### MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

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

(Effective from the academic year 2018 -2019)

#### SEMESTER – I

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>IA Marks</th>
<th>Exam Marks</th>
<th>Exam Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>18SFC11 / 18LNI11 / 18SCES11 / 18SCSN11 / 18SSE11 / 18SIT11</td>
<td>40</td>
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<td>03</td>
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<table>
<thead>
<tr>
<th>Number of Contact Hours/Week</th>
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<tr>
<td>04</td>
<td>50</td>
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**CREDITS – 04**

#### Course Objectives:
This course will enable students to
- To acquaint the students with mathematical/logical fundamentals including numerical techniques,
- To understand probability, sampling and graph theory that serve as an essential tool for applications of computer and information sciences.

### Module 1
**Numerical Methods:**

<table>
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<tr>
<th>RBT: L1, L2, L3</th>
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<tr>
<td>10 Hours</td>
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### Module 2
**Statistical Inference:**
- Introduction to multivariate statistical models: Correlation and Regression analysis, Curve fitting (Linear and Non linear)

<table>
<thead>
<tr>
<th>RBT: L1, L2, L3</th>
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<td>10 Hours</td>
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### Module 3
**Probability Theory:**
- Probability mass function (p.m.f), density function (p.d.f), Random variable: discrete and continuous, Mathematical expectation, Sampling theory: testing of hypothesis by t-test and chi - square distribution.

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<thead>
<tr>
<th>RBT: L1, L2, L3</th>
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### Module 4
**Graph Theory:**
- Isomorphism, Planar graphs, graph coloring, Hamilton circuits and Euler cycle. Specialized techniques to solve combinatorial enumeration problems.

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<tr>
<th>RBT: L1, L2, L3</th>
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### Module 5
**Vector Spaces:**
- Vector spaces; subspaces; Linearly independent and dependent vectors: Bases and dimension; coordinate vectors-Illustrative examples. Linear transformations; Representation of transformations by matrices; linear functional; Non singular Linear transformations; inverse of a linear transformation- Problems.

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<thead>
<tr>
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</table>

### Course Outcomes
- Understand the numerical methods to solve and find the roots of the equations.
- Utilize the statistical tools in multi variable distributions.
- Use probability formulations for new predictions with discrete and continuous RV’s.
- To understand various graphs in different geometries related to edges.
- Understand vector spaces and related topics arising in magnification and rotation of images.

### 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:**

**Web links and Video Contacts:**
1. [http://nptel.ac.in/courses.php?disciplineId=111](http://nptel.ac.in/courses.php?disciplineId=111)
2. [http://www.class-central.com/subject/math(MOOCs)](http://www.class-central.com/subject/math(MOOCs))
### Course objectives:
This course will enable students to

- Define the fundamentals of Operating Systems.
- Explain distributed operating system concepts that includes architecture, Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols.
- Illustrate distributed resource management components viz. the algorithms for implementation of distributed shared memory, recovery and commit protocols.
- Identify the components and management aspects of Real time, Mobile operating Systems.

### Module 1: Operating System Overview, Process description & Control

<table>
<thead>
<tr>
<th>Operating System Overview, Process description &amp; Control</th>
<th>Contact Hours</th>
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<td>10 Hours</td>
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</table>

**RBT: L1, L2, L3**

### Module 2: Threads, SMP, and Microkernel, Virtual Memory

<table>
<thead>
<tr>
<th>Threads, SMP, and Microkernel, Virtual Memory</th>
<th>Contact Hours</th>
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<td>10 Hours</td>
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</table>

**RBT: L1, L2, L3**

### Module 3: Multiprocessor and Real-Time Scheduling
- Multiprocessor Scheduling, Real-Time Scheduling, Linux Scheduling, UNIX PreclsSl) Scheduling, Windows Vista Hours Scheduling, Process Migration, Distributed Global States, Distributed Mutual Exclusion, Distributed Deadlock.

<table>
<thead>
<tr>
<th>Multiprocessor and Real-Time Scheduling</th>
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**RBT: L1, L2, L3**

### Module 4: Embedded Operating Systems

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<tr>
<th>Embedded Operating Systems</th>
<th>Contact Hours</th>
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<td>10 Hours</td>
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**RBT: L1, L2, L3**

### Module 5: Kernel Organization

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<tr>
<th>Kernel Organization</th>
<th>Contact Hours</th>
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<td>10 Hours</td>
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</table>

**RBT: L1, L2, L3**
Manager Kernel local procedure calls and IPC, The native API, subsystems.

**Course Outcomes**
The students should be able to:

- Demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system
- Learn the various resource management techniques for distributed systems
- Identify the different features of real time and mobile operating system
- Modify existing open source kernels in terms of functionality or features used

**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:**
## Subject Code
18SCE252 / 18SCS13 / 18SIT14 / 18SSE151

### 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.

RBT: L1, L2, L3

10 Hours

### 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.

RBT: L1, L2, L3

10 Hours

### 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.

RBT: L1, L2, L3

10 Hours

### 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.

RBT: L1, L2, L3

10 Hours

### 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.

| RBT: L1, L2, L3 | 10 Hours |

### 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:
INTERNET OF THINGS
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2018-2019)

SEMESTER – I

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<tr>
<th>Subject Code</th>
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<tbody>
<tr>
<td>18LNI22 / 18SCE23 / 18SCN14 / 18SCS14 / 18SSE321</td>
<td>40</td>
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CREDITS – 04

Course objectives: This course will enable students to
- Define and explain basic issues, policy and challenges in the IoT
- Illustrate Mechanism and Key Technologies in IoT
- Explain the Standard of the IoT
- Explain resources in the IoT and deploy of resources into business
- Demonstrate data analytics for IoT

Module -1
What is The Internet of Things? Overview and Motivations, Examples of Applications, IPV6 Role, Areas of Development and Standardization, Scope of the Present Investigation. Internet of Things Definitions and frameworks-IoT Definitions, IoT Frameworks, Basic Nodal Capabilities. Internet of Things Application Examples-Overview, Smart Metering/Advanced Metering Infrastructure-Health/Body Area Networks, City Automation, Automotive Applications, Home Automation, Smart Cards, Tracking, Over-The-Air-Passive Surveillance/Ring of Steel, Control Application Examples, Myriad Other Applications.

RBT: L1, L2, L3

10 Hours

Module -2

RBT: L1, L2, L3

10 Hours

Module – 3

RBT: L1, L2, L3

10 Hours

Module-4

RBT: L1, L2, L3

10 Hours

Module-5
Data Analytics for IoT – Introduction, Apache Hadoop, Using Hadoop MapReduce for Batch Data Analysis, Apache Oozie, Apache Spark, Apache Storm, Using Apache Storm for Real-time Data Analysis, Structural Health Monitoring Case Study.

RBT: L1, L2, L3

10 Hours
### Course outcomes:
At the end of this course the students will be able to:
- Develop schemes for the applications of IOT in real time scenarios
- Manage the Internet resources
- Model the Internet of things to business
- Understand the practical knowledge through different case studies
- Understand data sets received through IoT devices and tools used for analysis

### 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:
# ADVANCES IN COMPUTER NETWORKS

[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2018-2019)

## SEMESTER – I

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Number of Contact Hours/Week</th>
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<td>18SCN12</td>
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<td>18SCS151</td>
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**CREDITS – 04**

## Course objectives:
This course will enable students to:
- Discuss with the basics of Computer Networks.
- Compare various Network architectures.
- Discuss fundamental protocols.
- Define and analyze network traffic, congestion, controlling and resource allocation.

<table>
<thead>
<tr>
<th>Module 1</th>
<th>Contact Hours</th>
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<tbody>
<tr>
<td><strong>Foundation:</strong> Building a Network, Requirements, Perspectives, Scalable Connectivity, Cost-Effective Resource sharing, Support for Common Services, Manageability, Protocol layering, Performance, Bandwidth and Latency, Delay X Bandwidth Product, Perspectives on Connecting, Classes of Links, Reliable Transmission, Stop-and-Wait, Sliding Window, Concurrent Logical Channels.</td>
<td>10 Hours</td>
</tr>
<tr>
<td>T1: Chapter 1.1, 1.2, 1.5.1, 1.5.2, 2.1, 2.5</td>
<td>RBT: L1, L2, L3</td>
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<tr>
<td>T2: Chapter 3.1, 3.2</td>
<td>RBT: L1, L2, L3</td>
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<thead>
<tr>
<th>Module 2</th>
<th>Contact Hours</th>
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<tbody>
<tr>
<td><strong>Internetworking I:</strong> Switching and Bridging, Datagram’s, Virtual Circuit Switching, Source Routing, Bridges and LAN Switches, Basic Internetworking (IP), What is an Internetwork?, Service Model, Global Addresses, Datagram Forwarding in IP, sub netting and classless addressing, Address Translation (ARP), Host Configuration (DHCP), Error Reporting (ICMP), Virtual Networks and Tunnels.</td>
<td>10 Hours</td>
</tr>
<tr>
<td>T1: Chapter 3.1, 3.2</td>
<td>RBT: L1, L2, L3</td>
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<tr>
<td>T2: Chapter 13.1 to 13.18, Ch 18</td>
<td>RBT: L1, L2, L3</td>
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<tr>
<th>Module 3</th>
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<tr>
<td><strong>Internetworking II:</strong> Network as a Graph, Distance Vector (RIP), Link State (OSPF), Metrics, The Global Internet, Routing Areas, Routing among Autonomous systems (BGP), IP Version 6 (IPv6), Mobility and Mobile IP</td>
<td>10 Hours</td>
</tr>
<tr>
<td>T1: Chapter 3.3, 4.1.1, 4.1.3</td>
<td>RBT: L1, L2, L3</td>
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<tr>
<th>Module 4</th>
<th>Contact Hours</th>
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<tr>
<td><strong>End-to-End Protocols:</strong> Simple Demultiplexer (UDP), Reliable Byte Stream(TCP), End-to-End Issues, Segment Format, Connecting Establishment and Termination, Sliding Window Revisited, Triggering Transmission, Adaptive Retransmission, Record Boundaries, TCP Extensions, Queuing Disciplines, FIFO, Fair Queuing, TCP Congestion Control, Additive Increase/ Multiplicative Decrease, Slow Start, Fast Retransmit and Fast Recovery</td>
<td>10 Hours</td>
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<tr>
<td>T1: Chapter 5.1, 5.2.1 to 5.2.8, 6.2, 6.3</td>
<td>RBT: L1, L2, L3</td>
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<table>
<thead>
<tr>
<th>Module 5</th>
<th>Contact Hours</th>
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<tbody>
<tr>
<td><strong>Congestion Control and Resource Allocation</strong></td>
<td>10 Hours</td>
</tr>
<tr>
<td>Congestion-Avoidance Mechanisms, DEC bit, Random Early Detection (RED), Source-Based Congestion Avoidance, The Domain Name System (DNS), Electronic Mail (SMTP,POP,IMAP,MIME), World Wide Web</td>
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<tr>
<td>(HTTP), Network Management (SNMP)</td>
<td>T1: Chapter 6.4  T2: Chapter 23.1 to 23.16, Chapter 24, Chapter 25, Chapter 27.1 to 27.8  RBT: L1, L2, L3</td>
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## Course Outcomes

The students should be able to:

- List and classify network services, protocols and architectures, explain why they are layered.
- Choose key Internet applications and their protocols, and apply to develop their own applications (e.g. Client Server applications, Web Services) using the sockets API.
- Explain develop effective communication mechanisms using techniques like connection establishment, queuing theory, recovery etc.
- Explain various congestion control techniques.

## 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:
- Define technologies of multicore architecture and performance measures
- Demonstrate problems related to multiprocessing
- Illustrate windows threading, posix threads, openmp programming
- Analyze the common problems in parallel programming

### Module - 1

**RBT: L1, L2, L3**

**Contact Hours: 10 Hours**

### Module - 2

**RBT: L1, L2, L3**

**Contact Hours: 10 Hours**

### Module - 3
Threading APIs: Threading APIs for Microsoft Windows, Win32/MFC Thread APIs, Threading APIs for Microsoft .NET Framework, Creating Threads, Managing Threads, Thread Pools, Thread Synchronization, POSIX Threads, Creating Threads, Managing Threads, Thread Synchronization, Signaling, Compilation and Linking.

**RBT: L1, L2, L3**

**Contact Hours: 10 Hours**

### Module - 4

**RBT: L1, L2, L3**

**Contact Hours: 10 Hours**
Single-thread and Multi-thread Execution, Data Copy-in and Copy-out, Protecting Updates of Shared Variables, Intel Task queuing Extension to OpenMP, OpenMP Library Functions, OpenMP Environment Variables, Compilation, Debugging, performance  

**Module-5**  

**Course outcomes:**  
The students shall able to:  
- Identify the limitations of ILP and the need for multicore architectures  
- Define fundamental concepts of parallel programming and its design issues  
- Solve the issues related to multiprocessing and suggest solutions  
- Make out the salient features of different multicore architectures and how they exploit parallelism  
- Demonstrate the role of OpenMP and programming concept  

**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:** Nil.
DATA COMPRESSION
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2018-2019)

SEMESTER – I

Subject Code | 18SCS153 / 18SIT13 | IA Marks | 40
--- | --- | --- | ---
Number of Contact Hours/Week | 04 | Exam Marks | 60
Total Number of Contact Hours | 50 | Exam Hours | 03

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.

RBT: L1, L2, L3
10 Hours

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.

RBT: L1, L2, L3
10 Hours

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

RBT: L1, L2, L3
10 Hours

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 standards.

RBT: L1, L2, L3
10 Hours

Module 5


RBT: L1, L2, L3
10 Hours

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:**
### COMPUTER SYSTEMS PERFORMANCE ANALYSIS

[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2018 -2019)

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**CREDITS – 04**

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

- Discuss mathematical foundations needed for performance evaluation of computer systems
- Illustrate metrics used for performance evaluation
- Develop the analytical modeling of computer systems
- Develop new queuing analysis for both simple and complex systems
- Analyze techniques for evaluating scheduling policies

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<tr>
<th>Module 1</th>
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<td>RBT: L1, L2, L3</td>
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<tr>
<th>Module 2</th>
<th>Contact Hours</th>
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<tbody>
<tr>
<td>Workloads, Workload Selection and Characterization: Types of Workloads, addition instructions, Instruction mixes, Kernels; Synthetic programs, Application benchmarks, popular benchmarks. Work load Selection: Services exercised, level of detail; Representativeness; Timeliness, Other considerations in workload selection. Work load characterization Techniques: Terminology; Averaging, Specifying dispersion, Single Parameter Histograms, Multi Parameter Histograms, Principle Component Analysis, Markov Models, Clustering.</td>
<td>10 Hours</td>
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<td>RBT: L1, L2, L3</td>
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<table>
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<tr>
<th>Module 3</th>
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<tbody>
<tr>
<td>Monitors, Program Execution Monitors and Accounting Logs: Monitors: Terminology and classification; Software and hardware monitors, Software versus hardware monitors, Firmware and hybrid monitors, Distributed System Monitors, Program Execution Monitors and Accounting Logs, Program Execution Monitors, Techniques for Improving Program Performance, Accounting Logs, Analysis and Interpretation of Accounting log data, Using accounting logs to answer commonly asked questions.</td>
<td>10 Hours</td>
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<tr>
<td>RBT: L1, L2, L3</td>
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<tr>
<th>Module 4</th>
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<tr>
<td>Capacity Planning and Benchmarking: Steps in capacity planning and management; Problems in Capacity Planning; Common Mistakes in Benchmarking; Benchmarking Games; Load Drivers; Remote- Terminal Emulation; Components of an RTE; Limitations of RETEs. Experimental Design and Analysis: Introduction: Terminology, Common mistakes in experiments, Types of experimental designs, 2k Factorial Designs, Concepts, Computation of effects, Sign table method for computing effects; Allocation of variance; General 2k Factorial Designs, General full factorial designs with k factors: Model, Analysis of a General Design, Informal Methods.</td>
<td>10 Hours</td>
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### Module 5

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

### Course Outcomes

The students should be able to:

- Identify the need for performance evaluation and the metrics used for it
- Implement Little’s law and other operational laws
- Apply the operational laws to open and closed systems
- Use discrete-time and continuous-time Markov chains to model real world systems
- Develop analytical techniques for evaluating scheduling policies

### Question Paper Pattern:

The question paper will have ten questions. 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:

ADBMS AND IOT LABORATORY
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2018-2019)

SEMESTER – I

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>IA Marks</th>
<th>Exam Marks</th>
<th>Total Number of Contact Hours</th>
<th>Exam Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>18SCSL16</td>
<td>40</td>
<td>60</td>
<td>50</td>
<td>03</td>
</tr>
</tbody>
</table>

CREDITS – 02

Course objectives:
This course will enable students to

- To provide students with contemporary knowledge in Data Compression and Coding.
- To equip students with skills to analyze and evaluate different Data Compression and Coding methods.
- To be instrumental to handle multi dimension data compression.
- To acquire practical knowledge on advanced databases and its applications.
- To analyze and work on areas like Storage, Retrieval, Multi valued attributes, Triggers and other complex objects, Algorithms etc related to ADBMS.
- To design and implement recent applications database for better interoperability.

PART – A

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.

1. 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."

**PART – B  IOT LABORATORY WORK**

1. Transmit a string using UART
2. Point-to-Point communication of two Motes over the radio frequency.
3. Multi-point to single point communication of Motes over the radio frequency.LAN (Sub-netting).
4. I2C protocol study
    - Reading Temperature and Relative Humidity value from the sensor

**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:**

All laboratory experiments (nos) are to be included for practical examination. Students are allowed to pick one experiment from each part and execute both

Strictly follow the instructions as printed on the cover page of answer script for breakup of marks

*Change of experiment is allowed only once and marks allotted to the procedure part to be made zero.*
### MANAGING BIG DATA

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

(Effective from the academic year 2018-2019)

**SEMESTER – II**

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>IA Marks</th>
<th>Exam Marks</th>
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<td>04</td>
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</tbody>
</table>

**Number of Contact Hours/Week**: 04

**Total Number of Contact Hours**: 50

**Exam Hours**: 03

**CREDITS – 04**

**Course objectives**: This course will enable students to
- Define big data for business intelligence
- Analyze business case studies for big data analytics
- Explain managing of Big data Without SQL
- Develop map-reduce analytics using Hadoop and related tools

<table>
<thead>
<tr>
<th>Module -1</th>
<th>Contact Hours</th>
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<tr>
<th>Module -2</th>
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<th>Module -3</th>
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<tr>
<th>Module -4</th>
<th>Contact Hours</th>
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<tbody>
<tr>
<td>MAPREDUCE APPLICATIONS: MapReduce workflows – unit tests with MRUnit – test data and local tests – anatomy of MapReduce job run – classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution – MapReduce types – input formats – output formats</td>
<td>10 Hours</td>
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<tr>
<th>Module -5</th>
<th>Contact Hours</th>
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definition – HiveQL data manipulation – HiveQL queries.

| RBT: L1, L2, L3 |

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<tr>
<th>Course outcomes:</th>
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<tbody>
<tr>
<td>The students shall able to:</td>
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<tr>
<td>• Describe big data and use cases from selected business domains</td>
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<tr>
<td>• Explain NoSQL big data management</td>
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<tr>
<td>• Install, configure, and run Hadoop and HDFS</td>
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<tr>
<td>• Perform map-reduce analytics using Hadoop</td>
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<tr>
<td>• Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data Analytics</td>
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</table>
ADVANCED ALGORITHMS
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2018 -2019)
SEMESTER – II
Subject Code | 18SCS22/18SSE244
IA Marks | 40
Number of Contact Hours/Week | 04
Exam Marks | 60
Total Number of Contact Hours | 50
Exam Hours | 03
CREDITS – 04
Course objectives: This course will enable students to
- Define the graph search algorithms.
- Explain network flow and linear programming problems.
- Interpret hill climbing and dynamic programming design techniques.
- Develop recursive backtracking algorithms.
- Define NP completeness and randomized algorithms

Module -1
RBT: L1, L2, L3
10 Hours

Module -2
Graph Algorithms: Bellman - Ford Algorithm; Single source shortest paths in a DAG; Johnson’s Algorithm for sparse graphs; Flow networks and Ford-Fulkerson method; Maximum bipartite matching. Polynomials and the FFT: Representation of polynomials; The DFT and FFT; Efficient implementation of FFT.
RBT: L1, L2, L3
10 Hours

Module -3
Number -Theoretic Algorithms: Elementary notions; GCD; Modular Arithmetic; Solving modular linear equations; The Chinese remainder theorem; Powers of an element; RSA cryptosystem; Primality testing; Integer factorization
RBT: L1, L2, L3
10 Hours

Module-4
String-Matching Algorithms: Naïve string Matching; Rabin - Karp algorithm; String matching with finite automata; Knuth-Morris-Pratt algorithm; Boyer – Moore algorithms.
RBT: L1, L2, L3
10 Hours

Module-5
Probabilistic and Randomized Algorithms: Probabilistic algorithms; Randomizing deterministic algorithms, Monte Carlo and Las Vegas algorithms; Probabilistic numeric algorithms.
RBT: L1, L2, L3
10 Hours

Course outcomes:
Upon completion of the course, the students will be able to
- Design and apply iterative and recursive algorithms.
- Design and implement optimization algorithms in specific applications.
- Design appropriate shared objects and concurrent objects for applications.
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</table>
# CLOUD COMPUTING

[As per Choice Based Credit System (CBCS) scheme]  
(Effective from the academic year 2018 -2019)

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### CREDITS – 04

**Course objectives:** This course will enable students to
- Define and Cloud, models and Services.
- Compare and contrast programming for cloud and their applications
- Explain virtualization, Task Scheduling algorithms.
- Apply ZooKeeper, Map-Reduce concept to applications.

### Module 1

**Introduction, Cloud Infrastructure:** Cloud computing, Cloud computing delivery models and services, Ethical issues, Cloud vulnerabilities, Cloud computing at Amazon, Cloud computing the Google perspective, Microsoft Windows Azure and online services, Open-source software platforms for private clouds, Cloud storage diversity and vendor lock-in, Energy use and ecological impact, Service level agreements, User experience and software licensing. Exercises and problems.

**Contact Hours:** 10

RBT: L1, L2, L3

### Module 2


**Contact Hours:** 10

RBT: L1, L2, L3

### Module 3


**Contact Hours:** 10

RBT: L1, L2, L3

### Module 4

**Cloud Resource Management and Scheduling:** Policies and mechanisms for resource management, Application of control theory to task scheduling on a cloud, Stability of a two-level resource allocation architecture, Feedback control based on dynamic thresholds, Coordination of specialized autonomic performance managers, A utility-based model for cloud-based Web services, Resourcing bundling: Combinatorial auctions for cloud resources, Scheduling algorithms for computing clouds, Fair queuing, Start-time fair queuing, Borrowed virtual time, Cloud scheduling subject to deadlines, Scheduling MapReduce applications subject to deadlines, Resource management and dynamic scaling, Exercises and problems.

**Contact Hours:** 10
Module 5


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<th>Course Outcomes</th>
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<tbody>
<tr>
<td>The students should be able to:</td>
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<tr>
<td>• Compare the strengths and limitations of cloud computing</td>
</tr>
<tr>
<td>• Identify the architecture, infrastructure and delivery models of cloud computing</td>
</tr>
<tr>
<td>• Apply suitable virtualization concept.</td>
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<tr>
<td>• Choose the appropriate cloud player</td>
</tr>
<tr>
<td>• Address the core issues of cloud computing such as security, privacy and interoperability</td>
</tr>
<tr>
<td>• Design Cloud Services</td>
</tr>
<tr>
<td>• Set a private cloud</td>
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**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:**
### ADVANCES IN STORAGE AREA NETWORKS

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

(Effective from the academic year 2018-2019)

#### SEMESTER – II

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<tr>
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#### Course objectives:
This course will enable students to
- Define and contrast storage centric and server centric systems
- Define metrics used for Designing storage area networks
- Illustrate RAID concepts
- Demonstrate how data centers maintain the data with the concepts of backup mainly remote mirroring concepts for both simple and complex systems.

#### Module 1
**Introduction:** Server Centric IT Architecture and its Limitations; Storage – Centric IT Architecture and its advantages. Case study: Replacing a server with Storage Networks. The Data Storage and Data Access problem; The Battle for size and access. Intelligent Disk Subsystems: Architecture of Intelligent Disk Subsystems; Hard disks and Internal I/O Channels; JBOD, Storage virtualization using RAID and different RAID levels; Caching: Acceleration of Hard Disk Access; Intelligent disk subsystems, Availability of disk subsystems.

**RBT:** L1, L2, L3

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#### Module 2
**I/O Techniques:** The Physical I/O path from the CPU to the Storage System; SCSI; Fibre Channel Protocol Stack; Fibre Channel SAN; IP Storage. Network Attached Storage: The NAS Architecture, The NAS hardware Architecture, The NAS Software Architecture, Network connectivity, NAS as a storage system. File System and NAS: Local File Systems; Network file Systems and file servers; Shared Disk file systems; Comparison of fibre Channel and NAS.

**RBT:** L1, L2, L3

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#### Module 3
**Storage Virtualization:** Definition of Storage virtualization; Implementation Considerations; Storage virtualization on Block or file level; Storage virtualization on various levels of the storage Network; Symmetric and Asymmetric storage virtualization in the Network.

**RBT:** L1, L2, L3

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#### Module 4
**SAN Architecture and Hardware devices:** Overview, Creating a Network for storage; SAN Hardware devices; The fibre channel switch; Host Bus Adaptors; Putting the storage in SAN; Fabric operation from a Hardware perspective. Software Components of SAN: The switch’s Operating system; Device Drivers; Supporting the switch’s components; Configuration options for SANs.

**RBT:** L1, L2, L3

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#### Module 5
**Management of Storage Network:** System Management, Requirement of management System, Support by Management System, Management Interface, Standardized

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Mechanisms, Property Mechanisms, In-band Management, Use of SNMP, CIM and WBEM, Storage Management Initiative Specification (SMI-S), CMIP and DMI, Optional Aspects of the Management of Storage Networks, Summary

**Course Outcomes**

The students should be able to:

- Identify the need for performance evaluation and the metrics used for it
- Apply the techniques used for data maintenance.
- Realize strong virtualization concepts
- Develop techniques for evaluating policies for LUN masking, file 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:**

1. Ulf Troppens, Rainer Erkens and Wolfgang Muller: Storage Networks Explained, Wiley India, 2013.

**Reference Books:**

## AGILE TECHNOLOGIES

[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2018 -2019)

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<tr>
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</table>

**Number of Contact Hours/Week:** 04

**Number of Contact Hours:** 50

**Exam Hours:** 03

**CREDITS – 04**

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

- Explain iterative, incremental development process leads to faster delivery of more useful software
- Evaluate essence of agile development methods
- Illustrate the principles and practices of extreme programming
- Show the roles of prototyping in the software process
- Explain the Mastering Agility

### Module - 1

**Why Agile?:** Understanding Success, Beyond Deadlines, The Importance of Organizational Success, Enter Agility, **How to Be Agile?:** Agile Methods, Don’t Make Your Own Method, The Road to Mastery, Find a Mentor

**Contact Hours:** 10 Hours

**RBT:** L1, L2

### Module - 2

**Understanding XP:** The XP Lifecycle, The XP Team, XP Concepts, **Adopting XP:** Is XP Right for Us?, Go!, Assess Your Agility

**Contact Hours:** 10 Hours

**RBT:** L1, L2

### Module – 3


**Contact Hours:** 10 Hours

**RBT:** L1, L2, L3

### Module - 4

**Mastering Agility: Values and Principles:** Commonalities, About Values, Principles, and Practices, Further Reading, **Improve the Process:** Understand Your Project, Tune and Adapt, Break the Rules, **Rely on People:** Build Effective Relationships, Let the Right People Do the Right Things, Build the Process for the People, **Eliminate Waste:** Work in Small, Reversible Steps, Fail Fast, Maximize Work Not Done, Pursue Throughput

**Contact Hours:** 10 Hours

**RBT:** L1, L2, L3

### Module - 5

**Deliver Value:** Exploit Your Agility, Only Releasable Code Has Value, Deliver Business Results, Deliver Frequently, **Seek Technical Excellence:** Software Doesn’t Exist, Design Is

**Contact Hours:** 10 Hours
for Understanding, Design Trade-offs, Quality with a Name, Great Design, Universal Design Principles, Principles in Practice, Pursue Mastery

| RBT: L1, L2, L3 |

**Course outcomes:**

Students should be able to

- Define XP Lifecycle, XP Concepts, Adopting XP
- Evaluate on Pair Programming, Root-Cause Analysis, Retrospectives, Planning, Incremental Requirements, Customer Tests
- Demonstrate concepts to Eliminate Waste

**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. *The Art of Agile Development* (Pragmatic guide to agile software development),

**Reference Books:**

# BUSINESS INTELLIGENCE AND ITS APPLICATIONS

[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2018 -2019)

## SEMESTER - II

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<td>60</td>
<td>50</td>
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## CREDITS - 04

### Course objectives:
This course will enable students to
- Evaluate the key elements of a successful business intelligence (BI) program
- Apply a BI meta model that turns outcomes into actions
- Extract and transform data from an operational data to a data business data
- Evaluate business analytics and performance measurement tools

### Module -1

RBT: L1, L2, L3

10 Hours

### Module -2
Managing The BI Project, Defining And Planning The BI Project, Project Planning Activities, Roles And Risks Involved In These Activities, General Business Requirement, Project Specific Requirements, Interviewing Process

RBT: L1, L2, L3

10 Hours

### Module – 3
Differences in Database Design Philosophies, Logical Database Design, Physical Database Design, Activities, Roles And Risks Involved In These Activities, Incremental Rollout, Security Management, Database Backup And Recovery

RBT: L1, L2, L3

10 Hours

### Module-4

RBT: L1, L2, L3

10 Hours

### Module-5
Business View of Information technology Applications: Business Enterprise excellence, Key purpose of using IT, Type of digital data, basics f enterprise reporting, BI road ahead.

RBT: L1, L2, L3

10 Hours

### Course outcomes:
Upon completion of the course, the students will be able to
- Explain the complete life cycle of BI/Analytical development
- Illustrate technology and processes associated with Business Intelligence framework
- Demonstrate a business scenario, identify the metrics, indicators and make recommendations to achieve the business goal.
**Question paper pattern:**
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There will be 2 questions from each module. 
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# DATA MINING & DATA WAREHOUSING

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

**(Effective from the academic year 2018 -2019)**

## SEMESTER – II

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## CREDITS – 04

### Course objectives:
This course will enable students to
- Define Data warehousing Architecture and Implementation
- Explain Data mining principles and techniques and Introduce DM as a cutting edge business intelligence
- Interpret association rule mining for handling large data
- Classification for the retrieval purposes
- Explain clustering techniques in details for better organization and retrieval of data

### Module -1
Introduction and Data Preprocessing: Why data mining, What is data mining, What kinds of data can be mined, What kinds of patterns can be mined, Which Technologies Are used, Which kinds of Applications are targeted, Major issues in data mining. Data Preprocessing: An overview, Data cleaning, Data integration, Data reduction, Data transformation and data discretization.

RBT: L1, L2, L3

10 Hours

### Module -2
Data warehousing and online analytical processing: Data warehousing: Basic concepts, Data warehouse modeling: Data cube and OLAP, Data warehouse design and usage, Data warehouse implementation, Data generalization by attribute-oriented induction.

RBT: L1, L2, L3

10 Hours

### Module – 3
Classification: Basic Concepts: Basic Concepts, Decision tree induction, Bays Classification Methods, Rule-Based classification, Model evaluation and selection, Techniques to improve classification accuracy

RBT: L1, L2, L3

10 Hours

### Module-4
Cluster Analysis: Basic concepts and methods: Cluster Analysis, Partitioning methods, Hierarchical Methods, Density-based methods, Grid-Based Methods, Evaluation of clustering.

RBT: L1, L2, L3

10 Hours

### Module-5
Data mining trends and research frontiers: Mining complex data types, other methodologies of data mining, Data mining applications, Data Mining and society.

RBT: L1, L2, L3

10 Hours

### Course outcomes:
The students shall able to:
- Demonstrate Storing voluminous data for online processing, Preprocess the data for mining applications
- Apply the association rules for mining the data
- Design and deploy appropriate classification techniques
- Cluster the high dimensional data for better organization of the data
- Discover the knowledge imbibed in the high dimensional system

**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. Jiawei Han, Micheline Kamber, Jian Pei: Data Mining Concepts and Techniques, ELSEVIER(MK) 3rd edition 2012.

**Reference Books:** NIL.
### Course Objectives:

This course will enable students to:

- Explain basic and fundamental computer graphics techniques.
- Compare and contrast image synthesis techniques.
- Examine applications of modeling, design and visualization.
- Discuss different color modeling and computer animation.
- Explain hierarchical modeling and graphing file formats.

### Module 1: Three-Dimensional Object Representations

<table>
<thead>
<tr>
<th>Contact Hours</th>
<th>10 Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three-Dimensional Object Representations: Polyhedra, OpenGL Polyhedron Functions, Curved Surfaces, Quadric Surfaces, Super quadrics, OpenGL Quadric-Surface and Cubic-Surface Functions, Blobby Objects, Spline Representations, Cubic-Spline Interpolation Methods, Bezier Spline Curves, Bzier Surfaces B-Spline Curves, B-Spline Surfaces, Beta-Splines, Retional Splines, Conversion Between Spline Representations, Displaying Spline Curves and faces, OpenGL Approximation-Spline Functions, Sweep Representations, Constructive Solid–Geometry Method, Octrees, BSP Trees, Fractal-Geometry Methods, Shape Grammars and Others Procedural Methods, Particle Systems, Physically Based Modeling, Visualization Of Data Sets.</td>
<td></td>
</tr>
</tbody>
</table>

| RBT: L1, L2 |

### Module 2: Visible-Surface Detection Methods

<table>
<thead>
<tr>
<th>Contact Hours</th>
<th>10 Hours</th>
</tr>
</thead>
</table>

| RBT: L1, L2, L3 |

### Module 3: Illumination Models and Surface-Rendering Methods

<table>
<thead>
<tr>
<th>Contact Hours</th>
<th>10 Hours</th>
</tr>
</thead>
</table>

| RBT: L1, L2, L3 |

### Module 4: Color models, color applications and Computer animation

<table>
<thead>
<tr>
<th>Contact Hours</th>
<th>10 Hours</th>
</tr>
</thead>
</table>

<p>| RBT: L1, L2, L3 |</p>
<table>
<thead>
<tr>
<th>Module 5</th>
<th>10 Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hierarchical modeling and Graphics file formats: Basic modeling concepts, Modeling packages, General hierarchical modeling methods, Hierarchical modeling using openGL display list, Image-File configurations, Color-reduction methods, File-compression techniques, Composition of the major file formats.</td>
<td>RBT: L1, L2, L3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The students should be able to:</td>
<td></td>
</tr>
<tr>
<td>• Discuss and implement images and objects using 3D representation and openGL methodologies.</td>
<td></td>
</tr>
<tr>
<td>• Design and develop surface detection using various detection methods.</td>
<td></td>
</tr>
<tr>
<td>• Choose various illumination models for provides effective standards of objects.</td>
<td></td>
</tr>
<tr>
<td>• Design of develop effective computer animations.</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
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<table>
<thead>
<tr>
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</table>

<table>
<thead>
<tr>
<th>Reference Books:</th>
<th></th>
</tr>
</thead>
</table>
TRENDS IN ARTIFICIAL INTELLIGENCE AND SOFT COMPUTING

[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2018 -2019)

SEMESTER –

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>IA Marks</th>
<th>Exam Marks</th>
<th>Exam Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>18SCS252 / 18SIT323 / 18SSE254</td>
<td>40</td>
<td>60</td>
<td>03</td>
</tr>
</tbody>
</table>

CREDITS – 04

Course objectives: This course will enable students to

- Describe Artificial Intelligence, its utility and intelligent agents
- Describe a problem as a state space
- Use and implement search techniques
- Use knowledge representation techniques for problem solving
- Solve AI problems using symbolic reasoning and game theory
- Describe and apply neural networks
- Describe and apply Fuzzy systems to various problem domains
- Describe and apply GA to different problem domains

Module 1

<table>
<thead>
<tr>
<th>Teachings Hours</th>
<th>Role of AI in Engineering, AI in daily life, Intelligence and AI, Different Task Domains of AI, History and Early Works of AI, History of AI, Programming Methods, Limitations of AI, Agent, Performance Evaluation, Task environment of an Agent, Agents Classification, Agent Architecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBT: L1, L2, L3</td>
<td>Logic Programming, Logic Representation, Propositional Logic, Predicate Logic and Predicate Calculus, Horn Clauses, Well formed Formula, Computable functions and predicate, Quantifiers, Universe of discourse, Applications of Predicate Logic, Unification, Resolution, Conjuctive Normal Form, conversion to normal form or clausal form</td>
</tr>
</tbody>
</table>

Module 2

<table>
<thead>
<tr>
<th>Teachings Hours</th>
<th>Fundamental Problem of Logic: Logic Inadequacy: FundamentaProblem of Logic-Monotonicity wuth “Flying Penguin” example, General disadvantage of monotonicity property in logic, logic in search space problem, logic in decidability and Incompleteness, Logic in Uncertainty Modelling, Knowledge representation: Knowledge, Need to represent knowledge, Knowledge representation with mapping scheme, properties of a good knowledge base system, Knowledge representation issues, AND-OR graphs, Types of knowledge, Knowledge representation schemes, semantic nets, Frames, conceptual graphs, conceptual dependence theory, script, weak and strong slot filler, Reasoning: Types of Reasoning, Methods of reasoning, Application of Reasoning, Forward and Backward Reasoning</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBT: L1, L2, L3</td>
<td>10 Hours</td>
</tr>
</tbody>
</table>

## Module 3

Search Techniques: Search, Representation techniques, Categories of Search, Disadvantage of state space search, Issues in design of search programs, General Search examples, Classification of search diagram representation, Hill climbing method and Hill climbing search, Simulates Annealing, Best-First Search, Branch and Bound Search, A* search

Game Playing: Two player games, Minmax Search, Complexity of Minmax algorithm, Alpha-Beta Pruning

Planning: Necessity of planning, Components of Planning, Planning Agents, Planning generating schemes, Algorithm for planning, Planning Representation with STRIPS, BLOCKS WORLD, difficulties with planning

RBT: L1, L2, L3  
10 Hours

## Module 4

Fuzzy Sets and Uncertainties: Fuzzy set and fuzzy logic, set and fuzzy operators, Extended fuzzy operations, Fuzzy relations, Properties of fuzzy relations, Fuzzy system and design, Linguistic hedges, Syntax for IF and Then rules, Types of fuzzy rule based system, Fuzzy linguistic controller, Fuzzy Inference, Graphical techniques of Inference, How, Fuzzy logic is used, Fuzzification, De-fuzzification. Unique features of Fuzzy Logic, Application of Fuzzy Logic, Fuzzy logic uncertainty and probability, Advantages and Limitations of Fuzzy logic and Fuzzy Systems

RBT: L1, L2, L3  
10 Hours

## Module 5


RBT: L1, L2, L3  
10 Hours

## Course Outcomes

The students should be able to:

- Design intelligent agents for problem solving, reasoning, planning, decision making, and learning. specific design and performance constraints, and when needed, design variants of existing algorithms.
- Apply AI technique to current applications.
- Apply Problem solving, knowledge representation, reasoning, and learning techniques to solve real world problems
- Design and build expert systems for various application domains.
- Apply Soft Computing techniques such as neural networks, fuzzy logic to solve problems in various application domains

## 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:

3. Anindita Das Battacharjee, Artificial Intelligence and Softcomputing for Beginners, Shroff Publishers, 2nd edition

## Reference Books:

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**OBJECT ORIENTED SOFTWARE ENGINEERING**  
[As per Choice Based Credit System (CBCS) scheme]  
(Effective from the academic year 2018 -2019)

**SEMESTER – II**

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>IA Marks</th>
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<th>Exam Hours</th>
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</table>

**CREDITS – 04**

**Course objectives:** This course will enable students to
- Discuss the fundamental principles underlying Object-Oriented software design
- Illustrate the requirements of various domain applications
- Interpret object-oriented analysis and to familiarize UML concepts
- Design, implement and test the software in object oriented approach
- Explore the factors related to software maintenance and software configuration management

<table>
<thead>
<tr>
<th>Module 1</th>
<th>Contact Hours</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Module 2</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>REQUIREMENT ELICITATION AND ANALYSIS: Requirements Elicitation: Requirements Elicitation Concepts, Requirements Elicitation Activities, Managing Requirements Elicitation, <strong>Analysis:</strong> Analysis Concepts, Analysis Activities, Managing Analysis.</td>
<td>10 Hours</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Module 3</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSTEM DESIGN :System design-Decomposing the system: Overview of System Design, System Design Concepts, System Design Activities: Objects to Subsystems, <strong>System Design –Addressing design goals:</strong> Activities: An overview of system design actives, UML deployment diagrams, Addressing Design Goals, Managing System Design.</td>
<td>10 Hours</td>
</tr>
</tbody>
</table>
Module 4


RBT: L1, L2, L3

Module 5


RBT: L1, L2, L3

Course Outcomes

The students should be able to:
- Apply Object Oriented Software Engineering approach in every aspect of software project
- Analyze the requirements from various domains
- Adapt appropriate object oriented design aspects in the development process
- Implement and test the software projects using object oriented approach
- Learn the issues and concepts relating to maintenance of software projects
- Adapt the concepts and tools related to software configuration management

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

- Explain image fundamentals and mathematical transforms necessary for image processing and to study the image enhancement techniques.
- Demonstrate the image segmentation and representation techniques.
- How image are analyzed to extract features of interest.
- Introduce the concepts of image registration and image fusion.
- Analyze the constraints in image processing when dealing with 3D data sets.


Module 5

Course Outcomes
The students should be able to:
- Explain image formation and the role human visual system plays in perception of gray and color image data.
- Apply image processing techniques in both the spatial and frequency (Fourier) domains.
- Design image analysis techniques in the form of image segmentation and to evaluate the Methodologies for segmentation.
- Conduct independent study and analysis of feature extraction techniques.
- Explain the concepts of image registration and image fusion.
- Analyze the constraints in image processing when dealing with 3D data sets and to apply image
- Apply algorithms in practical applications.

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:
MACHINE LEARNING TECHNIQUES  
[As per Choice Based Credit System (CBCS) scheme]  
(Effective from the academic year 2018 -2019)  
SEMESTER - III

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>IA Marks</th>
<th>CREDITS – 04</th>
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<tbody>
<tr>
<td>18LNI322 / 18SCE321 / 18SCN324 / <strong>18SCS31</strong> / 18SFC254 / 18SIT322 / 18SSE334</td>
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<table>
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<tr>
<th>Number of Contact Hours/Week</th>
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<th>Exam Marks</th>
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</thead>
<tbody>
<tr>
<td>Total Number of Contact Hours</td>
<td>50</td>
<td>Exam Hours</td>
</tr>
</tbody>
</table>

Course objectives: This course will enable students to
- Explain basic concepts of learning and decision trees.
- Compare and contrast neural networks and genetic algorithms
- Apply the Bayesian techniques and instance based learning
- Examine analytical learning and reinforced learning

<table>
<thead>
<tr>
<th>Module -1</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION, CONCEPT LEARNING AND DECISION TREES</td>
<td>10 Hours</td>
</tr>
<tr>
<td>RBT: L1, L2, L3</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Module -2</th>
<th>Contact Hours</th>
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</thead>
<tbody>
<tr>
<td>RBT: L1, L2, L3</td>
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</table>

<table>
<thead>
<tr>
<th>Module – 3</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBT: L1, L2, L3</td>
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</table>

<table>
<thead>
<tr>
<th>Module-4</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBT: L1, L2, L3</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Module-5</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBT: L1, L2, L3</td>
<td></td>
</tr>
</tbody>
</table>

Course outcomes: 
On Completion of the course, the students will be able to
• Choose the learning techniques with this basic knowledge.
• Apply effectively neural networks and genetic algorithms for appropriate applications.
• Apply bayesian techniques and derive effectively learning rules.
• Choose and differentiate reinforcement and analytical learning techniques

**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:**
EMBEDDED COMPUTING SYSTEMS
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2018-2019)

SEMESTER – III

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>IA Marks</th>
<th>Exam Marks</th>
<th>Exam Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>18SCE13 / 18SCS321</td>
<td>40</td>
<td>60</td>
<td>03</td>
</tr>
</tbody>
</table>

CREDITS – 04

Course objectives: This course will enable students to

- Explain a general overview of Embedded Systems
- Show current statistics of Embedded Systems
- Examine a complete microprocessor-based hardware system
- Design, code, compile, and test real-time software
- Integrate a fully functional system including hardware and software
- Make intelligent choices between hardware/software tradeoffs

<table>
<thead>
<tr>
<th>Module</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module 1</td>
<td>10 Hours</td>
</tr>
<tr>
<td>Introduction to embedded systems: Embedded systems, Processor embedded into a system, Embedded hardware units and device in a system, Embedded software in a system, Examples of embedded systems, Design process in embedded system, Formalization of system design, Design process and design examples, Classification of embedded systems, skills required for an embedded system designer.</td>
<td></td>
</tr>
<tr>
<td>RBT: L1, L2, L3</td>
<td></td>
</tr>
</tbody>
</table>

| Module 2                                    | 10 Hours      |
| Devices and communication buses for devices network: IO types and example, Serial communication devices, Parallel device ports, Sophisticated interfacing features in device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock, Networked embedded systems, Serial bus communication protocols, Parallel bus device protocols-parallel communication internet using ISA, PCI, PCI-X and advanced buses, Internet enabled systems-network protocols, Wireless and mobile system protocols. |               |
| RBT: L1, L2, L3                            |               |

| Module 3                                    | 10 Hours      |
| Device drivers and interrupts and service mechanism: Programming-I/O busy-wait approach without interrupt service mechanism, ISR concept, Interrupt sources, Interrupt servicing (Handling) Mechanism, Multiple interrupts, Context and the periods for context switching, interrupt latency and deadline, Classification of processors interrupt service mechanism from Context-saving angle, Direct memory access, Device driver programming. |               |
| RBT: L1, L2, L3                            |               |

| Module 4                                    | 10 Hours      |
| Inter process communication and synchronization of processes, Threads and tasks: Multiple process in an application, Multiple threads in an application, Tasks, Task states, Task and Data, Clear-cut distinction between functions. ISRS and tasks by their characteristics, concept and semaphores, Shared data, Inter-process communication, Signal function, Semaphore functions, Message Queue functions, Mailbox functions, Pipe functions, Socket functions, RPC functions. |               |
| RBT: L1, L2, L3                            |               |

| Module 5                                    | 10 Hours      |
| Real-time operating systems: OS Services, Process management, Timer functions, Event |               |
functions, Memory management, Device, file and IO subsystems management, Interrupt routines in RTOS environment and handling of interrupt source calls, Real-time operating systems, Basic design using an RTOS, RTOS task scheduling models, interrupt latency and response of the tasks as performance metrics, OS security issues. Introduction to embedded software development process and tools, Host and target machines, Linking and location software.

RBT: L1, L2, L3

<table>
<thead>
<tr>
<th>Course Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>The students should be able to:</td>
</tr>
<tr>
<td>• Distinguish the characteristics of embedded computer systems.</td>
</tr>
<tr>
<td>• Examine the various vulnerabilities of embedded computer systems.</td>
</tr>
<tr>
<td>• Design an embedded system.</td>
</tr>
<tr>
<td>• Design and develop modules using RTOS.</td>
</tr>
<tr>
<td>• Implement RPC, threads and tasks</td>
</tr>
</tbody>
</table>

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</table>
### INFORMATION AND NETWORK SECURITY

[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2018 -2019)

**SEMESTER – III**

<table>
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<tr>
<th>Subject Code</th>
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<tbody>
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<td>Number of Contact Hours/Week</td>
<td>Exam Marks</td>
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<tr>
<td>Total Number of Contact Hours</td>
<td>Exam Hours</td>
<td>03</td>
</tr>
</tbody>
</table>

**CREDITS – 04**

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

- Explain standard algorithms used to provide confidentiality, integrity and authenticity.
- Distinguish key distribution and management schemes.
- Deploy encryption techniques to secure data in transit across data networks
- Implement security applications in the field of Information technology

<table>
<thead>
<tr>
<th>Module 1</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classical Encryption Techniques</td>
<td>Symmetric Cipher Model, Cryptography, Cryptanalysis and Brute-Force Attack, Substitution Techniques, Caesar Cipher, Mono-alphabetic Cipher. Playfair Cipher, Hill Cipher, Poly alphabetic Cipher, One Time Pad. <strong>Block Ciphers and the data encryption standard:</strong> Traditional block Cipher structure, stream Ciphers and block Ciphers, Motivation for the feistel Cipher structure, the feistel Cipher, The data encryption standard, DES encryption, DES decryption, A DES example, results, the avalanche effect, the strength of DES, the use of 56-Bit Keys, the nature of the DES algorithm, timing attacks, Block cipher design principles, number of rounds, design of function F, key schedule algorithm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Module 2</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public-Key Cryptography and RSA: Principles of public-key cryptosystems. Public-key cryptosystems. Applications for public-key cryptosystems, requirements for public-key cryptosystems. Public-key cryptanalysis. The RSA algorithm, description of the algorithm, computational aspects, the security of RSA. <strong>Other Public-Key Cryptosystems:</strong> Diffie-hellman key exchange, The algorithm, key exchange protocols, man in the middle attack, Elgamal Cryptographic systems, Elliptic curve arithmetic, abelian groups, elliptic curves over real numbers, elliptic curves over Zp, elliptic curves over GF(2m), Elliptic curve cryptography, Analog of Diffie-hellman key exchange, Elliptic curve encryption/decryption, security of Elliptic curve cryptography, Pseudorandom number generation based on an asymmetric cipher, PRNG based on RSA.</td>
<td>10 Hours</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Module 3</th>
<th>Contact Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key Management and Distribution: Symmetric key distribution using Symmetric encryption, A key distribution scenario, Hierarchical key control, session key lifetime, a transparent key control scheme, Decentralized key control, controlling key usage, Symmetric key distribution using asymmetric encryption, simple secret key distribution, secret key distribution with confidentiality and authentication, A hybrid scheme, distribution of public keys, public announcement of public keys, publicly available directory, public key authority, public keys certificates, X-509 certificates. Certificates, X-509 version 3, public key infrastructure. <strong>User Authentication:</strong> Remote user Authentication principles, Mutual Authentication, one way Authentication, remote user Authentication using Symmetric encryption, Mutual Authentication, one way Authentication, Kerberos, Motivation , Kerberos version 4, Kerberos version 5, Remote user Authentication using Asymmetric encryption,</td>
<td>10 Hours</td>
</tr>
</tbody>
</table>


**Course Outcomes**

The students should be able to:

- Analyze the vulnerabilities in any computing system and hence be able to design a security solution.
- Identify the security issues in the network and resolve it.
- Evaluate security mechanisms using rigorous approaches, including theoretical.

**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:**

WIRELESS NETWORKS AND MOBILE COMPUTING
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2018-2019)

SEMESTER – III

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>IA Marks</th>
<th>Number of Contact Hours/Week</th>
<th>Exam Marks</th>
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<tbody>
<tr>
<td>18LNI331 / 18SCE241 / 18SCN151 / 18SCS323</td>
<td>40</td>
<td>04</td>
<td>60</td>
<td>50</td>
</tr>
</tbody>
</table>

CREDITS – 04

Course objectives: This course will enable students to
- Define concepts of wireless communication.
- Compare and contrast propagation methods, Channel models, capacity calculations multiple antennas and multiple user techniques used in the mobile communication.
- Explain CDMA, GSM, Mobile IP, WiMax and Different Mobile OS
- Illustrate various Markup Languages CDC, CLDC, MIDP; Programming for CLDC, MIDlet model and security concerns

Module -1
RBT: L1, L2, L3
10 Hours

Module -2
Mobile Client: Moving beyond desktop, Mobile handset overview, Mobile phones and their features, PDA, Design Constraints in applications for handheld devices. Mobile IP: Introduction, discovery, Registration, Tunneling, Cellular IP, Mobile IP with IPv6
RBT: L1, L2, L3
10 Hours

Module – 3
RBT: L1, L2, L3
10 Hours

Module-4
Building, Mobile Internet Applications: Thin client: Architecture, the client, Middleware, messaging Servers, Processing a Wireless request, Wireless Applications Protocol (WAP) Overview, Wireless Languages: Markup Languages, HDML, WML, HTML, cHTML, XHTML, VoiceXML.
RBT: L1, L2, L3
10 Hours

Module-5
**Course outcomes:**
The students shall be able to:
- Explain state of art techniques in wireless communication.
- Discover CDMA, GSM, Mobile IP, WiMax
- Demonstrate program for CLDC, MIDlet model and security concerns

**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:**
# ENTERPRISE APPLICATION PROGRAMMING

[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2018 -2019)

## SEMESTER – III

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>18SFC253 / 18SIT12 / 18SSE22 / 18SCS324</th>
</tr>
</thead>
<tbody>
<tr>
<td>IA Marks</td>
<td>40</td>
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<tr>
<td>Number of Lecture Hours/Week</td>
<td>04</td>
</tr>
<tr>
<td>Exam Marks</td>
<td>60</td>
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<td>Total Number of Lecture Hours</td>
<td>50</td>
</tr>
<tr>
<td>Exam Hours</td>
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</tbody>
</table>

**CREDITS – 04**

**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

<table>
<thead>
<tr>
<th>Teaching Hours</th>
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<tbody>
<tr>
<td>10 Hours</td>
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</tbody>
</table>

**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** Exploring the features of java servlet, Exploring new features in servlet 3.0, Exploring the servlet API, explaining the servlet life cycle, creating a sample servlet, creating a servlet by using annotation, working with servlet config and servlet context objects, working with the HTTP servlet request and HTTP servlet response interfaces, Exploring request delegation and request scope, implementing servlet collaboration.

**RBT:** L1, L2, L3

## Module 2

<table>
<thead>
<tr>
<th>Teaching Hours</th>
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</thead>
<tbody>
<tr>
<td>10 Hours</td>
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</tbody>
</table>

**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. **Implementing event handling** Introducing events, Introducing event handling, working with the servlet events, developing the online shop web application. **Working with java server pages:** Introducing JSP technology, Exploring new features of JSP2.1, listing advantages of JSP over java servlet, Exploring the architecture of a JSP page, Describing the life cycle of a JSP page, working with JSP basic tags and implicit objects, working with the action tags in JSP, exploring the JSP unified EL, using functions with EL.

**RBT:** L1, L2, L3

## Module 3

<table>
<thead>
<tr>
<th>Teaching Hours</th>
</tr>
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<tbody>
<tr>
<td>10 Hours</td>
</tr>
</tbody>
</table>

**Implementing JSP tag extensions:** Exploring the elements of tag extensions, Working with classic tag handlers, Exploring the tags extensions, Working with simple tag handlers.

**Implementing java server pages standard tag library 1.2:** Introducing JSTL, Exploring the tag libraries JSTL, working with the core tag library. **Implementing filters:** Exploring the need of filters, exploring the working of filters, exploring filters API, configuring a filter, creating a web application using filters, using initializing parameter in filters.

**RBT:** L1, L2, L3

## Module 4

<table>
<thead>
<tr>
<th>Teaching Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Hours</td>
</tr>
</tbody>
</table>

**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.** Java EE design patterns: Describing the java EE application architecture, Introducing a design patterns, discussing...
the role of design patterns, exploring types of patterns.

**Module 5**

<table>
<thead>
<tr>
<th>Web Frameworks: Working with struts 2</th>
<th>10 Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introducing struts 2, understanding actions in struts 2.</td>
<td></td>
</tr>
<tr>
<td><strong>Working with java server faces 2.0:</strong> Introducing JSF, Explaining the features of JSF, Exploring the JSF architecture, describing JSF elements, Exploring the JSF request processing life cycle. <strong>Working with spring 3.0:</strong> Introducing features of the spring framework, exploring the spring framework architecture, exploring dependency injection &amp; inversion of control, exploring AOP with spring, managing transactions. <strong>Securing java EE 6 applications:</strong> Introducing security in java EE 6, exploring security mechanisms, implementing security on an application server.</td>
<td></td>
</tr>
</tbody>
</table>

**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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**APPLICATION AND WEB SECURITY**

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

(SEMESTER – III)

**Subject Code**

18SFC154 / 18SCS331

**IA Marks**

40

**Exam Marks**

60

**Total Number of Lecture Hours**

40

**Exam Hours**

03

**CREDITS – 04**

**Course objectives:** This course will enable students to
- Web application’s vulnerability and malicious attacks.
- Basic web technologies used for web application development.
- Basic concepts of Mapping the application
- Illustrate different attacking illustrations.
- Basic concepts of Attacking Data Stores.

**Module 1**

<table>
<thead>
<tr>
<th>Teaching Hours</th>
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</thead>
<tbody>
<tr>
<td>---</td>
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</tr>
<tr>
<td>Module 2</td>
<td>Web Application Technologies: The HTTP Protocol, HTTP Requests, HTTP Responses, HTTP Methods, URLs, REST, HTTP Headers, Cookies, Status Codes, HTTPS, HTTP Proxies, HTTP Authentication, Web Functionality, Server-Side Functionality, Client-Side Functionality, State and Sessions, Encoding Schemes, URL Encoding, Unicode Encoding, HTML Encoding, Base64 Encoding, Hex Encoding, Remoting and Serialization Frameworks.</td>
</tr>
<tr>
<td>Module 3</td>
<td>Mapping the Application: Enumerating Content and Functionality, Web Spidering, User-Directed Spidering, Discovering Hidden Content, Application Pages Versus Functional Paths, Discovering Hidden Parameters, Analyzing the Application, Identifying Entry Points for User Input, Identifying Server-Side Technologies, Identifying Server-Side Functionality, Mapping the Attack Surface.</td>
</tr>
<tr>
<td>Module 5</td>
<td>Attacking Data Stores: Injecting into Interpreted Contexts, Bypassing a Login, Injecting into SQL, Exploiting a Basic Vulnerability Injecting into Different Statement Types, Finding SQL Injection Bugs, Fingerprinting the Database, The UNION Operator, Extracting Useful Data, Extracting Data with UNION, Bypassing Filters, Second-Order SQL Injection, Advanced Exploitation Beyond SQL Injection: Escalating the Database Attack, Using SQL Exploitation Tools, SQL Syntax and Error Reference, Preventing SQL Injection.</td>
</tr>
</tbody>
</table>

**Course Outcomes**

The students should be able to:
- Achieve Knowledge of web application’s vulnerability and malicious attacks.
- Understand the basic web technologies used for web application development
- Understands the basic concepts of Mapping the application.
- Able to illustrate different attacking illustrations
- Basic concepts of Attacking Data Stores.
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:

SOFTWARE PROJECT PLANNING AND MANAGEMENT
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2018 -2019)

SEMESTER - III

Subject Code 18SSE21/ 18SCS332  IA Marks 40
Number of Lecture Hours/Week 04  Exam Marks 60
Total Number of Lecture Hours 50  Exam Hours 03

CREDITS - 04

Course objectives: This course will enable students to
• Define and highlight importance of software project management.
• Formulate strategy in managing projects
• Estimate the cost associated with a project
• Plan, schedule and monitor projects for the risk management
• Define the software management metrics

Module -1

Metrics: Introduction, The Metrics Roadmap, A Typical Metrics Strategy, What Should you Measure?, Set Targets and track Them, Understanding and Trying to minimize variability, Act on data, People and Organizational issues in Metrics Programs, Common Pitfalls to watch out for in Metrics Programs, Matrices implementation checklists and tools, Software configuration management: Introduction, Some Basic Definitions and terminology, the processes and activities of software configuration management, configuration status accounting, configuration audit, software configuration management in geographically distributed teams, Metrics in software configuration management, software configuration management tools and automation.

RBT: L1, L2, L3 10 Hours

Module -2

Risk Management: Introduction, What is risk management and why is it important?, Risk management cycle, Risk identification: common tools and techniques, Risk Quantifications, 10 Hours
### Module – 3

**Software Requirements gathering**: Inputs and start criteria for requirements gathering, Dimensions of requirements gathering, Steps to be followed during requirements gathering, outputs and quality records from the requirements phase, skill sets required during requirements phase, differences for a shrink-wrapped software, challenges during the requirements management phase, Metrics for requirements phase. Estimation: What is Estimation? when and why is Estimation done?, the three phases of Estimation, Estimation methodology, formal models for size Estimation, Translating size Estimate into effort Estimate, Translating effort Estimates into schedule Estimate, common challenges during Estimation, Metrics for the Estimation processes. Design and Development Phases: Some differences in our chosen approach, salient features of design, evolving an architecture/blueprint, design for reusability, technology choices/constraints, design to standards, design for portability, user interface issues, design for testability, design for diagnose ability, design for maintainability, design for install ability, inter-operability design, challenges during design and development phases, skill sets for design and development, metrics for design and development phases.

**Module-4**

Project management in the testing phase: Introduction, What is testing?, what are the activities that makeup testing?, test scheduling and types of tests, people issues in testing, management structures for testing in global teams, metrics for testing phase. Project management in the Maintenance Phase: Introduction, Activities during Maintenance Phase, management issues during Maintenance Phase, Configuration management during Maintenance Phase, skill sets for people in the maintenance phase, estimating size, effort, and people resources for the maintenance phase, advantages of using geographically distributed teams for the maintenance phase, metrics for the maintenance phase.

**Module-5**

Globalization issues in project management: Evolution of globalization, challenges in building global teams, Models for the execution of global projects, some effective management techniques for managing global teams. Impact of the internet on project management: Introduction, the effect of internet on project management, managing projects for the internet, Effect on the project management activities. People focused process models: Growing emphasis on people centric models, people capability maturity model(P-CMM), other people focused models in the literature, how does an organization choose the models to use?

**Course outcomes:**
At the end of this course students will be able to:

- Evaluate a project to develop the scope of work, provide accurate cost estimates and to plan the various activities.
- Apply risk management analysis techniques that identify the factors that put a project at risk and to quantify the likely effect of risk on project timescales.
- Identify the resources required for a project and to produce a work plan and resource schedule.
- Monitor the progress of a project and to assess the risk of slippage, revising targets counteract drift.
- Use appropriate metrics to management the software development outcome.
- Develop research methods and techniques appropriate to defining, planning and carrying out a research project within your chosen specialist area within the management of software projects.

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:


NATURAL LANGUAGE PROCESSING AND TEXT MINING
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2018 -2019)
SEMESTER – III

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>IA Marks</th>
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<tr>
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<td>40</td>
<td>60</td>
<td>40</td>
<td>03</td>
</tr>
</tbody>
</table>

CREDITS – 04

Course objectives: This course will enable students to
The student should be able to:
- Learn the techniques in natural language processing.
- Be familiar with the natural language generation.
- Be exposed to Text Mining.
- Analyze the information retrieval techniques.

Module -1


<table>
<thead>
<tr>
<th>Teaching Hours</th>
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</thead>
<tbody>
<tr>
<td>10 Hours</td>
</tr>
</tbody>
</table>
### Module -2


**RBT: L1, L2, L3**  
**10 Hours**

### Module -3


**RBT: L1, L2, L3**  
**10 Hours**

### Module -4


**RBT: L1, L2, L3**  
**10 Hours**

### Module -5


**RBT: L1, L2, L3**  
**10 Hours**

### Course outcomes:

Upon completion of the course, the student should be able to:
- Analyze the natural language text.
- Generate the natural language.
- Demonstrate Text mining.
- Apply information retrieval techniques.

### 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:

2. Anne Kao and Stephen R. Poteet (Eds), “Natural LanguageProcessingandText Mining”, Springer-
Reference Books:

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**CYBER SECURITY AND CYBER LAW**

[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2018-2019)

**SEMESTER – III**

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>IA Marks</th>
<th>Number of Lecture Hours/Week</th>
<th>Exam Marks</th>
<th>Total Number of Lecture Hours</th>
<th>Exam Hours</th>
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<td>03</td>
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<tr>
<td>18SIT244 / 18SCS334</td>
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</tbody>
</table>

**CREDITS – 04**

Course objectives: This course will enable students to
- Define the area of cybercrime and forensics.
- Explain the motive and causes for cybercrime, detection and handling.
- Investigate areas affected by cybercrime.
- Illustrate tools used in cyber forensic.
- Infer legal perspectives in cyber security.

**Module -1**

RBT: L1, L2, L3

10 Hours

**Module -2**
Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and

10 Hours
### Module – 3


**RBT:** L1, L2, L3

**10 Hours**

### Module-4


**RBT:** L1, L2, L3

**10 Hours**

### Module-5


**RBT:** L1, L2, L3

**10 Hours**

### Course outcomes:

By the end of this course the student acquire

- Define cyber security, cyber law and their roles
- Demonstrate cyber security cybercrime and forensics.
- Infer legal issues in cybercrime,
- Demonstrate tools and methods used in cybercrime and security.
- Illustrate evidence collection and legal challenges

### 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: