### Course Objectives:

This course will enable students to:

- Explain Web Application Development and related terminologies
- Demonstrate persistent framework and other ORM tools.
- Illustrate solutions using Design Patterns
- Outline latest WEB frameworks

### Module 1

**Web application and java EE 6:**
- Exploring the HTTP Protocol
- Introducing web applications
- Describing web containers
- Exploring web architecture models
- Exploring the MVC architecture
- Working with servlets 3.0

**Module 2**

**Handling sessions in servlet 3.0:**
- Describing a session
- Introducing session tracking
- Exploring the session tracking mechanisms
- Using the java servlet API for session tracking
- Creating login application using session tracking

**Module 3**

**Implementing JSP tag extensions:**
- Exploring the elements of tag extensions
- Working with classic tag handlers
- Exploring the tag extensions
- Working with simple tag handlers

**Module 4**

**Persistence Management and Design Patterns:**
- Implementing java persistence using hibernate
- Introducing hibernate, exploring the architecture of hibernate
- Downloading hibernate, exploring HQL, understanding hibernate O/R mapping
- Working with hibernate, Implementing O/R mapping with hibernate

**Module 5**

**Web Frameworks:**
- Working with struts 2
- Introducing struts 2, understanding actions in struts 2
- Working with java server faces 2.0:
- Introducing JSF, Explaining the features of JSF, Exploring the JSF architecture, describing JSF elements, Exploring the JSF request processing life cycle
- Working with spring 3.0:
- Introducing features of the
spring framework, exploring the spring framework architecture, exploring dependency injection & inversion of control, exploring AOP with spring, managing transactions. 

**Securing java EE 6 applications:** Introducing security in java EE 6, exploring security mechanisms, implementing security on an application server.

### Course Outcomes

The students should be able to:

- Explain WEB basics and their functionalities
- Develop JAVA support and API skills
- Build a WEB application.
- Build Security mechanisms

### Question paper pattern:

The question paper will have ten questions. There will be 2 questions from each module. Each question will have questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.

### Text Books:

1. Kogent learning solution: JAVA SERVER PROGRAMMING JAVA EE6(J2EE 1.6), Dreamtech press 2014

### Reference Books:

1. NIL

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**DATA COMPRESSION**  
[As per Choice Based Credit System (CBCS) scheme]  
(Effective from the academic year 2016 -2017)

**SEMESTER – I**

<table>
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**CREDITS – 04**

**Course objectives:** This course will enable students to  
- Develop comprehensive knowledge in the field of Data Compression and Coding.  
- Analyze and evaluate different Data Compression and Coding methods.

**Module 1**

**Introduction:** Compression techniques, modeling and coding mathematical preliminaries for lossless compression: A brief introduction to information theory, models, coding, algorithmic information theory, minimum description length principle.  

**Module 2**

**Huffman Coding:** The Huffman coding algorithm, non binary Huffman codes, adaptive Huffman coding, golomb codes, rice codes, Tunstall codes, application of Huffman coding.  

**Module 3**

**Lossless Image Compression:** Introduction, CALIC, JPEG-LS, multi resolution approaches, facsimile encoding, MRC-T.44. **Mathematical Preliminaries For Lossy Coding:** Introduction, distortion criteria, information theory revisited, rate distortion theory, models

**Module 4**

**Wavelet Based Compression:** Introduction, wavelets, multi resolution analysis and scaling function, implementation using filters, image compression, embedded zero tree coder, set partitioning in hierarchical trees, JPEG zero. **Audio Coding:** Introduction, MPEG coding, MPEG advanced audio coding, Dolby AC3(DOLBY DIGITAL) other
Module 5


### Course Outcomes

The students should be able to:

- Explain the evolution and fundamental concepts will Data Compression and Coding techniques.
- Analyze the operation of a range of commonly used Coding and Compression techniques.
- Identify the basic software and hardware tools used for data compression.
- Identify what new trends and what new possibilities of data compression are available.

### Question paper pattern:

The question paper will have ten questions. There will be 2 questions from each module. Each question will have questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.

### Text Books:


### Reference Books:


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### ADVANCES IN DATA BASE MANAGEMENT SYSTEMS

**[As per Choice Based Credit System (CBCS) scheme]**

**(Effective from the academic year 2016 - 2017)**

**SEMESTER – I**

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**CREDITS – 04**

### Course objectives:

This course will enable students to

- Define parallel and distributed databases and its applications.
- Show applications of Object Oriented database
- Explain basic concepts, principles of intelligent databases.
- Utilize the advanced topics of data warehousing and mining.
- Infer emerging and advanced data models
- Extend knowledge in research topics of databases.

### Module 1

**Review of Relational Data Model and Relational Database Constraints**: Relational model concepts; Relational model constraints and relational database schemas; Update operations, anomalies, dealing with constraint violations, Types and violations. Overview of Object-Oriented Concepts – Objects, Basic properties. Advantages, examples, Abstract data types, Encapsulation, class hierarchies, polymorphism, examples.

### Module 2

**Object and Object-Relational Databases**: Overview of OOP; Complex objects;
Identity, structure etc. Object model of ODMG, Object definition Language ODL; Object Query Language OQL; Conceptual design of Object database. Overview of object relational features of SQL; Object-relational features of Oracle; Implementation and related issues for extended type systems; syntax and demo examples, The nested relational model. Overview of C++ language binding;

### Module 3

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

### Module 4

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

### Module 5

**Enhanced Data Models for Some Advanced Applications:** Active database concepts and triggers; Temporal, Spatial, and Deductive Databases – Basic concepts. More Recent Applications: Mobile databases; Multimedia databases; Geographical Information Systems; Genome data management.

### Course Outcomes

The students should be able to:
- Select the appropriate high performance database like parallel and distributed database
- Infer and represent the real world data using object oriented database
- Interpret rule set in the database to implement data warehousing of mining
- Discover and design database for recent applications database for better interoperability

### Question paper pattern:

The question paper will have ten questions. There will be 2 questions from each module. Each question will have questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.

### Text Books:


### Reference Books:

### Course objectives:

This course will enable students to:

- Develop analytical capability and to impart knowledge of Probability, Statistics and Queuing.
- Apply above concepts in Engineering and Technology.
- Acquire knowledge of Hypothesis testing and Queuing methods and their applications so as to enable them to apply them for solving real world problems.

#### Module 1

Axioms of probability, Conditional probability, Total probability, Baye’s theorem, Discrete Random variable, Probability mass function, Continuous Random variable, Probability density function, Cumulative Distribution Function, and its properties, Two-dimensional Random variables, Joint pdf / cdf and their properties.

**Teaching Hours:** 10 Hours

#### Module 2


**Teaching Hours:** 10 Hours

#### Module 3


**Teaching Hours:** 10 Hours

#### Module 4

Testing Hypothesis: Testing of Hypothesis: Formulation of Null hypothesis, critical region, level of significance, errors in testing, Tests of significance for Large and Small Samples, t-distribution, its properties and uses, F-distribution, its properties and uses, Chi-square distribution, its properties and uses, χ² – test for goodness of fit, χ² test for Independence.

**Teaching Hours:** 10 Hours

#### Module 5


**Teaching Hours:** 10 Hours

### Course Outcomes

The students should be able to:

- Demonstrate use of probability and characterize probability models using probability mass (density) functions & cumulative distribution functions.
- Explain the techniques of developing discrete & continuous probability distributions and its applications.
- Describe a random process in terms of its mean and correlation functions.
- Outline methods of Hypothesis testing for goodness of fit.
- Define the terminology & nomenclature appropriate queuing theory and also distinguish various queuing models.

### Question paper pattern:

The question paper will have ten questions. There will be 2 questions from each module.
Each question will have questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.

### Text Books:

### Reference Books:

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### CLIENT SERVER PROGRAMMING

[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)

**SEMESTER – I**

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**CREDITS – 03**

**Course objectives:** This course will enable students to
- Explain Client-Server software, Context Switching and Protocol Software, I/O.
- Define System Calls, Basic I/O Functions available in UNIX
- Illustrate socket interface, TCP, UDP in detail.
- Compare various client Software and various algorithms issue related to server software design.

#### Module 1


**Program Interface to Protocols:** Introduction, Loosely Specified Protocol Software Interface, Interface Functionality, Conceptual Interface Specification, System Calls, Two Basic Approaches to Network Communication, The Basic I/O Functions available in UNIX, Using UNIX I/O with TCP/IP.

**Module 2**

**The Socket Interface:** Introduction, Berkley Sockets, Specifying a Protocol Interface, The Socket Abstraction, Specifying an End Point Address, A Generic Address Structure, Major System Calls used with Sockets, Utility Routines for Integer Conversion, Using Socket Calls in a Program, Symbolic Constants for Socket Call Parameters.

**Algorithms and Issues in Client Software Design:** Introduction, Learning Algorithms instead of Details, Client Architecture, Identifying the Location of a Server, Parsing an Address Argument, Looking up a Domain Name, Looking up a well-known Port by Name, Port Numbers and Network Byte Order, Looking up a Protocol by Name, The TCP Client Algorithm, Allocating a Socket, Choosing a Local Protocol Port Number, A fundamental Problem in choosing a Local IP Address, Connecting a TCP Socket to a Server, Communicating with the Server using TCP, Reading a response from a TCP Connection, Closing a TCP Connection, Programming a UDP Client, Connected and Unconnected UDP Socket, Using Connect with UDP, Communicating with a Server

**Teaching Hours**

8 Hours
using UDP, Closing a Socket that uses UDP, Partial Close for UDP, A Warning about UDP Unreliability.

### Module 3


### Module 4


### Module 5


### Course Outcomes

The students should be able to:
- Explain Client-Server software, Context Switching and Protocol Software, I/O.
- Demonstrate programming System Calls, Basic I/O Functions available in UNIX
- Implement Socket interface, TCP, UDP in detail.
- Compare and contrast Client Software Various applications and their issues

### Question paper pattern:

The question paper will have ten questions. There will be 2 questions from each module. Each question will have questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.

### Text Books:


### Reference Books:

1. NIL
# INFORMATION STORAGE MANAGEMENT

[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)

**SEMESTER – 1**

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**CREDITS – 03**

**Course Objectives:** This course will enable students to

- Define basic terminology and components in information storage and retrieval systems
- Compare and contrast information retrieval models and internal mechanisms such as Boolean, Probability, and Vector Space Models
- Discuss current trends in information retrieval such as information visualization.
- Illustrate backup process and securing of management storage infrastructure

## Module 1

**Introduction to Information Storage:** Information Storage, Evolution of Storage Architecture, Data center Infrastructure, Virtualization and cloud computing. **Data Center Environment:** Application, Database Management System(DBMS), Host(compute), Connectivity, Storage, Disk Drive Components, Disk Drive Performance, Host Access to Data, Direct-Attached Storage, Storage Design Based On Application, Disk Native Command Queuing, Introduction to Flash Drives, Concept in Practice: VMware ESXi. **Data Protection: RAID:** RAID Implementation Methods, RAID Array Components, RAID Techniques, RAID Levels, RAID Impact on Disk Performance, RAID Comparison, Hot Spares.

**Fiber Channel Storage Area Networks:** Fiber Channel: Overview, The SAN and Its Evolution, Components of FC SAN, FC Connectivity, Switched Fabric Ports, Fiber Channel Architecture, fabric Services, Switched fabric Login Types, Zoning, FC SAN Topologies, Virtualization in SAN, Concepts in Practice: EMC Connectrix and EMC VPLEX. **IP SAN and FcoE:** iSCSI, FCIP, FcoE.

**Module 2**

**Intelligent Storage Systems:** Components of an Intelligent Storage System, Storage Provisioning, Types of intelligent Storage Systems, Concepts in Practice: EMC Symmetrix and VNX. **Fiber Channel Storage Area Networks:** Fiber Channel: Overview, The SAN and Its Evolution, Components of FC SAN, FC Connectivity, Switched Fabric Ports, Fiber Channel Architecture, fabric Services, Switched fabric Login Types, Zoning, FC SAN Topologies, Virtualization in SAN, Concepts in Practice: EMC Connectrix and EMC VPLEX. **IP SAN and FcoE:** iSCSI, FCIP, FcoE.

## Module 3


**Module 4**

**Backup and Archive:** Backup Purpose, Backup Considerations, Backup Granularity, Recovery Considerations, Backup Methods, Backup Architecture, Backup and Restore Operation, Backup Topologies, Backup in NAS Environments, Backup Targets, Data Deduplication for Backup, Backup in Virtualized Environments, Data Archive, Archiving Solution Architecture, Concepts in Practice: EMC Networker, EMC Avamar, and EMC Data domain. **Local Replication:** Replication Terminology, Uses of Local Replicas, Replica Consistency, Local Replication Technologies, Tracking Changes to Source and Replica, Restore and Restart Considerations, Creating Multiple Replicas, Local Replication in Virtualized Environment, Concepts in Practice: EMC TimeFinder.
Remote Replication: Modes of Remote Replication, Remote Replication Technologies, Three-Site Replication, Data Migration Solutions, Remote Replication and Migration in a Virtualized Environment, Concepts in Practice: EMC SRDF, EMC MirrorView, and EMC RecoverPoint.

Module 5

Course Outcomes
The students should be able to:
- Recognize the role and use are technology in business systems and operations
- Identify and describe organizational structure and business processes within these
- Implement information systems in industry.
- Choose backup method and replication method.
- Provide securing of management storage infrastructure.

Question paper pattern:
The question paper will have ten questions.
There will be 2 questions from each module.
Each question will have questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:
1. EMC²: Information Storage and Management, Willey India 2013.

Reference Books:
4. Additional resource material on www.emc.com/resource-library/resource-library.esp

SERVICE ORIENTED ARCHITECTURE
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016-2017)
SEMESTER – 1

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CREDITS – 03

Course objectives: This course will enable students to
- Interpret various architecture for application development
- Demonstrate the importance of SOA in Application Integration
- To learn web service and SOA related tools
To Learn implementation details of SOA  
To understand varies case studies

| Module 1 |  
|---|---|
8 Hours |

| Module 2 |  
|---|---|
8 Hours |

| Module 3 |  
|---|---|
8 Hours |

| Module 4 |  
|---|---|
| **SOA IMPLEMENTATION:** SOA based integration – integrating existing application – development of web services – Integration - SOA using REST – RESTful services – RESTful services with and without JWS – Role of WSDL, SOAP and Java/XML mapping in SOA – JAXB Data binding. | Teaching Hours  
8 Hours |

| Module 5 |  
|---|---|
| **APPLICATION INTEGRATION:** JAX-WS 2.0 client side/server side development – Packaging and Deployment of SOA component – SOA shopper case study – WSDL centric java WS with SOA-J – related software – integration through service composition (BPEL) – case study - current trends. | Teaching Hours  
8 Hours |

**Course Outcomes**

The students should be able to:

- Compare different IT architecture  
- Analyze and design of SOA based applications  
- Implement web service and realize of SOA  
- Implement REST full services  
- Design and implement of SOA based Application Integration using BPEL

**Question paper pattern:**

The question paper will have ten questions.

There will be 2 questions from each module.

Each question will have questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.

**Text Books:**


**Reference Books:**

DISTRIBUTED OPERATING SYSTEM
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)

SEMESTER – 1

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CREDITS – 03

Course objectives: This course will enable students to

- Explain distributed systems principles associated with communication, naming, synchronization, distributed file systems, system design, distributed scheduling, and several case studies
- Extend foundational concepts and as well as practical deployments.
- Recall distributed operating system concepts that includes architecture, Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols
- Explain the distributed resource management components viz. the algorithms for implementation of distributed shared memory, recovery and commit protocols

Module 1


Module 2

Remote Procedure Calls: Introduction, The RPC Model, Transparency of RPC, Implementing RPC Mechanism, Stub Generation, RPC Messages, Marshaling Arguments and Results, Server Management, Parameter-Passing Semantics, Call Semantics, Communication Protocols for RPCs, Complicated RPCs, Client-Server Binding, Exception Handling, Security, Some Special Types of RPCs, RPC in Heterogeneous Environments, Lightweight RPC, Optimization for Better Performance, Case Studies: Sun RPC.

Module 3


Module 4


Module 5


Course Outcomes

The students should be able to:
• The concepts underlying distributed systems
• Demonstrate an ability to apply theory and techniques to unseen problems.
• Demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system
• Explore the various resource management techniques for distributed systems.

Question paper pattern:
The question paper will have ten questions.
There will be 2 questions from each module.
Each question will have questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

Reference Books:

DATA COMPRESSION AND ADBMS LABORATORY
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)

SEMESTER – I

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CREDITS – 02

Course objectives: This course will enable students to
• Expose to contemporary knowledge in Data Compression and Coding.
• Analyze and evaluate different Data Compression and Coding methods.
• Demonstrate to handle multi dimension data compression.
• Acquire practical knowledge on advanced databases and its applications.
• Evaluate and work on areas like Storage, Retrieval, Multi valued attributes, Triggers and other complex objects, Algorithms etc related to ADBMS.
• Design and implement recent applications database for better interoperability.

PART – A DATA COMPRESSION LAB WORK
NOTE: Use appropriate tool/language or package to implement and For programs 5 and 6, MATLAB or any equivalent tools can be used.

1. Write a program to compress a source Text file using Run-length encoding Compression algorithm save the output in a destination file. Decompress the destination file to get the original source file.

2. Write a program to compress a source image file using Run-length encoding Compression algorithm save the output in a destination file. Decompress the destination file to get the original source file.

3. Write a program to Read the string to generate Huffman code and display the code along with the input string (program should be case sensitive). Show all the calculation manually. Verify the results.

4. Write a program to read Huffman codes & compressed string (contains Huffman codes) codes and replaces the code with character (decompression). Display the input string(compressed) and output string (Decompressed).

5. Write a program to Read the string of numbers to generate Rice codes and display the code
6. Write a program to Read the string to generate LZW code for the given string. Display the LZW code along with the input string.

PART – B ADBMS LABORATORY WORK

Note: The following experiments may be implemented on MySQL/ORACLE or any other suitable RDBMS with support for Object features.

1. Develop a database application to demonstrate storing and retrieving of BLOB and CLOB objects.
   a. Write a binary large object (BLOB) to a database as either binary or character (CLOB) data, depending on the type of the field in your data source. To write a BLOB value to the database, issue the appropriate INSERT or UPDATE statement and pass the BLOB value as an input parameter. If your BLOB is stored as text, such as a SQL Server text field, pass the BLOB as a string parameter. If the BLOB is stored in binary format, such as a SQL Server image field, pass an array of type byte as a binary parameter.
   b. Once storing of BLOB and CLOB objects is done, retrieve them and display the results accordingly.

2. Develop a database application to demonstrate the representation of multi valued attributes, and the use of nested tables to represent complex objects. Write suitable queries to demonstrate their use.

Consider Purchase Order Example: This example is based on a typical business activity: managing customer orders. Need to demonstrate how the application might evolve from relational to object-relational, and how you could write it from scratch using a pure object-oriented approach.
   a. Show how to implement the schema -- Implementing the Application under the Relational Model -- using only Oracle's built-in data types. Build an object-oriented application on top of this relational schema using object views.

3. Design and develop a suitable Student Database application by considering appropriate attributes. Couple of attributes to be maintained is the Attendance of a student in each subject for which he/she has enrolled and Internal Assessment Using TRIGGERS, write active rules to do the following:
   a. Whenever the attendance is updated, check if the attendance is less than 85%; if so, notify the Head of the Department concerned.
   b. Whenever, the marks in an Internal Assessment Test are entered, check if the marks are less than 40%; if so, notify the Head of the Department concerned.

Use the following guidelines when designing triggers:
- Use triggers to guarantee that when a specific operation is performed, related actions are performed.
- Use database triggers only for centralized, global operations that should be fired for the triggering statement, regardless of which user or database application issues the statement.
- Do not define triggers that duplicate the functionality already built into Oracle. For example, do not define triggers to enforce data integrity rules that can be easily enforced using declarative integrity constraints.
- Limit the size of triggers (60 lines or fewer is a good guideline). If the logic for your trigger requires much more than 60 lines of PL/SQL code, it is better to include most of the code in a stored procedure, and call the procedure from the trigger.
- Be careful not to create recursive triggers. For example, creating an AFTER UPDATE statement trigger on the EMP table that itself issues an UPDATE statement on EMP causes the trigger to fire recursively until it has run out of memory.
1. Design, develop, and execute a program to implement specific Apriori algorithm for mining association rules. Run the program against any large database available in the public domain and discuss the results.

Association rules are if/then statements that help uncover relationships between seemingly unrelated data in a relational database or other information repository. An example of an association rule would be "If a customer buys a dozen eggs, he is 80% likely to also purchase milk."

Course Outcomes
The students should be able to:
- Work on the concepts of Software Testing and ADBMS at the practical level.
- Compare and pick out the right type of software testing process for any given real world problem.
- Carry out the software testing process in efficient way.
- Establish a quality environment as specified in standards for developing quality software.
- Model and represent the real world data using object oriented database.
- Embed the rules set in the database to implement various features of ADBMS.
- Choose, design and implement recent applications database for better interoperability.

Conduction of Practical Examination:
1. All laboratory experiments (nos) are to be included for practical examination.
2. Students are allowed to pick one experiment from each part and execute both.
3. Strictly follow the instructions as printed on the cover page of answer script for breakup of marks.
4. PART – A: Procedure + Conduction + Viva: 10 + 20 + 10 (40)
5. PART – B: Procedure + Conduction + Viva: 10 + 20 + 10 (40)
6. Change of experiment is allowed only once and marks allotted to the procedure part to be made zero.

SEMINAR
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016-2017)

SEMMESTER – I

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CREDITS – 01

Course objectives: This course will enable students to
- Motivate the students to read technical article
- Discover recent technology developments

Descriptions
The students should read a recent technical article (try to narrow down the topic as much as possible) from any of the leading reputed and refereed journals like:
- IEEE Transactions, journals, magazines, etc.
- ACM Transactions, journals, magazines, SIG series, etc.
- Springer
• Elsevier publications etc
In the area of (to name few and not limited to)
• Web Technology
• Cloud Computing
• Artificial Intelligent
• Networking
• Security
• Data mining

**Course Outcomes**
The students should be able to:
• Conduct survey on recent technologies
• Infer and interpret the information from the survey conducted
• Motivated towards research

**Conduction:**
The students have to present at least ONE technical seminar on the selected topic and submit a report for internal evaluation.

**Marks Distribution:** Literature Survey + Presentation (PPT) + Report + Question & Answer + Paper: 20 + 30 + 30 + 20 (100).