation in research activities.

**Phase I**

1. Select a Research Problem.
2. Conduct a Survey in the chosen area.
3. Perform a feasibility study.
4. Study the limitations of the Existing System.
5. Define the Problem Statement and Objectives.
6. Choose the Research Methodology.
7. Finalize the Experimental Environment.
8. Choose the evaluation parameters.
9. Implement the Existing System.
10. Document the outcome of Phase I.

Total contact Hours: -  Total Tutorials: -  Total Practical Classes: -  Total Hours: -
## Subject Code: CS161  
### Course Name: Project Work (Phase II)  

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<tr>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>L T P C CA SE TM</td>
<td>14 200 200 400</td>
<td></td>
</tr>
</tbody>
</table>

### Prerequisite
- 

### Objectives
- To encourage and expose students for participation in National/ International paper presentation activities.
- Acquire in depth working knowledge in the chosen area of problem.

### Outcome:
- Acquire knowledge and skills needed for the construction of highly software project.
- Enhance the technical presentation skills.
- Inculcate the practice of publishing in Conferences and Journal.

### Phase I
1. High level Design of the Proposed Solution.
2. Detailed Design of the Proposed Solution.
3. Implementation of the Proposed Solution.
4. Comparison of the performance with the existing system.

### Total contact Hours: -  
### Total Tutorials: -  
### Total Practical Classes: -  
### Total Hours: -
SYLLABUS (Elective Subjects)
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<th>C</th>
<th>CA</th>
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<tr>
<td>CSE51</td>
<td>Mobile Computing Systems</td>
<td>3</td>
<td>1</td>
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<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
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</table>

**Prerequisite**
- 

**Objectives**
- Introduction to the basics of Wireless transmission basics.
- To have a wide knowledge on Layers in Mobile Layers.
- Security issues in Mobile Computing.

**Outcome**
On successful completion of the course, students will be able to:
- Posses knowledge on digital data transfer and digital mobile communication systems.
- Knowledgeable Protocols in mobile network layer and transport layer.
- Be well versed in the standards and issues in Wireless and Mobile Computing.

**UNIT – I**
**Mobile Computing**

**Introduction**
– Technology overview
– Research Issues
– Dialogue control
– Middleware and Gateway

**Application and services**
– Security
– Standards

**Architecture of Mobile Software Applications**
– Signals
– Antennas and its types
– Signal propagation

**UNIT – II**
**Telecommunication**

**Group of Special mobile**
– General Packet Radio Service
– Digital Enhanced Cordless telecommunication (DECT)

**IMT-2000 and UMTS**
– Satellite communication basics
– Satellite network configuration
– Allocation of Frequency for mobile satellite services

**Iridium Systems**
– Digital Video broadcasting

**UNIT – III**
**Mobile Network Layer**

**Mobile IP**
– IP Packet Delivery
– Agent Advertisement and Discovery
– Registration-Tunneling and Encapsulation
– Optimizations

**Reverse Tunneling**
– IPv6

**Dynamic Host Configuration Protocol**
– Ad Hoc Networks:

**Routing**
– Destination Sequence Distance Vector
– Dynamic Source Routing
– Hierarchical Algorithms

**UNIT – IV**
**Mobility and Location Based Services**

**Data Acquisition**
– Location Information
– GIS

**Modeling**
– Location Information

**Assignment**
– Location Based Services Applied

**Utilizing Location Based Services with Mobile Applications**
– Representing Location with UML
– Security and Privacy of Location Information

**UNIT – V**
**Security Issues in Mobile Computing**

**Information Security**
– Techniques and Algorithm
– Security Protocols
– Public Key Infrastructure
– Trust

**Security Models**

**Text Books:**

**Reference Books:**

**Websites:**
-
<table>
<thead>
<tr>
<th>Department: Computer Science and Engineering</th>
<th>Programme: M.Tech. (Distributed Systems)</th>
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<tbody>
<tr>
<td>Semester:</td>
<td>Category: TY</td>
</tr>
<tr>
<td>Subject Code: CSE52</td>
<td>Subject: Information Retrieval Techniques</td>
</tr>
<tr>
<td>Prerequisite:</td>
<td></td>
</tr>
</tbody>
</table>
| Objectives: | • Apply machine learning techniques to text classification and clustering which is used for efficient retrieval.  
• Identify and design the various components of an Information Retrieval system Information Retrieval.  
• Design cross language information retrieval systems. |
| Outcome: | On successful completion of the course, students will be able to:  
• Build an Information Retrieval system using the available tools  
• Ability to analyze the Web content structure  
• Design an efficient search engine |
| UNIT – I | Introduction |
| Hours: 09 | |
| UNIT – II | Ontology |
| Hours: 09 | |
| UNIT – III | Modeling and Indexing |
| Hours: 09 | |
| UNIT – IV | Evaluation and Text Classification |
| Hours: 09 | |
| UNIT – V | CLIR and Latest Trends |
| Hours: 09 | |
| Total contact Hours: 45 | Total Tutorials: 15 | Total Practical Classes: - | Total Hours: 60 |
| Text Books: | |
| Reference Books: | |
| WebSites: | |
1. http://nptel.ac.in/courses/106101007/
**Department**: Computer Science and Engineering  
**Programme**: M.Tech. (Distributed Systems)  

<table>
<thead>
<tr>
<th>Subject Code</th>
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<th>Maximum Marks</th>
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<tr>
<td>CSE53</td>
<td>Advanced Distributed System Architectures</td>
<td>3 1 -</td>
<td>4</td>
<td>40 60 100</td>
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</table>

**Prerequisite**: -

**Objectives**
- To learn the state of the art in distributed system architectures.
- To understand the advantages and disadvantages of various distributed system architectures.
- To understand the management of distributed System architectures in industrial organizations.

**Outcome**
On successful completion of the course students will be able to:
- Adopt appropriate architecture for real-world distributed system.
- Develop and implement new ideas to solve open problems in distributed systems.
- Design Enterprise Applications with the use of Service Oriented Architecture.

**UNIT – I**  
**Introduction**  
**Hours: 09**


**UNIT – II**  
**Middleware**  
**Hours: 09**


**UNIT – III**  
**Client-Server Architecture**  
**Hours: 09**


**UNIT – IV**  
**Distributed Object Architecture**  
**Hours: 09**


**UNIT – V**  
**Inter-Organizational Distributed Architecture**  
**Hours: 09**


**Total contact Hours: 45**  
**Total Tutorials: 15**  
**Total Practical Classes: -**  
**Total Hours: 60**

**Text Books**


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<table>
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<td>3. jan.newmarch.name/go/arch/chapter-arch.html</td>
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### Programme: M.Tech. (Distributed Systems)  
### Semester:  
### Category: TY

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<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
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<tr>
<td>CSE54</td>
<td>Machine Learning</td>
<td>3</td>
<td>1</td>
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</tbody>
</table>

**Prerequisite**  
-  

**Objectives**  
The students are to  
- Be exposed to the overview of machine learning and supervised learning.  
- Understand the decision theory and parametric methods.  
- Understand the underlying mathematical and probability structures in Machine learning.  
- Get an overview of the dimensionality reduction and Clustering.

**Outcome**  
At the end of the course the students will be able to:  
- Understand the theories and concepts of supervised learning.  
- Identify, formulate and analyze machine learning problems.  
- Interpret the process and evaluation model to get the results.

**UNIT – I**  
**Introduction and Supervised Learning**  
- Hours: 09

- Introduction to Machine Learning  
- Applications  
- Learning Associations  
- Classification  
- Regression  
- Unsupervised Learning  
- Reinforcement Learning  
- Supervised Learning  
- Vapnik-Chervonenkis (VC) Dimension  
- Probably Approximately Correct (PAC) Learning  
- Noise  
- Learning multiple classes  
- Model selection and Generalization.

**UNIT – II**  
**Bayesian Decision Theory and Parametric Methods**  
- Hours: 09

- Bayesian Decision Theory  
- Classification  
- Losses and Risks  
- Discriminant Functions  
- Utility theory  
- Value of Information  
- Bayesian Networks  
- Influence Diagrams  
- Association rules  
- Parametric methods  
- Maximum Likelihood estimation  
- Bernoulli Density  
- Multinomial Density  
- Gaussian Density  
- Bias and Variance  
- Bayes’ estimator  
- Tuning Model complexity  
- Model selection procedures.

**UNIT – III**  
**Multivariate Methods and Dimensionality Reduction**  
- Hours: 09

- Multivariate methods  
- Parameter estimation  
- Multivariate Normal Distribution  
- Tuning Complexity  
- Discrete Features  
- Multivariate regression  
- Dimensionality reduction  
- Subset selection  
- Principal component analysis  
- Factor analysis  
- Multidimensional scaling  
- Linear discriminate analysis.

**UNIT – IV**  
**Clustering and Non-Parametric Methods**  
- Hours: 09

- Clustering  
- Mixture densities  
- k-Means clustering  
- Expectation-Maximization algorithm  
- Hierarchical clustering  
- Non-parametric methods  
- Histogram estimator  
- Kernel estimator  
- k-Nearest neighbor estimator  
- Decision trees  
- Univariate trees  
- Pruning  
- Rule extraction from trees  
- Learning rules from data  
- Multivariate trees.

**UNIT – V**  
**Multilayer Perceptions and Local Models**  
- Hours: 09

- Multilayer perceptions  
- Neural networks  
- perceptron  
- Training a perceptron  
- Back propagation algorithm  
- Local models  
- Competitive learning  
- Radial basis functions  
- Mixture of experts  
- Hidden Markov models  
- Discrete Markov processes  
- Evaluation problem  
- State sequence  
- Learning model parameters  
- Model selection in HMM.

**Total contact Hours:** 45  
**Total Tutorials:** 15  
**Total Practical Classes:** -  
**Total Hours:** 60

**Text Books:**

**Reference Books:**

**Websites:**
1. www.cmpe.boun.edu.tr/~ethem/i2ml2e  
2. http://dl.acm.org/citation.cfm?id=1734076
Department: Computer Science and Engineering
Programme: M.Tech. (Distributed Systems)

<table>
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<th>Credit</th>
<th>Maximum Marks</th>
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<td>3 1 - 4 40  60  100</td>
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Prerequisite

Objectives
The students are to
- Be introduced the concepts, techniques and applications of software agents.
- Get an overview of problem solving technique using agent technology
- Acquire an understanding of agent based system development

Outcome
At the end of the course the students will be able to:
- Understand the basic concepts techniques and applications of software agents.
- Learn to develop a agent based system.
- Gain Knowledge in Multi agent and Intelligent agents.

UNIT – I
Hours: 09

UNIT – II
Hours: 09

UNIT – III
Hours: 09

UNIT – IV
Hours: 09

UNIT – V
Hours: 09
Agent based system development Lifecycle (Agent oriented analysis, Agent oriented design, Agent oriented Implementation) – Agents Development frameworks and languages – JADE, AGLET – Agent Communication Languages – KQML – Agent Oriented methodologies – GAIA, MASE, Tropos, Prometheus.

Total contact Hours: 45
Total Tutorials: 15
Total Practical Classes: -
Total Hours: 60

Text Books:
1. Bradshaw, Software Agents , MIT Press, 2000

Reference Books:

Websites: -
### Optical Communication Networks

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
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**Prerequisite**: -

**Objectives**
- Illustrate the concepts of static traffic routing and the constraints related to virtual topology design and identify the importance of Optical communication.
- Explain the mechanism to transfer the control information in optical networks.
- Design an algorithm for dynamically establishing a lightpath.
- Design an optical network which works under IP network.

**Outcome**
On successful completion of the course, students will be able to:
- Appreciate the necessity of static traffic routing and constraints involved in it.
- Distinguish between static traffic routing and dynamic traffic routing.
- Explain the concepts related to virtual topology reconfiguration, survivability of the network.
- Develop algorithms to transfer traffic in an IP-over-WDM network environment.

**UNIT – I**  
**Types of Optical Networks**  
<table>
<thead>
<tr>
<th>Hours: 09</th>
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**UNIT – II**  
**Static Routing and Virtual Topology Design**  
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**UNIT – III**  
**Dynamic Routing**  
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**UNIT – IV**  
**Control Management of Optical Network**  
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**UNIT – V**  
**Advanced Issues**  
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**Total contact Hours: 45**  
**Total Tutorials: 15**  
**Total Practical Classes: -**  
**Total Hours: 60**

**Text Books:**

**Reference Books:**

**Web Sites:**
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<tr>
<td>CSE57</td>
<td>Software Architecture</td>
<td>3</td>
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</table>

### Prerequisite
- No prerequisite.

### Objectives
- To learn how to develop quality software products
- To introduce fundamentals of software design
- To understand the software architecture evaluation process

### Outcome
- Students would have acquired traits of a good software architect
- Students would be able to design software products that ensures quality
- Students would be able to choose from a set of alternative designs

### UNIT – I
#### Concepts of Design
- Hours: 09
- Characteristics of design activities – Elements of design – Software quality models and their effects – Quality Attributes – Basic rules of software design – Design process.

### UNIT – II
#### Software Architecture
- Hours: 09

### UNIT – III
#### Styles in Design and Design Space
- Hours: 09

### UNIT – IV
#### Architecture Evaluation
- Hours: 09

### UNIT – V
#### Architecture Evaluation Methods
- Hours: 09

### Total contact Hours: 45
- Total Tutorials: 15
- Total Practical Classes: -
- Total Hours: 60

### Text Books:

### Reference Books:

### Websites:
3. [http://www.sei.cmu.edu/architecture/](http://www.sei.cmu.edu/architecture/)
Subject Code: CSE58
Subject: Distributed Algorithms

Prerequisite:
- To gain depth knowledge about the Distributed Algorithms
- To design efficient algorithms using Distributed Algorithmic Techniques
- Introduce development of distributed algorithms for solving larger engineering problems

Objectives:
- On successful completion of the course, students will be able to:
  - Design and Develop the algorithms using Distributed programming principle
  - Identify, analyze, formulate and solve larger engineering problems.
  - Analyze and Implement different algorithm design techniques

Outcome:
UNIT – I
Distributed Algorithms

UNIT – II
Asynchronous Algorithms

UNIT – III
Asynchronous Network Algorithms
Introduction - Asynchronous Network Model- Basic Asynchronous Network Algorithms-Synchronizers-Shared Memory versus Networks- Logical Time, Global Snapshots and Stable properties.

UNIT – IV
Network Resource Allocation

UNIT – V
Partially Synchronous Algorithms

Text Books:

Reference Books:

Websites:
1. http://nptel.ac.in
Department: Computer Science and Engineering
Programme: M.Tech. (Distributed Systems)

Subject Code: CSE59
Subject: Data Mining and Warehousing Techniques

<table>
<thead>
<tr>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
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<td>L</td>
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<td>P</td>
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<td>-</td>
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</table>

Prerequisite: 
- To familiarize with clustering, classification and association rule mining algorithms.
- To develop and apply critical thinking, problem-solving, and decision-making skills.
- To understand the overall architecture of a data warehouse techniques and Hardware and operational design methods.

Objectives:
- On successful completion of the course, students will be able to:
  - Discover interesting patterns from large amount data to analyze and extract patterns to solve problems, make predictions of outcomes
  - Select and apply proper data mining algorithm to build analytical applications
  - Explore Data warehousing methods and device efficient and cost effective methods for maintaining Data warehousing

Outcomes:
- Data Mining: - Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation. Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining

UNIT – I Data Mining Hours: 09
- Data Mining: - Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation. Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining

UNIT – II Classification and Prediction Hours: 09
- Classification and Prediction: - Issues Regarding Classification and Prediction – Classification by Decision Tree

UNIT – III Cluster Analysis Hours: 09

UNIT – IV Data Warehousing and Business Analysis Hours: 09

UNIT – V Trends in Mining Hours: 09

Total contact Hours: 45 Total Tutorials: 15 Total Practical Classes: - Total Hours: 60

Text Books:

Reference Books:
2. Alex Berson and Stephen J. Smith, Data Warehousing, Data mining and OLAP, Tata McGraw-Hill, 2004
3. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Introduction to Data Mining, Pearson Education,
2007


**Websites:**

1. [http://web.engr.illinois.edu/~hanj/bk2/datamining concepts](http://web.engr.illinois.edu/~hanj/bk2/datamining concepts)
2. [http://www.cs.waikato.ac.nz/ml/weka/data mining software in java](http://www.cs.waikato.ac.nz/ml/weka/data mining software in java)
3. [http://datawarehouse4u.info/](http://datawarehouse4u.info/)
5. [http://www.cis.syr.edu/~hhuang13/cis600/notes.html](http://www.cis.syr.edu/~hhuang13/cis600/notes.html)
<table>
<thead>
<tr>
<th>Subject Code</th>
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<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
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<tr>
<td>CSE60</td>
<td>Multi core Programming</td>
<td>3</td>
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**Prerequisite**
- Parallel Computing

**Objectives**
- Understand the challenges in parallel and multi-threaded programming.
- Learn about the various parallel programming paradigms, and solutions.

**Outcome**
On successful completion of the course, students will be able to:
- Develop Program for Parallel Processors.
- Develop programs using OpenMP and MPI.
- Compare and contrast programming for serial processors and programming for parallel processors.

**UNIT – I**
**Introduction to Parallel Computing**
**Hours: 09**

**UNIT – II**
**Shared-Memory Programming with Pthreads**
**Hours: 09**

**UNIT – III**
**Shared Memory Programming with OpenMP**
**Hours: 09**

**UNIT – IV**
**Distributed Memory Programming with MPI**
**Hours: 09**
MPI program execution – MPI constructs – libraries – MPI send and receive – Point-to-point and Collective communication – MPI derived datatypes – Performance evaluation.

**UNIT – V**
**Parallel Program Development**
**Hours: 09**
Case studies – n-Body solvers – Tree Search – OpenMP and MPI implementations and comparison.

**Total contact Hours: 45**
**Total Tutorials: 15**
**Total Practical Classes:-**
**Total Hours: 60**

**Text Books:**

**Reference Books:**

**Websites:**
1. [http://www.openmp.org](http://www.openmp.org)
2. [http://www.nptel.ac.in](http://www.nptel.ac.in)
3. [https://gcc.gnu.org](https://gcc.gnu.org)
<table>
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<tr>
<td>CSE61</td>
<td>Ad hoc and Sensor Networks</td>
<td>3 L 1 T 0 P 4</td>
<td>40 CA 60 SE 100 TM</td>
<td></td>
</tr>
</tbody>
</table>

**Prerequisite**
-  

**Objectives**
- To study the applications of ad hoc networks
- To understand the specific challenges in protocol design
- To design energy efficient and QoS aware protocols
- To familiarize about the taxonomy of MANETs and WSNs

**Outcome**
- On successful completion of the course, students will be able to:
  - Design their own protocol at any stack
  - Evaluate the performance through experiments and simulations
  - Design energy-efficient protocols and applications

**UNIT – I**


**UNIT – II**


**UNIT – III**


**UNIT – IV**


**UNIT – V**


Total contact Hours: 45 | Total Tutorials: 15 | Total Practical Classes: - | Total Hours: 60

**Text Books:**

**Reference Books:**

**Websites:**
1. Autonomous Networks Research Group, University of Southern California, available at https://anrg.usc.edu
2. Research publications by Prof. Ian Akyildiz, Georgia Institute of Technology, available at http://www.ece.gatech.edu/research/labs/bwn/publications.html
### Subject Details

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<th>Credit</th>
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<td>CSE62</td>
<td>Network Management Systems</td>
<td>3 L 1 T</td>
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</table>

#### Prerequisite
- Understand general concepts and architecture behind standards based network management.
- Understand concepts and terminology associated with SNMP and TMN.
- Get a feeling of current trends in network management technologies.
- Understand Technologies used for network management.

#### Objectives
- Understand clearly SNMP versions 1 and 2, with TMN.
- Understand the tools and able to manage the network using web based NMS.

#### Outcome
- Develop a clear understanding of network management.
- Understand clearly SNMP versions 1 and 2, with TMN.
- Understand the tools and able to manage the network using web based NMS.

#### UNIT – I
**Data Communications and Network Management Overview**
- Hours: 09

#### UNIT – II
**SNMPV1 Network Management**
- Hours: 09

#### UNIT – III
**SNMP Management: SNMPV2 and RMON**
- Hours: 09

#### UNIT – IV
**Telecommunications Management Network, Network Management Tools and Systems**
- Hours: 09

#### UNIT – V
**Web-Based Management**
- Hours: 09

#### Total contact Hours: 45
- Total Tutorials: 15
- Total Practical Classes: 0
- Total Hours: 60

#### Text Books:

#### Reference Books:

#### Websites:
1. http://nptel.ac.in/courses/106105081/
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<td>CSE63</td>
<td>Search Engine Optimization</td>
<td>3</td>
<td>1</td>
<td>4</td>
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</tbody>
</table>

### Prerequisite
- Acquire a knowhow to optimize each a page in a web site.
- Get an overview of various important search engines and directories.
- Know about web design elements to ensure a site is search engine compatible.

### Objectives
- On successful completion of the course, students will be able to:
  - Knowledge about good Search keywords to get optimized search.
  - Knowledge about how to design web page so as to get top page rank.

### Outcome
- Knowledge about good Search keywords to get optimized search.
- Knowledge about how to design web page so as to get top page rank.

#### UNIT – I Search Engine Basics
- Importance of Internet Marketing, its Types and Methods
- Working of Search Engines
- Search Engine Optimization - Basic Understanding of SERP, Search Operators, Search Engine Architecture
- Search Engine Algorithms and their Updates
- Page Rank Technology
- Web Masters Tool

#### UNIT – II Keywords Search
- Introduction to Keyword Research
- Business Analysis
- Types of Keywords
- Keyword Research Methodology
- Keywords Analysis Tools
- Competition Analysis
- Preparing a Keyword List for Project
- Localized Keywords Research

#### UNIT – III On-Page Optimization
- Website Designing and Development Basics: HTML based SEO Basics
- Basics of Onsite Optimization
- Importance of Domain Names and their Selection
- Optimization of Website Structure and Navigation Menu
- Filename and Title Tag Optimization
- Keyword Research and Density Analysis
- Knowledge of Meta Tags and its Optimization
- Content Optimization
- Page Speed and Anchor Links Optimization
- Header and Footer Optimization
- Canonical Implementation and many more

#### UNIT – IV Off Page Optimization
- Basic Introduction
- Subsequent Promotion of Web Pages
- Directory and Blog Submissions
- Link Building Methods and Types
- Free Classifieds, Forums, Press Releases, Forum Signatures and Commenting
- Social Book marking and Business Listing
- Classified Posting, Blog Commenting, Press Release and Article Submissions
- Video and RSS Feed Submissions
- Basics of Social Media Optimization (SMO)
- Link and Page Rank Tracking

#### UNIT – V SEO For Dynamic Websites
- Difference between Static and Dynamic Websites
- Search Engine Optimization for Word Press
- Search Engine Optimization for Joomla
- Search Engine Optimization for Blogspot
- Optimization of Flash Websites
- Traffic Analysis
- Use of Google Analytics
- Tracking and Improving Conversions

### Total contact Hours: 45
### Total Tutorials: 15
### Total Practical Classes: -
### Total Hours: 60

#### Text Books:
1. Introduction to Search Engine Optimization - Getting Started With SEO to Achieve Business Goals, Hubspot

#### Reference Books:
1. Search Engine Optimization Book, Aaron Matthew Wall
2. Search Engine Optimization An Hour a Day, Jennifer Grappone Gradiva Cousin Wiley Publishing Inc.
3. The Basics of Search Engine Optimisation, David Burdon and Simply Clicks, June 2005

#### Websites:
-
### Subject Code: CSE64  
**Subject:** Text Data Mining

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<tr>
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<th>Hours / Week</th>
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<tr>
<td>CSE64</td>
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**Prerequisite:** -

**Objectives:**
- To appreciate the different aspects of text categorization and clustering
- To understand the role played by text mining in Information retrieval and extraction
- To appreciate the use of probabilistic models for text mining

**Outcome:**
On successful completion of the course, students will be able to:
- Use available open source classification and clustering tools on standard text datasets.
- Modify existing classification/clustering algorithms in terms of functionality or features used.
- Design a system that uses text mining to improve the functions of an existing open source search engine.

#### UNIT – I
**Overview of Text Mining**

Definition—General Architecture—Algorithms—Core Operations —Pre-processing—Types of Problems—basics of document classification—information retrieval—clustering and organizing documents—information extraction—prediction and evaluation—Textual information to numerical vectors -Collecting documents—document standardization—tokenization—lemmatization—vector generation for prediction—sentence boundary determination -evaluation performance

**Total Contact Hours:** 45  
**Total Tutorials:** 15  
**Total Practical Classes:** -  
**Total Hours:** 60

#### UNIT – II
**Text Categorization and Clustering**


**Total Contact Hours:** 45  
**Total Tutorials:** 15  
**Total Practical Classes:** -  
**Total Hours:** 60

#### UNIT – III
**Text Mining for Information Retrieval and Information Extraction**


**Total Contact Hours:** 45  
**Total Tutorials:** 15  
**Total Practical Classes:** -  
**Total Hours:** 60

#### UNIT – IV
**Probabilistic Models**


**Total Contact Hours:** 45  
**Total Tutorials:** 15  
**Total Practical Classes:** -  
**Total Hours:** 60

#### UNIT – V
**Recent Trends**

Visualization Approaches -Architectural Considerations -Visualization Techniques in Link Analysis -Example-Mining Text Streams -Text Mining in Multimedia -Text Analytics in Social Media -Opinion Mining and Sentiment Analysis - Document Sentiment Classification -Opinion Lexicon Expansion -Aspect -Based Sentiment Analysis -Opinion Spam Detection–Text Mining Applications and Case studies

**Total Contact Hours:** 45  
**Total Tutorials:** 15  
**Total Practical Classes:** -  
**Total Hours:** 60

### Text Books:

### Reference Books:

### Websites:

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<table>
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<tr>
<td>Objectives</td>
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<td>Outcome</td>
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**Total Contact Hours:** 45  
**Total Tutorials:** 15  
**Total Practical Classes:** -  
**Total Hours:** 60

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**Department:** Computer Science and Engineering  
**Programme:** M.Tech. (Distributed Systems)

---

**Prerequisite:** -

**Objectives:**
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- To understand the role played by text mining in Information retrieval and extraction
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**Outcome:**
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- Modify existing classification/clustering algorithms in terms of functionality or features used.
- Design a system that uses text mining to improve the functions of an existing open source search engine.

---

**UNIT – I**  
**Overview of Text Mining**

Definition—General Architecture—Algorithms—Core Operations —Pre-processing—Types of Problems—basics of document classification—information retrieval—clustering and organizing documents—information extraction—prediction and evaluation—Textual information to numerical vectors -Collecting documents—document standardization—tokenization—lemmatization—vector generation for prediction—sentence boundary determination -evaluation performance

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**UNIT – II**  
**Text Categorization and Clustering**


---

**UNIT – III**  
**Text Mining for Information Retrieval and Information Extraction**


---

**UNIT – IV**  
**Probabilistic Models**


---

**UNIT – V**  
**Recent Trends**

Visualization Approaches -Architectural Considerations -Visualization Techniques in Link Analysis -Example-Mining Text Streams -Text Mining in Multimedia -Text Analytics in Social Media -Opinion Mining and Sentiment Analysis - Document Sentiment Classification -Opinion Lexicon Expansion -Aspect -Based Sentiment Analysis -Opinion Spam Detection–Text Mining Applications and Case studies

---

**Total Contact Hours:** 45  
**Total Tutorials:** 15  
**Total Practical Classes:** -  
**Total Hours:** 60

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**Text Books:**

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**Reference Books:**

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**Websites:**
1. http://nptel.ac.in/courses/106106093/35
2. http://nptel.ac.in/syllabus/106101007/
Department: Computer Science and Engineering  
Programme: M.Tech. (Distributed Systems)

Subject Code | Subject            | Hours / Week | Credit | Maximum Marks |
-------------|--------------------|--------------|--------|---------------|
CSE65        | Social Network Analytics | 3 1 - 4 40 60 100 |

Prerequisite: -

Objectives: The students are to
- Understand the social network concepts and various methods of analysis.
- Understand the underlying mathematical structures of Social Networks.
- Get an overview of the structural properties of Social Networks.

Outcome: At the end of the course the students will be able to:
- Understand the data in the Social Network way.
- Identify, formulate and analyze Social network problems and interpret the results obtained.

UNIT – I  
Network, Relations and Structure  
Hours: 09
The Social Networks Perspective- Network Data- Boundary Specification and Sampling- Types of Networks- Network Data, Measurement and Collection.

UNIT – II  
Mathematical Representations of Social Networks  
Hours: 09

UNIT – III  
Structural and Locational Properties  
Hours: 09
Actor Centrality- Degree Centrality- Closeness Centrality- Betweenness Centrality- Information Centrality- Structural Balance- Clusterability- Generalizations of Clusterability- Transitivity.

UNIT – IV  
Roles and Positions  
Hours: 09
Background- Structural Equivalence- Automorphic and Isomorphic Equivalence- Regular Equivalence- Types of Ties- Local Role Equivalence- Ego Algebras.

UNIT – V  
Dyadic and Triadic Methods  
Hours: 09
The Dyad Census- The Example and Its Dyad Census- An Index for Mutuality- Simple Distributions on Digraphs- Conditional Uniform Distributions- The Triad Census- The Example and Its Triad Census- Mean and Variance of a Triad Census.

Total contact Hours: 45  
Total Tutorials: 15  
Total Practical Classes: -  
Total Hours: 60

Text Books:

Reference Books:

Websites:
2. Introduction to social network methods by Robert A. Hanneman and Mark Riddle available at http://faculty.ucr.edu/~hanneman/nettext/
<table>
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<th>Credit</th>
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<tbody>
<tr>
<td>CSE66</td>
<td>Geographical Information System</td>
<td>3 1 - 4</td>
<td>40</td>
<td>60 100</td>
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**Prerequisite**
- Basic understanding of spatial phenomena and fundamentals of GIS
- The quantitative analysis and qualitative analysis of spatial and attribute information in a GIS database.
- Capacity to understand possibilities and constrains related to GIS

**Objectives**
- On completion of this course, students will be able to
  - Deep theoretical knowledge about how to capture, import, structure, analyze and present geographical data
  - Apply GIS analyses to address geospatial problems.
  - Provide a spatial visualization capability for analyzing descriptive characteristics about geographical features.

**Outcome**

**UNIT – I Introduction**


**UNIT – II Geographic Information and Spatial Data Types**


**UNIT – III Data Entry and Preparation**


**UNIT – IV Spatial Data Analysis**


**UNIT – V Data Visualization**

GIS and Maps – The visualization process – Visualization strategies: present or explore? – How to Map – Map cosmetics – Map dissemination

**Total contact Hours: 45 | Total Tutorials: 15 | Total Practical Classes: | Total Hours: 60**

**Text Books:**

**Reference Books:**

**Website:**
Department: Computer Science and Engineering  
Programme: M.Tech. (Distributed Systems)

Semester: Category: TY

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<td>CSE67</td>
<td>Internals of Operating System</td>
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Prerequisite: -

Objectives:
- To identify the necessity of various sub systems in UNIX operating system.
- To analyze the mechanism of process communication and the differences in the organization of Unix and Windows operating systems.
- To design various data structures needed to develop an operating system.

Outcome:
On successful completion of the course, the students will be able to:
- Explain the components in Unix and Windows operating system.
- Use the system calls whenever they are necessary.
- Know the storage of information of system usage and other information in Windows system and develop the algorithms to perform kernel functions.
- Appreciate the appropriateness of various data structures used to store data related to process and files.

UNIT – I  
Buffer Cache and File Sub-System  
Introduction to Kernel - Architecture of the UNIX operating system, System concepts, Data structures. Buffer Cache: Buffer header, Structure of Buffer pool, Reading and writing disk blocks. Files INODES, Structure of a regular file, Directories, Super block, Inode assignment.  

UNIT – II  
System Calls and Process Sub-System  

UNIT – III  
Inter-Process Communications  

UNIT – IV  
Windows System Components  

UNIT – V  
Registry and Process Management  

Total contact Hours: 45  
Total Tutorials: 15  
Total Practical Classes: -  
Total Hours: 60

Text Books:

Reference Books:

Websites:
### Course Outline

**Department**: Computer Science and Engineering  
**Programme**: M.Tech. (Distributed Systems)  
**Semester**: TY  
**Category**: Programme

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<tr>
<td>CSE68</td>
<td>Distributed System Security</td>
<td>3 L 1 T 4 P</td>
<td>40 CA</td>
<td>60 SE TM 100</td>
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**Prerequisite**: -

**Objectives**
- To understand the various threats, vulnerabilities, solutions and security standards for each layer of distributed systems  
- To understand the secure software development lifecycle process for distributed systems  
- To know the emerging area of User-centric Identity Management and Identity-Based Encryption

**Outcome**

On successful completion of the course students will be able to:
- Structure and design the distributed systems using multiple levels of security and protection  
- Have knowledge on the threats, vulnerabilities and solution at various level of distributed systems

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### UNIT – I


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### UNIT – II


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### UNIT – III


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### UNIT – IV


**Total contact Hours**: 45  
**Total Tutorials**: 15  
**Total Practical Classes**: -  
**Total Hours**: 60

**Text Books**:  

**Reference Books**:  

**Websites**:  
com-plus-28

3. http://www.nr.no/~abie/security.htm
Department : Computer Science and Engineering  
Programme : M.Tech. (Distributed Systems)

Semester :  
Category : TY

Subject Code | Subject | Hours / Week | Credit | Maximum Marks |
-------------|---------|--------------|--------|---------------|
CSE69        | Ethical Hacking | 4 - - 4 | 40 | 60 | 100 |

Prerequisite: -

Objectives:
- To immerse the students into an interactive environment where they will be shown how to scan, test, hack and secure their own systems.
- To give students in-depth knowledge and practical experience with the current essential security systems.
- To learn how intruders escalate privileges and what steps can be taken to secure a system.

Outcome:
On successful completion of the course, the students will be able to:
- Defend a computer against a variety of different types of security attacks using a number of hands-on techniques.
- Defend a LAN against a variety of different types of security attacks using a number of hands-on techniques. Practice and use safe techniques on the World Wide Web.

UNIT – I | Introduction to Ethical Hacking | Hours: 09

UNIT – II | Footprints | Hours: 09

UNIT – III | Scanning and Enumeration | Hours: 09

UNIT – IV | Social Engineering | Hours: 09

UNIT – V | System Hacking | Hours: 09

Total contact Hours: 60  
Total Tutorials: -  
Total Practical Classes: -  
Total Hours: 60

Text Books:

Reference Books:

Websites:
-
### Department: Computer Science and Engineering
### Programme: M.Tech. (Distributed Systems)

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<td>CSE70</td>
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#### Prerequisite:
- 

#### Objectives
- To provide a clear understanding on the basic concepts, ARM processor and Architecture
- To introduce on Embedded Process development Environment
- To study on Basic of Processes and Operating systems

#### Outcomes
On successful completion of the course, the students will be able to:
- Have skills in the Embedded C Programming
- Design Embedded System with real time constraints

#### UNIT – I


#### UNIT – II


#### UNIT – III


#### UNIT – IV


#### UNIT – V


#### Total contact Hours: 45  Total Tutorials: 15  Total Practical Classes: -  Total Hours: 60

#### Text Books:

#### Reference Books:

#### Websites:
- 

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