

<b>MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE</b> [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2018 -2019) <b>SEMESTER – I</b>			
Subject Code	18SFC11 / 18LNI11 / 18SCE11 / 18SCS11 / 18SCN11 / 18SSE11 / <b>18SIT11</b>	IA Marks	40
Number of Contact Hours/Week	04	Exam Marks	60
Total Number of Contact Hours	50	Exam Hours	03
<b>CREDITS – 04</b>			
<b>Course objectives:</b> This course will enable students to			
<ul style="list-style-type: none"> <li>• To acquaint the students with mathematical/logical fundamentals including numerical techniques,</li> <li>• To understand probability, sampling and graph theory that serve as an essential tool for applications of computer and information sciences.</li> </ul>			
<b>Module 1</b>			<b>Contact Hours</b>
<b>Numerical Methods:</b> Significant figures, Error definitions, Approximations and round off errors, accuracy and precision. Roots of Equations: Bairstow-Lin's Method, Graeffe's Root Squaring Method. Computation of eigen values of real symmetric matrices: Jacobi and Givens method.			<b>10 Hours</b>
			<b>RBT: L1,L2</b>
<b>Module 2</b>			
<b>Statistical Inference:</b> Introduction to multivariate statistical models: Correlation and Regression analysis, Curve fitting (Linear and Non linear)			<b>10 Hours</b>
			<b>RBT: L1,L2,L3</b>
<b>Module 3</b>			
<b>Probability Theory:</b> 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.			<b>10 Hours</b>
			<b>RBT: L1,L2,L3</b>
<b>Module 4</b>			
<b>Graph Theory:</b> Isomorphism, Planar graphs, graph coloring, Hamilton circuits and Euler cycle. Specialized techniques to solve combinatorial enumeration problems.			<b>10 Hours</b>
			<b>RBT: L1,L2,L3</b>
<b>Module 5</b>			
<b>Vector Spaces:</b> 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.			<b>10 Hours</b>
			<b>RBT: L1,L2,L3</b>
<b>Course Outcomes</b>			
<ul style="list-style-type: none"> <li>• Understand the numerical methods to solve and find the roots of the equations.</li> <li>• Utilize the statistical tools in multi variable distributions.</li> <li>• Use probability formulations for new predictions with discrete and continuous RV's.</li> <li>• To understand various graphs in different geometries related to edges.</li> <li>• Understand vector spaces and related topics arising in magnification and rotation of images.</li> </ul>			
<b>Question paper pattern:</b>			
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. Steven C. Chapra and Raymond P Canale: " Numerical Methods for Engineers, 7<sup>th</sup> Edition, McGraw-Hill Publishers, 2015.
2. T.Veerarajan: "Probability, Statistics and Random Process",3<sup>rd</sup> Edition,Tata Mc-Graw Hill Co.,2016.
3. David C.Lay, Steven R.Lay and J.J.McDonald: Linear Algebra and its Applications, 5<sup>th</sup> Edition, Pearson Education Ltd., 2015.

**Reference Books:**

1. **B.S. Grewal:** Higher Engineering Mathematics, Khanna Publishers, 44<sup>th</sup> Ed., 2017.
2. **John Vince :** "Foundation Mathematics for Computer Science", Springer International Publishing, Switzerland, 2015
3. **M.K.Jain, S.R.K.Iyengar and R.K.Jain:** Numerical Methods for Scientific and Engineering Computation. 6<sup>th</sup> Ed.,New Age Int.Publishers.2012.
4. **Norman L.Biggs:** Discrete Mathematics, 2<sup>nd</sup> Ed., Oxford University Press, 2017.

**Web links and Video Contacts:**

1. <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))
3. <http://ocw.mit.edu/courses/mathematics/>

<b>ENTERPRISE APPLICATION PROGRAMMING</b> <b>[As per Choice Based Credit System (CBCS) scheme]</b> <b>(Effective from the academic year 2018 -2019)</b> <b>SEMESTER – I</b>			
Subject Code	18SFC253 / 18SIT12 / 18SSE22	IA Marks	40
Number of Contact Hours/Week	04	Exam Marks	60
Total Number of Contact Hours	50	Exam Hours	03
CREDITS – 04			
<b>Course objectives:</b> This course will enable students to			
<ul style="list-style-type: none"> <li>• Explain Web Application Development and related terminologies</li> <li>• Demonstrate persistent framework and other ORM tools.</li> <li>• Illustrate solutions using Design Patterns</li> <li>• Outline latest WEB frameworks</li> </ul>			
Module 1			Contact Hours
<b>Web application and java EE 6:</b> Exploring the HTTP Protocol, Introducing web applications, describing web containers, exploring web architecture models, exploring the MVC architecture. <b>Working with servlets 3.0</b> 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.  <b>RBT: L1,L2</b>			<b>10 Hours</b>
Module 2			Contact Hours
<b>Handling sessions in servlet 3.0:</b> 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. <b>Implementing event handling</b> Introducing events, Introducing event handling, working with the servlet events, developing the online shop web application. <b>Working with java server pages:</b> 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.  <b>RBT: L1,L2,L3</b>			<b>10 Hours</b>
Module 3			Contact Hours
<b>Implementing JSP tag extensions:</b> Exploring the elements of tag extensions, Working with classic tag handlers, Exploring the tag extensions, Working with simple tag handlers. <b>Implementing java server pages standard tag library 1.2:</b> Introducing JSTL, Exploring the tag libraries JSTL, working with the core tag library. <b>Implementing filters:</b> 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.  <b>RBT: L1,L2,L3</b>			<b>10 Hours</b>
Module 4			Contact Hours
<b>Persistence Management and Design Patterns: Implementing java persistence using hibernate</b> 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. <b>Java EE design patterns:</b> Describing the java EE application architecture, Introducing a design patterns, discussing the role of design			<b>10 Hours</b>

patterns, exploring types of patterns.	<b>RBT: L1,L2,L3</b>
<b>Module 5</b>	
<b>Web Frameworks: Working with struts 2</b> Introducing struts 2, understanding actions in struts 2. <b>Working with java server faces 2.0:</b> Introducing JSF, Explaining the features of JSF, Exploring the JSF architecture, describing JSF elements, Exploring the JSF request processing life cycle. <b>Working with spring 3.0:</b> Introducing features of the spring framework, exploring the spring framework architecture, exploring dependency injection & inversion of control, exploring AOP with spring, managing transactions. <b>Securing java EE 6 applications:</b> Introducing security in java EE 6, exploring security mechanisms, implementing security on an application server.	<b>10 Hours</b>
<b>RBT: L1,L2,L3</b>	
<b>Course Outcomes</b>	
The students should be able to: <ul style="list-style-type: none"> <li>• Explain WEB basics and their functionalities</li> <li>• Develop JAVA support and API skills</li> <li>• Build a WEB application.</li> <li>• Build Security mechanisms</li> </ul>	
<b>Question paper pattern:</b> 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.	
<b>Text Books:</b> <ol style="list-style-type: none"> <li>1. Kogent learning solution: JAVA SERVER PROGRAMMING JAVA EE6(J2EE 1.6), Dreamtech press 2014</li> </ol>	
<b>Reference Books:</b> <ol style="list-style-type: none"> <li>1. NIL</li> </ol>	

<b>DATA COMPRESSION</b> <b>[As per Choice Based Credit System (CBCS) scheme]</b> <b>(Effective from the academic year 2018 -2019)</b> <b>SEMESTER – I</b>			
Subject Code	18SCS153 / <b>18SIT13</b>	IA Marks	40
Number of Contact Hours/Week	04	Exam Marks	60
Total Number of Contact Hours	50	Exam Hours	03
<b>CREDITS – 04</b>			
<b>Course objectives:</b> This course will enable students to			
<ul style="list-style-type: none"> <li>• Develop comprehensive knowledge in the field of Data Compression and Coding.</li> <li>• Analyze and evaluate different Data Compression and Coding methods.</li> </ul>			
<b>Module 1</b>			<b>Contact Hours</b>
<b>Introduction:</b> 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. <b>RBT: L1,L2</b>			<b>10 Hours</b>
<b>Module 2</b>			
<b>Huffman Coding:</b> The Huffman coding algorithm, non binary Huffman codes, adaptive Huffman coding, golomb codes, rice codes, Tunstall codes, application of Huffman coding. <b>RBT: L1,L2</b>			<b>10 Hours</b>
<b>Module 3</b>			
<b>Lossless Image Compression:</b> Introduction, CALIC, JPEG-LS, multi resolution approaches, facsimile encoding, MRC-T.44. <b>Mathematical Preliminaries For Lossy Coding:</b> Introduction, distortion criteria, information theory revisited, rate distortion theory, models <b>RBT: L1,L2,L3</b>			<b>10 Hours</b>
<b>Module 4</b>			
<b>Wavelet Based Compression:</b> Introduction, wavelets, multi resolution analysis and scaling function, implementation using filters, image compression, embedded zero tree coder, set partitioning in hierarchical trees, JPEG zero. <b>Audio Coding:</b> Introduction , MPEG coding, MPEG advanced audio coding, Dolby AC3(DOLBY DIGITAL) other standards. <b>RBT: L1,L2,L3</b>			<b>10 Hours</b>
<b>Module 5</b>			
<b>Video Compression:</b> Introduction, motion compensation, video signal representation, ITU-T recommendation H.261, model based coding, asymmetric applications, The MPEG-1 video standard, The MPEG-2 video standard, ITU-T recommendation H.263, ITU-T recommendation H.264, MPEG-4 part 1.0 advanced video coding, MPEG-4 part 2 , packet video, ATM networks. <b>RBT: L1,L2,L3</b>			<b>10 Hours</b>
<b>Course Outcomes</b>			
The students should be able to:			
<ul style="list-style-type: none"> <li>• Explain the evolution and fundamental concepts will Data Compression and Coding techniques.</li> <li>• Analyze the operation of a range of commonly used Coding and Compression techniques</li> <li>• Identify the basic software and hardware tools used for data compression.</li> <li>• Identify what new trends and what new possibilities of data compression are available</li> </ul>			
<b>Question paper pattern:</b>			

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. Introduction to data compression 4<sup>th</sup> edition, Khalid sayood. *Elsevier*. Reprinted 2014.

**Reference Books:**

1. Data compression, The complete reference. 4<sup>th</sup> edition. David Salomon. Springer Year 2014.

<b>ADVANCES IN DATA BASE MANAGEMENT SYSTEMS</b> <b>[As per Choice Based Credit System (CBCS) scheme]</b> <b>(Effective from the academic year 2018 -2019)</b> <b>SEMESTER – I</b>			
Subject Code	18SCE252 / 18SCS13 / <b>18SIT14</b> / 18SSE151	IA Marks	40
Number of Lecture Hours/Week	04	Exam Marks	60
Total Number of Lecture Hours	50	Exam Hours	03
<b>CREDITS – 04</b>			
<b>Course objectives:</b> This course will enable students to			
<ul style="list-style-type: none"> <li>• Define parallel and distributed databases and its applications.</li> <li>• Show applications of Object Oriented database</li> <li>• Explain basic concepts, principles of intelligent databases.</li> <li>• Utilize the advanced topics of data warehousing and mining .</li> <li>• Infer emerging and advanced data models</li> <li>• Extend knowledge in research topics of databases.</li> </ul>			
<b>Module 1</b>			<b>Teaching Hours</b>
<b>Review of Relational Data Model and Relational Database Constraints:</b> Relational model concepts; Relational model constraints and relational database schemas; Update operations, anomalies, dealing with constraint violations, Types and violations. <b>Object and Object-Relational Databases:</b> Overview of Object Database Concepts, Object Database Extensions to SQL, The ODMG Object Model and the Object Definition Language ODL, Object Database Conceptual Design, The Object Query Language OQL, Overview of the C++ Language Binding in the ODMG Standard. <div style="text-align: right;"><b>RBT: L1,L2</b></div>			<b>10 Hours</b>
<b>Module 2</b>			
<b>Disk Storage, Basic File Structures, Hashing, and Modern Storage Architectures:</b> Introduction, Secondary Storage Devices, Buffering of Blocks, Placing File Records on Disk Operations on Files, Files of Unordered Records (Heap Files) , Files of Ordered Records (Sorted Files), Hashing Techniques, Other Primary File Organizations, Parallelizing Disk Access Using RAID Technology, Modern Storage Architectures. <b>Distributed Database Concepts:</b> Distributed Database Concepts, Data Fragmentation, Replication, and Allocation Techniques for Distributed Database Design, Overview of Concurrency Control and Recovery in Distributed Databases, Overview of Transaction Management in Distributed Databases, Query Processing and Optimization in Distributed Databases, Types of Distributed Database Systems , Distributed Database Architectures, Distributed Catalog Management. <div style="text-align: right;"><b>RBT: L1,L2</b></div>			<b>10 Hours</b>
<b>Module 3</b>			
<b>NOSQL Databases and Big Data Storage Systems:</b> Introduction to NOSQL Systems, The CAP Theorem, Document-Based NOSQL Systems and MongoDB, NOSQL Key-Value Stores, Column-Based or Wide Column NOSQL Systems, NOSQL Graph Databases and Neo4j. <b>Big Data Technologies Based on MapReduce and Hadoop:</b> What Is Big Data? Introduction to MapReduce and Hadoop, Hadoop Distributed File System (HDFS), MapReduce: Additional Details Hadoop v2 alias YARN, General			<b>10 Hours</b>

Discussion	<b>RBT: L1,L2,L3</b>	
<b>Module 4</b>		
<b>Enhanced Data Models: Introduction to Active, Temporal, Spatial, Multimedia, and Deductive Databases:</b> Active Database Concepts and Triggers, Temporal Database Concepts, Spatial Database Concepts, Multimedia Database Concepts, Introduction to Deductive Databases. <b>Introduction to Information Retrieval and Web Search:</b> Information Retrieval (IR) Concepts, Retrieval Models, Types of Queries in IR Systems, Text Preprocessing, Inverted Indexing, Evaluation Measures of Search Relevance, Web Search and Analysis. Trends in Information Retrieval	<b>RBT: L1,L2,L3</b>	<b>10 Hours</b>
<b>Module 5</b>		
<b>Data Mining Concepts:</b> Overview of Data Mining Technology, Association Rules, Classification, Clustering, Approaches to Other Data Mining Problems, Applications of Data Mining, Commercial Data Mining Tools <b>Overview of Data Warehousing and OLAP:</b> Introduction, Definitions, and Terminology, Characteristics of Data Warehouses, Data Modeling for Data Warehouses, Building a Data Warehouse, Typical Functionality of a Data Warehouse, Data Warehouse versus Views, Difficulties of Implementing Data Warehouses. <b>RBT: L1,L2,L3</b>		<b>10 Hours</b>
<b>Course Outcomes</b>		
The students should be able to: <ul style="list-style-type: none"> <li>• Select the appropriate high performance database like parallel and distributed database</li> <li>• Infer and represent the real world data using object oriented database</li> <li>• Interpret rule set in the database to implement data warehousing of mining</li> <li>• Discover and design database for recent applications database for better interoperability</li> </ul>		
<b>Question paper pattern:</b> 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.		
<b>Text Books:</b> <ol style="list-style-type: none"> <li>1. Elmasri and Navathe: Fundamentals of Database Systems, Pearson Education, 2013.</li> <li>2. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2013.</li> </ol>		
<b>Reference Books:</b> <ol style="list-style-type: none"> <li>1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan: Database System Concepts, 6th Edition, McGraw Hill, 2010.</li> </ol>		



<b>CLIENT SERVER PROGRAMMING</b> <b>[As per Choice Based Credit System (CBCS) scheme]</b> <b>(Effective from the academic year 2018 -2019)</b> <b>SEMESTER – I</b>			
Subject Code	18LNI331 / <b>18SIT151</b>	IA Marks	40
Number of Contact Hours/Week	04	Exam Marks	60
Total Number of Contact Hours	50	Exam Hours	03
CREDITS – 04			
<b>Course objectives:</b> This course will enable students to			
<ul style="list-style-type: none"> <li>• Explain Client-Server software, Context Switching and Protocol Software, I/o.</li> <li>• Define System Calls, Basic I/O Functions available in UNIX</li> <li>• Illustrate socket interface, TCP, UDP in detail.</li> <li>• Compare various client Software and various algorithms issue related to server software design.</li> </ul>			
<b>Module 1</b>			<b>Contact Hours</b>
<b>The Client Server Model and Software Design:</b> Introduction, Motivation, Terminology and Concepts. <b>Concurrent Processing in Client-Server software:</b> Introduction, Concurrency in Networks, Concurrency in Servers, Terminology and Concepts, An example of Concurrent Process Creation, Executing New Code, Context Switching and Protocol Software Design, Concurrency and Asynchronous I/O. <b>Program Interface to Protocols:</b> Introduction, Loosely Specified Protocol Software Interface, Interface Functionality, Conceptual Interface Specification, System Calls, Two Basic Approaches to Network Communication, The Basic I/O Functions available in UNIX, Using UNIX I/O with TCP/IP.  <b>RBT: L1,L2</b>			<b>10 Hours</b>
<b>Module 2</b>			
<b>The Socket Interface:</b> Introduction, Berkley Sockets, Specifying a Protocol Interface, The Socket Abstraction, Specifying an End Point Address, A Generic Address Structure, Major System Calls used with Sockets, Utility Routines for Integer Conversion, Using Socket Calls in a Program, Symbolic Constants for Socket Call Parameters. <b>Algorithms and Issues in Client Software Design:</b> Introduction, Learning Algorithms instead of Details, Client Architecture, Identifying the Location of a Server, Parsing an Address Argument, Looking up a Domain Name, Looking up a well-known Port by Name, Port Numbers and Network Byte Order, Looking up a Protocol by Name, The TCP Client Algorithm, Allocating a Socket, Choosing a Local Protocol Port Number, A fundamental Problem in choosing a Local IP Address, Connecting a TCP Socket to a Server, Communicating with the Server using TCP, Reading a response from a TCP Connection, Closing a TCP Connection, Programming a UDP Client, Connected and Unconnected UDP Socket, Using Connect with UDP, Communicating with a Server using UDP, Closing a Socket that uses UDP, Partial Close for UDP, A Warning about UDP Unreliability.  <b>RBT: L1,L2</b>			<b>10 Hours</b>
<b>Module 3</b>			
<b>Example Client Software:</b> Introduction, The Importance of Small Examples, Hiding Details, An Example Procedure Library for Client Programs, Implementation of Connect TCP, Implementation of Connect UDP, A Procedure that Forms Connections, Using the Example Library, The DAYTIME Service, Implementation of a TCP Client for DAYTIME, Reading from a TCP Connection, The Time Service, Accessing the TIME Service, Accurate Times and Network Delays, A UDP Client for the TIME Service, The ECHO Service, A			<b>10 Hours</b>

TCP Client for the ECHO Service, A UDP Client for the ECHO Service. <b>RBT: L1,L2,L3</b>	
<b>Module 4</b>	
<p><b>Algorithms and Issues in Server Software Design:</b> Introduction, The Conceptual Server Algorithm, Concurrent Vs Iterative Servers, Connection-Oriented Vs Connectionless Access, Connection-Oriented Servers, Connectionless Servers, Failure, Reliability and Statelessness, Optimizing Stateless Servers, Four Basic Types of Servers, Request Processing Time, Iterative Server Algorithms, An Iterative Connection-Oriented Server Algorithm, Binding to a Well Known Address using INADDR_ANY, Placing the Socket in Passive Mode, Accepting Connections and using them. An Iterative Connectionless Server Algorithm, Forming a Reply Address in a Connectionless Server, Concurrent Server Algorithms, Master and Slave Processes, A Concurrent Connectionless Server Algorithm, A concurrent Connection-Oriented Server Algorithm, Using separate Programs as Slaves, Apparent Concurrency using a Single Process, When to use each Server Types, The Important Problem of Server Deadlock, Alternative Implementations.</p> <p><b>RBT: L1,L2,L3</b></p>	<b>10 Hours</b>
<b>Module 5</b>	
<p><b>Iterative, Connectionless Servers (UDP):</b> Introduction, Creating a Passive Socket, Process Structure, An example TIME Server. <b>Iterative, Connection-Oriented Servers (TCP):</b> Introduction, Allocating a Passive TCP Socket, A Server for the DAYTIME Service, Process Structure, An Example DAYTIME Server, Closing Connections, Connection Termination and Server Vulnerability. <b>Concurrent, Connection-Oriented Servers (TCP):</b> Introduction, Concurrent ECHO, Iterative Vs Concurrent Implementations, Process Structure, An example Concurrent ECHO Server, Cleaning up Errant Processes.</p> <p><b>RBT: L1,L2,L3</b></p>	<b>10 Hours</b>
<b>Course Outcomes</b>	
<p>The students should be able to:</p> <ul style="list-style-type: none"> <li>• Explain Client-Server software, Context Switching and Protocol Software, I/O.</li> <li>• Demonstrate programming System Calls, Basic I/O Functions available in UNIX</li> <li>• Implement Socket interface, TCP, UDP in detail.</li> <li>• Compare and contrast Client Software Various applications and their issues</li> </ul>	
<b>Question paper pattern:</b>	
<p>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.</p>	
<b>Text Books:</b>	
<ol style="list-style-type: none"> <li>1. Douglas E.Comer, David L. Stevens: Internetworking with TCP/IP – Vol. 3, Client-Server Programming and Applications, BSD Socket Version with ANSI C, 2nd Edition, Pearson, 2001.</li> </ol>	
<b>Reference Books:</b>	
<ol style="list-style-type: none"> <li>1. NIL</li> </ol>	

<b>INFORMATION STORAGE MANAGEMENT</b> <b>[As per Choice Based Credit System (CBCS) scheme]</b> <b>(Effective from the academic year 2018 -2019)</b> <b>SEMESTER – I</b>			
Subject Code	<b>18SIT152</b>	IA Marks	40
Number of Contact Hours/Week	04	Exam Marks	60
Total Number of Contact Hours	50	Exam Hours	03
<b>CREDITS – 04</b>			
<b>Course objectives:</b> This course will enable students to <ul style="list-style-type: none"> <li>• Define basic terminology and components in information storage and retrieval systems</li> <li>• Compare and contrast information retrieval models and internal mechanisms such as Boolean, Probability, and Vector Space Models</li> <li>• Discuss current trends in information retrieval such as information visualization.</li> <li>• Illustrate backup process and securing of management storage infrastructure</li> </ul>			
<b>Module 1</b>			<b>Contact Hours</b>
<b>Introduction to Information Storage:</b> Information Storage, Evolution of Storage Architecture, Data center Infrastructure, Virtualization and cloud computing. <b>Data Center Environment:</b> Application, Database Management System(DBMS), Host(compute), Connectivity, Storage, Disk Drive Components, Disk Drive Performance, Host Access to Data, Direct-Attached Storage, Storage Design Based On Application, Disk Native Command Queuing, Introduction to Flash Drives, Concept in Practice: VMware ESXi. <b>Data Protection: RAID:</b> RAID Implementation Methods, RAID Array Components, RAID Techniques, RAID Levels, RAID Impact on Disk Performance, RAID Comparison, Hot Spares.  <b>RBT: L1,L2</b>			<b>10 Hours</b>
<b>Module 2</b>			<b>Contact Hours</b>
<b>Intelligent Storage Systems:</b> Components of an Intelligent Storage System, Storage Provisioning, Types of intelligent Storage Systems, Concepts in Practice: EMC Symmetrix and VNX. <b>Fiber Channel Storage Area Networks:</b> Fiber Channel: Overview, The SAN and Its Evolution, Components of FC SAN, FC Connectivity, Switched Fabric Ports, Fiber Channel Architecture, fabric Services, Switched fabric Login Types, Zoning, FC SAN Topologies, Virtualization in SAN, Concepts in Practice: EMC Connectrix and EMC VPLEX. <b>IP SAN and FcoE:</b> iSCSI, FCIP, FcoE.  <b>RBT: L1,L2</b>			<b>10 Hours</b>
<b>Module 3</b>			<b>Contact Hours</b>
<b>Network-Attached Storage:</b> General-purpose Servers versus NAS Devices, benefits of NAS, File Systems and network File Sharing. Components of NAS, NAS I/O Operation, NAS Implementations, NAS File-Sharing Protocols, factors Affecting NAS Performance, File-Level Virtualization, Concepts in Practice: EMC Isilon and EMC VNX gateway. <b>Object-Based and unified Storage:</b> Object-Based Storage Devices, Content-Addressed Storage, CAS use Cases, unified Storage, Concepts in Practice: EMC atoms, EMC VNX, and EMC centra. <b>Introduction to Business Continuity.</b> Information Availability, BC Terminology, BC Planning life Cycle, failure Analysis, Business Impact Analysis, BC Technology solutions.  <b>RBT: L1,L2</b>			<b>10 Hours</b>
<b>Module 4</b>			<b>Contact Hours</b>
<b>Backup and Archive :</b> Backup Purpose, Backup Considerations, Backup Granularity, Recovery Considerations, Backup Methods, Backup Architecture, Backup and Restore Operation, Backup Topologies, Backup in NAS Environments, Backup Targets, Data			<b>10 Hours</b>

<p>Deduplication for Backup, Backup in Virtualized Environments, Data Archive ,Archiving Solution Architecture, Concepts in Practice :EMC Networker, EMC Avamar, and EMC Data domain. <b>Local Replication:</b> Replication Terminology, Uses of Local Replicas, Replica Consistency, Local Replication Technologies, Tracking Changes to Source and Replica, Restore and Restart Considerations, Creating Multiple Replicas, Local Replication in Virtualized Environment, Concepts in Practice: EMC TimeFinder .<b>Remote Replication:</b> Modes of Remote Replication, Remote Replication Technologies, Three-Site Replication, Data Migration Solutions, Remote Replication and Migration in a Virtualized Environment, Concepts in Practice : EMC SRDF, EMC MirrorView, and EMC RecoverPoint.</p> <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>	
<p><b>Module 5</b></p>	
<p><b>Securing the Storage Infrastructure:</b> Information Security Framework, Risk Triad, Storage Security Domains, Security implementations in Storage Networking, Securing Storage Infrastructure in Virtualized and Cloud Environments, Concepts in practice: RSA and VMware Security Products. <b>Managing the Storage Infrastructure:</b> Monitoring the Storage Infrastructure, Storage Infrastructure Management Activities, Storage Infrastructure Management Challenges, Developing an Idea Solution, Information Lifecycle Management, Storage Tiering, Concepts in Practice: EMC Infrastructure.</p> <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>	<p><b>10 Hours</b></p>
<p><b>Course Outcomes</b></p>	
<p>The students should be able to:</p> <ul style="list-style-type: none"> <li>• Recognize the role and use are technology in business systems and operations</li> <li>• Identify and describe organizational structure and business processes within these</li> <li>• Implement information systems in industry.</li> <li>• Choose backup method and replication method.</li> <li>• Provide securing of management storage infrastructure.</li> </ul>	
<p><b>Question paper pattern:</b>  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.</p>	
<p><b>Text Books:</b>  1. EMC<sup>2</sup>: Information Storage and Management, Willey India 2013.</p>	
<p><b>Reference Books:</b>  1. EMC Corporation, Information Storage and Management, Wiley, India. ISBN-13: 978-8126537501, August 2012.  2. Robert Spalding, “Storage Networks: The Complete Reference“, Tata McGraw Hill , Osborne, 2003.  3. Marc Farley, “Building Storage Networks”, Tata McGraw Hill ,Osborne, 2001.  4. Additional resource material on <a href="http://www.emc.com/resource-library/resource-library.esp">www.emc.com/resource-library/resource-library.esp</a></p>	

<b>SERVICE ORIENTED ARCHITECTURE</b> [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2018 -2019) <b>SEMESTER – I</b>			
Subject Code	<b>18SIT153 /</b> 18SSE14	IA Marks	20
Number of Contact Hours/Week	04	Exam Marks	80
Total Number of Contact Hours	50	Exam Hours	03
<b>CREDITS – 04</b>			
<b>Course objectives:</b> This course will enable students to			
<ul style="list-style-type: none"> <li>• Interpret various architecture for application development</li> <li>• Demonstrate the importance of SOA in Application Integration</li> <li>• To learn web service and SOA related tools</li> <li>• To Learn implementation details of SOA</li> <li>• To understand various case studies</li> </ul>			
<b>Module 1</b>			<b>Contact Hours</b>
<b>SOA BASICS</b> :Software Architecture – Types of IT Architecture – SOA – Evolution – Key components – perspective of SOA – Enterprise-wide SOA – Architecture – Enterprise Applications – Solution Architecture for enterprise application – Software platforms for enterprise Applications – Patterns for SOA – SOA programming models.  <b>RBT: L1,L2</b>			<b>10 Hours</b>
<b>Module 2</b>			
<b>SOA ANALYSIS AND DESIGN:</b> Service-oriented Analysis and Design – Design of Activity, Data, Client and business process services – Technologies of SOA – SOAP – WSDL – JAX – WS – XML WS for .NET – Service integration with ESB – Scenario – Business case for SOA – stakeholder OBJECTIVES – benefits of SPA – Cost Savings.  <b>RBT: L1,L2</b>			<b>10 Hours</b>
<b>Module 3</b>			
<b>SOA GOVERNANCE:</b> SOA implementation and Governance – strategy – SOA development – SOA governance – trends in SOA – event-driven architecture – software as a service – SOA technologies – proof-of-concept – process orchestration – SOA best practices.  <b>RBT: L1,L2,L3</b>			<b>10 Hours</b>
<b>Module 4</b>			
<b>SOA IMPLEMENTATION:</b> SOA based integration – integrating existing application – development of web services – Integration - SOA using REST – RESTful services – RESTful services with and without JWS – Role of WSDL,SOAP and Java/XML mapping in SOA – JAXB Data binding.  <b>RBT: L1,L2,L3</b>			<b>10 Hours</b>
<b>Module 5</b>			
<b>APPLICATION INTEGRATION:</b> JAX –WS 2.0 client side/server side development – Packaging and Deployment of SOA component – SOA shopper case study –WSDL centric java WS with SOA-J – related software – integration through service composition (BPEL) – case study - current trends.  <b>RBT: L1,L2,L3</b>			<b>10 Hours</b>
<b>Course Outcomes</b>			
The students should be able to:			
<ul style="list-style-type: none"> <li>• Compare different IT architecture</li> <li>• Analyze and design of SOA based applications</li> </ul>			

- Implement web service and realize of SOA
- Implement REST full services
- Design and implement of SOA based Application Integration using BPEL

**Question paper pattern:**

The question paper will have ten questions.

There will be 2 questions from each module.

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

**Text Books:**

1. Shankar Kambhampaly, “Service–Oriented Architecture for Enterprise Applications”, Wiley 2008.

**Reference Books:**

1. Mark D. Hansen, “SOA using Java Web Services”, Practice Hall, 2007.
2. Waseem Roshen, “SOA-Based Enterprise Integration”, Tata McGraw-HILL, 2009.

<b>DISTRIBUTED OPERATING SYSTEM</b> <b>[As per Choice Based Credit System (CBCS) scheme]</b> <b>(Effective from the academic year 2018 -2019)</b> <b>SEMESTER – I</b>			
Subject Code	18SCE152 / <b>18SIT154</b> / 18SSE152	IA Marks	40
Number of Contact Hours/Week	04	Exam Marks	60
Total Number of Contact Hours	50	Exam Hours	03
<b>CREDITS – 04</b>			
<b>Course objectives:</b> This course will enable students to			
<ul style="list-style-type: none"> <li>• Explain distributed systems principles associated with communication, naming, synchronization, distributed file systems, system design, distributed scheduling, and several case studies</li> <li>• Extend foundational concepts and as well as practical deployments.</li> <li>• Recall distributed operating system concepts that includes architecture, Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols</li> <li>• Explain the distributed resource management components viz. the algorithms for implementation of distributed shared memory, recovery and commit protocols</li> </ul>			
<b>Module 1</b>			<b>Contact Hours</b>
<b>Fundamentals:</b> What is Distributed Computing Systems? Evolution of Distributed Computing System; Distributed Computing System Models; What is Distributed Operating System? Issues in Designing a Distributed Operating System; Introduction to Distributed Computing Environment (DCE). <b>Message Passing:</b> Introduction, Desirable features of a Good Message Passing System, Issues in PC by Message Passing, Synchronization, Buffering, Multi-datagram Messages, Encoding and Decoding of Message Data, Process Addressing, Failure Handling, Group Communication, Case Study: 4.3 BSD UNIX IPC Mechanism.  <b>RBT: L1,L2</b>			<b>10 Hours</b>
<b>Module 2</b>			
<b>Remote Procedure Calls:</b> Introduction, The RPC Model, Transparency of RPC, Implementing RPC Mechanism, Stub Generation, RPC Messages, Marshaling Arguments and Results, Server Management, Parameter-Passing Semantics, Call Semantics, Communication Protocols for RPCs, Complicated RPCs, Client-Server Binding, Exception Handling, Security, Some Special Types of RPCs, RPC in Heterogeneous Environments, Lightweight RPC, Optimization for Better Performance, Case Studies: Sun RPC.  <b>RBT: L1,L2</b>			<b>10 Hours</b>
<b>Module 3</b>			
<b>Distributed Shared Memory:</b> Introduction, General Architecture of DSM Systems, Design and Implementation Issues of DSM, Granularity, Structure of Shared Memory Space, Consistency Models, Replacement Strategy, Thrashing, Other approaches to DSM, Heterogeneous DSM, Advantages of DSM. <b>Synchronization:</b> Introduction, Clock Synchronization, Event Ordering, Mutual Exclusion, Dead Lock, Election Algorithms.  <b>RBT: L1,L2,L3</b>			<b>10 Hours</b>
<b>Module 4</b>			
<b>Resource Management:</b> Introduction, Desirable Features of a Good Global Scheduling Algorithm, Task Assignment Approach, Load – Balancing Approach, Load – Sharing Approach <b>Process Management:</b> Introduction, Process Migration, Threads.  <b>RBT: L1,L2,L3</b>			<b>10 Hours</b>
<b>Module 5</b>			

<p><b>Distributed File Systems:</b> Introduction, Desirable Features of a Good Distributed File System, File models, File–Accessing Models, File – Sharing Semantics, File – Caching Schemes, File Replication, Fault Tolerance, Atomic Transactions and Design Principles.  <b>RBT: L1,L2,L3</b></p>	<p><b>10 Hours</b></p>
<p><b>Course Outcomes</b></p>	
<p>The students should be able to:</p> <ul style="list-style-type: none"> <li>• The concepts underlying distributed systems</li> <li>• Demonstrate an ability to apply theory and techniques to unseen problems.</li> <li>• Demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system</li> <li>• Explore the various resource management techniques for distributed systems.</li> </ul>	
<p><b>Question paper pattern:</b>  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.</p>	
<p><b>Text Books:</b>  2. Pradeep. K. Sinha: Distributed Operating Systems: Concepts and Design, PHI, 2007.</p>	
<p><b>Reference Books:</b>  1. Andrew S. Tanenbaum: Distributed Operating Systems, Pearson Education, 2013.</p>	



**DATA COMPRESSION AND ADBMS LABORATORY**  
**[As per Choice Based Credit System (CBCS) scheme]**  
**(Effective from the academic year 2018 -2019)**  
**SEMESTER – I**

Subject Code	<b>18SITL16</b>	IA Marks	40
Number of Contact Hours/Week	04	Exam Marks	60
Total Number of Contact Hours	50	Exam Hours	03

**CREDITS – 02**

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

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

**PART – A DATA COMPRESSION LAB WORK**

**NOTE: Use appropriate tool/language or package to implement and For programs 5 and 6, MATLAB or any equivalent tools can be used.**

1. Write a program to compress a source Text file using Run-length encoding Compression algorithm save the output in a destination file. Decompress the destination file to get the original source file.
2. Write a program to compress a source image file using Run-length encoding Compression algorithm save the output in a destination file. Decompress the destination file to get the original source file.
3. Write a program to Read the string to generate Huffman code and display the code along with the input string (program should be case sensitive). Show all the calculation manually. Verify the results.
4. Write a program to read Huffman codes & compressed string (contains Huffman codes) codes and replaces the code with character (decompression). Display the input string(compressed) and output string (Decompressed).
5. Write a program to Read the string of numbers to generate Rice codes and display the code along with the input string. Verify the results manually.
6. Write a program to Read the string to generate LZW code for the given string. Display the LZW code along with the input string.

**PART – B ADBMS LABORATORY WORK**

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

1. **Develop a database application to demonstrate storing and retrieving of BLOB and CLOB objects.**
  - a. Write a binary large object (BLOB) to a database as either binary or character (CLOB) data, depending on the type of the field in your data source. To write a BLOB value to the database, issue the appropriate INSERT or UPDATE statement and pass the BLOB value as

an input parameter. If your BLOB is stored as text, such as a SQL Server text field, pass the BLOB as a string parameter. If the BLOB is stored in binary format, such as a SQL Server image field, pass an array of type byte as a binary parameter.

- b. Once storing of BLOB and CLOB objects is done, retrieve them and display the results accordingly.

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

Consider Purchase Order Example: This example is based on a typical business activity: managing customer orders. Need to demonstrate how the application might evolve from relational to object-relational, and how you could write it from scratch using a pure object-oriented approach.

- a. Show how to implement the schema -- Implementing the Application under the Relational Model -- using only Oracle's built-in data types. Build an object-oriented application on top of this relational schema using object views.

**3. Design and develop a suitable Student Database application by considering appropriate attributes. Couple of attributes to be maintained is the Attendance of a student in each subject for which he/she has enrolled and Internal Assessment Using TRIGGERS, write active rules to do the following:**

- a. Whenever the attendance is updated, check if the attendance is less than 85%; if so, notify the Head of the Department concerned.
- b. Whenever, the marks in an Internal Assessment Test are entered, check if the marks are less than 40%; if so, notify the Head of the Department concerned.

**Use the following guidelines when designing triggers:**

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

**1. Design, develop, and execute a program to implement specific Apriori algorithm for mining association rules. Run the program against any large database available in the public domain and discuss the results.**

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

### **Course Outcomes**

The students should be able to:

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

### **Conduction of Practical Examination:**

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.**

<b>WEB SERVICES</b> <b>[As per Choice Based Credit System (CBCS) scheme]</b> <b>(Effective from the academic year 2018 -2019)</b> <b>SEMESTER – II</b>			
Subject Code	18LNI242 / <b>18SIT21</b> / 18SSE154	IA Marks	40
Number of Contact Hours/Week	04	Exam Marks	60
Total Number of Contact Hours	50	Exam Hours	03
<b>CREDITS – 04</b>			
<b>Course objectives:</b> This course will enable students to			
<ul style="list-style-type: none"> <li>• Define and explain Web Services.</li> <li>• Summarize WSDL Web Services.</li> <li>• Analyze Web service Architecture.</li> <li>• Explain Building Blocks of Web services.</li> </ul>			
<b>Module 1</b>			<b>Contact Hours</b>
<b>Middleware:</b> Understanding the middle ware, RPC and Related Middle ware, TP Monitors, Object Brokers, Message-Oriented Middleware.  <b>RBT: L1,L2</b>			<b>10 Hours</b>
<b>Module 2</b>			
<b>Web Services:</b> Web Services Technologies, Web Services Architecture.  <b>RBT: L1,L2</b>			<b>10 Hours</b>
<b>Module 3</b>			
<b>Basic Web Services Technology:</b> WSDL Web Services Description Language, UDDI Universal Description Discovery and Integration, Web Services at work interactions between the Specifications, Related Standards.  <b>RBT: L1,L2</b>			<b>10 Hours</b>
<b>Module 4</b>			
<b>Service Coordination Protocols:</b> Infrastructure for Coordination Protocols, WS-Coordination, WS-Transaction, Rosetta Net and Other Standards Related to Coordination Protocols.  <b>RBT: L1,L2,L3</b>			<b>10 Hours</b>
<b>Module 5</b>			
<b>Service Composition:</b> Basic of Service Composition, A New Chance of Success for Composition, Services Composition Models, Dependencies between Coordination and Composition, BPEL: Business Process Execution Language for Web Services, Outlook, Applicability of the Web Services, Web services as a Problem and a Solution : AN Example.  <b>RBT: L1,L2,L3</b>			<b>10 Hours</b>
<b>Course Outcomes</b>			
The students should be able to:			
<ul style="list-style-type: none"> <li>• Bind and unbind services in UDDI.</li> <li>• Develop WSDL document</li> <li>• Implement web service client to call public service.</li> <li>• Implement a service and exposing it as public service.</li> </ul>			
<b>Question paper pattern:</b>			
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.			
<b>Text Books:</b>			
1. Gustavo Alonso, Fabio Casati, Harumi Kuno, Vijay Machiraju: Web Services(Concepts ,Architectures and Applications ), Springer International Edition 2009.			
<b>Reference Books:</b>			
NIL			
<b>CLOUD COMPUTING</b> [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2018 -2019) <b>SEMESTER – II</b>			
Subject Code	18LNI151 / 18SCE14 / 18SCN31 / 18SCS23 / <b>18SIT22</b> / 18SSE251	IA Marks	40
Number of Contact Hours/Week	04	Exam Marks	60
Total Number of Contact Hours	50	Exam Hours	03
<b>CREDITS – 04</b>			
<b>Course objectives:</b> This course will enable students to			
<ul style="list-style-type: none"> <li>• Define and Cloud, models and Services.</li> <li>• Compare and contrast programming for cloud and their applications</li> <li>• Explain virtuaization, Task Scheduling algorithms.</li> <li>• Apply ZooKeeper, Map-Reduce concept to applications.</li> </ul>			
<b>Module 1</b>			<b>Contact Hours</b>
<b>Introduction, Cloud Infrastructure:</b> 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.			<b>10 Hours</b>
			<b>RBT: L1,L2</b>
<b>Module 2</b>			
<b>Cloud Computing: Application Paradigms.:</b> Challenges of cloud computing, Architectural styles of cloud computing, Workflows: Coordination of multiple activities, Coordination based on a state machine model: The Zookeeper, The Map Reduce programming model, A case study: The Gre The Web application, Cloud for science and engineering, High-performance computing on a cloud, Cloud computing for Biology research, Social computing, digital content and cloud computing.			<b>10 Hours</b>
			<b>RBT: L1,L2</b>
<b>Module 3</b>			
<b>Cloud Resource Virtualization:</b> Virtualization, Layering and virtualization, Virtual machine monitors, Virtual Machines, Performance and Security Isolation, Full virtualization and paravirtualization, Hardware support for virtualization, Case Study: Xen a VMM based paravirtualization, Optimization of network virtualization, vBlades, Performance comparison of virtual machines, The dark side of virtualization, Exercises and problems			<b>10 Hours</b>
			<b>RBT: L1,L2,L3</b>
<b>Module 4</b>			
<b>Cloud Resource Management and Scheduling:</b> 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,			<b>10 Hours</b>

<p>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.</p> <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>	
<b>Module 5</b>	
<p><b>Cloud Security, Cloud Application Development:</b> Cloud security risks, Security: The top concern for cloud users, Privacy and privacy impact assessment, Trust, Operating system security, Virtual machine Security, Security of virtualization, Security risks posed by shared images, Security risks posed by a management OS, A trusted virtual machine monitor, Amazon web services: EC2 instances, Connecting clients to cloud instances through firewalls, Security rules for application and transport layer protocols in EC2, How to launch an EC2 Linux instance and connect to it, How to use S3 in java, Cloud-based simulation of a distributed trust algorithm, A trust management service, A cloud service for adaptive data streaming, Cloud based optimal FPGA synthesis .Exercises and problems.</p> <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>	<b>10 Hours</b>
<b>Course Outcomes</b>	
<p>The students should be able to:</p> <ul style="list-style-type: none"> <li>• Compare the strengths and limitations of cloud computing</li> <li>• Identify the architecture, infrastructure and delivery models of cloud computing</li> <li>• Apply suitable virtualization concept.</li> <li>• Choose the appropriate cloud player</li> <li>• Address the core issues of cloud computing such as security, privacy and interoperability</li> <li>• Design Cloud Services</li> <li>• Set a private cloud</li> </ul>	
<p><b>Question paper pattern:</b>  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.</p>	
<p><b>Text Books:</b>  1. Dan C Marinescu: Cloud Computing Theory and Practice. Elsevier(MK) 2013.</p>	
<p><b>Reference Books:</b>  1. Rajkumar Buyya , James Broberg, Andrzej Goscinski: Cloud Computing Principles and Paradigms, Willey 2014.  2. John W Rittinghouse, James F Ransome:Cloud Computing Implementation, Management and Security, CRC Press 2013.</p>	

<b>DATA MINING &amp; DATA WAREHOUSING</b> <b>[As per Choice Based Credit System (CBCS) scheme]</b> <b>(Effective from the academic year 2018 -2019)</b> <b>SEMESTER – II</b>			
Subject Code	18SCE154 / 18SCS244 / 18SFC251 / <b>18SIT23</b> / 18SSE241	IA Marks	40
Number of Contact Hours/Week	04	Exam Marks	60
Total Number of Contact Hours	50	Exam Hours	03
CREDITS – 04			
<b>Course objectives:</b> This course will enable students to <ul style="list-style-type: none"> <li>• Define Data warehousing Architecture and Implementation</li> <li>• Explain Data mining principles and techniques and Introduce DM as a cutting edge business intelligence</li> <li>• Interpret association rule mining for handling large data</li> <li>• Classification for the retrieval purposes</li> <li>• Explain clustering techniques in details for better organization and retrieval of data</li> </ul>			
Module -1			Contact Hours
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.			10 Hours
			<b>RBT: L1,L2</b>
Module -2			Contact Hours
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			10 Hours
			<b>RBT: L1,L2,L3</b>
Module – 3			Contact Hours
Classification: Basic Concepts: Basic Concepts, Decision tree induction, Bays Classification Methods, Rule-Based classification, Model evaluation and selection, Techniques to improve classification accuracy			10 Hours
			<b>RBT: L1,L2,L3</b>
Module-4			Contact Hours
Cluster Analysis: Basic concepts and methods: Cluster Analysis, Partitioning methods, Hierarchical Methods, Density-based methods, Grid-Based Methods, Evaluation of clustering.			10 Hours
			<b>RBT: L1,L2,L3</b>
Module-5			Contact Hours
Data mining trends and research frontiers: Mining complex data types, other methodologies of data mining, Data mining applications, Data Mining and society.			10 Hours
			<b>RBT: L1,L2,L3</b>
Course outcomes:			
The students shall able to: <ul style="list-style-type: none"> <li>• Demonstrate Storing voluminous data for online processing, Preprocess the data for mining applications</li> <li>• Apply the association rules for mining the data</li> </ul>			

- 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) 3<sup>rd</sup> edition 2012.

**Reference Books:** NIL



<b>MOBILE APPLICATION DEVELOPMENT</b> <b>[As per Choice Based Credit System (CBCS) scheme]</b> <b>(Effective from the academic year 2018 -2019)</b> <b>SEMESTER – II</b>			
Subject Code	18LNI323/ 18SCN244 18SFC332 / <b>18SIT241</b>	IA Marks	40
Number of Contact Hours/Week	04	Exam Marks	60
Total Number of Contact Hours	50	Exam Hours	03
<b>CREDITS – 04</b>			
<b>Course objectives:</b> This course will enable students to <ul style="list-style-type: none"> <li>• Analyze system requirements for mobile applications.</li> <li>• Apply of mobile development frameworks.</li> <li>• Demonstrate mobile application design.</li> <li>• Demonstrate and implement mobile application.</li> </ul>			
<b>Module -1</b>			<b>Contact Hours</b>
Introduction to mobile communication and computing: Introduction to mobile computing, Novel applications, limitations and GSM architecture, Mobile services, System architecture, Radio interface, protocols, Handover and security. Smart phone operating systems and smart phones applications.			<b>10 Hours</b>
<b>RBT: L1,L2</b>			
<b>Module -2</b>			
Fundamentals of Android Development: Introduction to Android., The Android 4.1 Jelly Bean SDK, Understanding the Android Software Stack, Installing the Android SDK, Creating Android Virtual Devices, Creating the First Android Project, Using the Text View Control, Using the Android Emulator.			<b>10 Hours</b>
<b>RBT: L1,L2</b>			
<b>Module – 3</b>			
The Intent of Android Development, Four kinds of Android Components: Activity, Service, Broadcast Receiver and Content Provider. Building Blocks for Android Application Design, Laying Out Controls in Containers. Graphics and Animation: Drawing graphics in Android, Creating Animation with Android’s Graphics API.			<b>10 Hours</b>
<b>RBT: L1,L2,L3</b>			
<b>Module-4</b>			
Creating the Activity, Working with views: Exploring common views, using a list view, creating custom views, understanding layout. Using Selection Widgets and Debugging Displaying and Fetching Information Using Dialogs and Fragments. Multimedia: Playing Audio, Playing Video and Capturing Media. Advanced Android Programming: Internet, Entertainment, and Services.			<b>10 Hours</b>
<b>RBT: L1,L2,L3</b>			
<b>Module-5</b>			
Displaying web pages and maps, communicating with SMS and emails. Creating and using content providers: Creating and consuming services, publishing android applications			<b>10 Hours</b>
<b>RBT: L1,L2,L3</b>			
<b>Course outcomes:</b>			
The students should be able to: <ul style="list-style-type: none"> <li>• Describe the requirements for mobile applications</li> <li>• Explain the challenges in mobile application design and development</li> <li>• Develop design for mobile applications for specific requirements</li> </ul>			

- Implement the design using Android SDK
- Implement the design using Objective C and iOS
- Deploy mobile applications in Android and iPone marketplace for distribution

**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. Mobile Computing: (technologies and Applications-N. N. Jani S chand
2. B.M.Hirwani- Android programming Pearson publications-2013
3. W. Frank Ableson, Robi Sen and C. E. Ortiz - **Android in Action**, Third Edition-2012 DreamTech Publisher

<b>BIOINFORMATICS</b> <b>[As per Choice Based Credit System (CBCS) scheme]</b> <b>(Effective from the academic year 2018 -2019)</b> <b>SEMESTER – II</b>			
Subject Code	18LNI253 / 18SIT242	IA Marks	40
Number of Contact Hours/Week	04	Exam Marks	60
Total Number of Contact Hours	50	Exam Hours	03
CREDITS – 04			
<b>Course objectives:</b> This course will enable students to <ul style="list-style-type: none"> <li>• Explain domain of bioinformatics</li> <li>• Illustrate role of data warehousing and data mining for bioinformatics</li> <li>• Compare model bioinformatics based applications</li> <li>• Demonstrate how to deploy the pattern matching and visualization techniques in bioinformatics</li> <li>• Define the Microarray technologies for genome expression</li> </ul>			
Module -1			Contact Hours
INTRODUCTION : Need for Bioinformatics technologies – Overview of Bioinformatics technologies – Structural bioinformatics – Data format and processing – secondary resources- Applications – Role of Structural bioinformatics - Biological Data Integration System.			<b>10 Hours</b>
<b>RBT: L1,L2</b>			
Module -2			Contact Hours
DATAWAREHOUSING AND DATAMINING IN BIOINFORMATICS: Bioinformatics data – Data ware housing architecture – data quality – Biomedical data analysis – DNA data analysis – Protein data analysis – Machine learning – Neural network architecture- Applications in bioinformatics.			<b>10 Hours</b>
<b>RBT: L1,L2,L3</b>			
Module – 3			Contact Hours
MODELING FOR BIOINFORMATICS : Hidden markov modeling for biological data analysis Sequence identification – Sequence classification – multiple alignment generation – Comparative modeling – Protein modeling – genomic modeling – Probabilistic modeling – Bayesian networks – Boolean networks - Molecular modeling – Computer programs for molecular modeling.			<b>10 Hours</b>
<b>RBT: L1,L2,L3</b>			
Module-4			Contact Hours
PATTERN MATCHING AND VISUALIZATION: Gene regulation – motif recognition and motif detection – strategies for motif detection – Visualization – Fractal analysis – DNA walk models – one dimension – two dimension – higher dimension – Game representation of Biological sequences – DNA, Protein, Amino acid sequences.			<b>10 Hours</b>
<b>RBT: L1,L2,L3</b>			
Module-5			Contact Hours
MICROARRAY ANALYSIS: Microarray technology for genome expression study – image analysis for data extraction – preprocessing – segmentation – gridding, spot extraction, normalization, filtering – cluster analysis – gene network analysis			<b>10 Hours</b>
<b>RBT: L1,L2,L3</b>			
Course outcomes:			
The students should be able to: <ul style="list-style-type: none"> <li>• Deploy the data warehousing and data mining techniques in Bioinformatics</li> </ul>			

- Model bioinformatics based applications
- Deploy the pattern matching and visualization techniques in bioinformatics
- Work on the protein sequences
- Use the Microarray technologies for genome expression .

**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. Yi-Ping Phoebe Chen (Ed), "Bio Informatics Technologies", Springer Verlag, 2014.

**Reference books :** NIL

<b>SOFTWARE METRICS AND QUALITY ASSURANCE</b> <b>[As per Choice Based Credit System (CBCS) scheme]</b> <b>(Effective from the academic year 2018 -2019)</b> <b>SEMESTER - II</b>			
Subject Code	18SFC334 / <b>18SIT243</b> / 18SSE242	IA Marks	40
Number of Contact Hours/Week	04	Exam Marks	60
Total Number of Contact Hours	50	Exam Hours	03
<b>CREDITS - 04</b>			
<b>Course objectives:</b> This course will enable students to <ul style="list-style-type: none"> <li>• Define metrics, measurement theory and related Terminologies</li> <li>• Assess the quality level of internal and external attributes of the software product</li> <li>• Explain of software reliability and to illustrate how to perform planning, executing and testing for software reliability</li> <li>• Evaluate various metrics and models of software reliability</li> <li>• Compare various models of software reliability based on its application</li> </ul>			
<b>Module -1</b>			<b>Contact Hours</b>
<b>What Is Software Quality:</b> Quality: Popular Views, Quality Professional Views, Software Quality, Total Quality Management and Summary. <b>Fundamentals Of Measurement Theory:</b> Definition, Operational Definition, And Measurement, Level Of Measurement, Some Basic Measures, Reliability And Validity, Measurement Errors, Be Careful With Correlation, Criteria For Causality, Summary. <b>Software Quality Metrics Overview:</b> Product Quality Metrics, In Process Quality Metrics, Metrics for Software Maintenance, Examples For Metrics Programs, Collecting Software Engineering Data. <b>RBT: L1,L2</b>			<b>10Hours</b>
<b>Module -2</b>			
<b>Applying The Seven Basic Quality Tools In Software Development :</b> Ishikawa's Seven Basic Tools, Checklist, Pareo Diagram, Histogram, Run Charts , Scatter Diagram, Control Chart, Cause And Effect Diagram. <b>The Rayleigh Model:</b> Reliability Models, The Rayleigh Model Basic Assumptions, Implementation, Reliability And Predictive Validity. <b>RBT: L1,L2,L3</b>			<b>10 Hours</b>
<b>Module – 3</b>			
<b>Complexity Metrics And Models:</b> Lines Of Code, Halstead's Software Science , Cyclomatic Complexity Syntactic Metrics, An Example Of Module Design Metrics In Practice . <b>Metric And Lessons Learned For Object Oriented Projects:</b> Object Oriented Concepts And Constructs, Design And Complexity Metrics, Productivity Metrics, Quality And Quality Management Metrics, Lessons Learned For object oriented Projects. <b>RBT: L1,L2,L3</b>			<b>10 Hours</b>
<b>Module-4</b>			
<b>Availability Metrics:</b> Definition And Measurement Of System Availability, Reliability Availability And Defect Rate, Collecting Customer Outage Data For Quality Improvement, In Process Metrics For Outage And Availability . <b>Conducting Software Project Assessment :Audit Ad Assessment , Software Process Maturity Assessment And Software Project Assessment , Software Process Assessment A Proponed Software Project Assessment Method.</b> <b>RBT: L1,L2,L3</b>			<b>10 Hours</b>

<b>Module-5</b>	
<p><b>Dos And Don'ts Of Software Process Improvement</b> :Measuring Process Maturity, Measuring Process Capability, Staged Versus Continuous Debating Religion, Measuring Levels Is Not Enough, Establishing The Alignment Principle , Take Time Getting Faster, Keep it Simple Or Face Decomplexification, Measuring The Value Of Process Improvement , Measuring Process Compliance , Celebrate The Journey Not Just The Destination. <b>Using Function Point Metrics to Measure Software Process Improvement: Software Process Improvement Sequences, Process Improvement Economies, Measuring Process Improvement at Activity Levels</b></p> <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>	<b>10 Hours</b>
<b>Course outcomes:</b>	
<p>Upon completion of the course, students shall be able to</p> <ul style="list-style-type: none"> <li>• Identify and apply various software metrics, which determines the quality level of software</li> <li>• Identify and evaluate the quality level of internal and external attributes of the software product</li> <li>• Compare and Pick out the right reliability model for evaluating the software</li> <li>• Evaluate the reliability of any given software product</li> <li>• Design new metrics and reliability models for evaluating the quality level of the software based on the requirement</li> </ul>	
<b>Question paper pattern:</b>	
<p>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.</p>	
<b>Text Books:</b>	
<ol style="list-style-type: none"> <li>1. Stephen H Khan: Metrics and Models in Software Quality Engineering, Pearson 2<sup>nd</sup> edition 2013.</li> </ol>	
<b>Reference Books:</b>	
<ol style="list-style-type: none"> <li>1. Norman E-Fentor and Share Lawrence Pflieger.” Software Metrics”. International Thomson Computer Press, 1997.</li> <li>2. S.A.Kelkar,”Software quality and Testing, PHI Learning, Pvt, Ltd., New Delhi 2012.</li> <li>3. Watts S Humphrey, “Managing the Software Process”, Pearson Education Inc, 2008.</li> <li>4. Mary Beth Chrissis, Mike Konrad and Sandy Shrum, “CMMI”, Pearson Education(Singapore) Pte Ltd, 2003</li> <li>5. Philip B Crosby, " Quality is Free: The Art of Making Quality Certain ", Mass Market, 1992.</li> </ol>	

<p align="center"><b>CYBER SECURITY AND CYBER LAW</b>  <b>[As per Choice Based Credit System (CBCS) scheme]</b>  <b>(Effective from the academic year 2018 -2019)</b>  <b>SEMESTER –II</b></p>			
Subject Code	18LNI244 / 18SCE244 / <b>18SIT244</b>	IA Marks	40
Number of Contact Hours/Week	04	Exam Marks	60
Total Number of Contact Hours	50	Exam Hours	03
<b>CREDITS – 04</b>			
<p><b>Course objectives:</b> This course will enable students to</p> <ul style="list-style-type: none"> <li>• Define the area of cybercrime and forensics.</li> <li>• Explain the motive and causes for cybercrime , detection and handling.</li> <li>• Investigate Areas affected by cybercrime.</li> <li>• Illustrate tools used in cyber forensic</li> <li>• Infer legal Perspectives in cyber security</li> </ul>			
<b>Module -1</b>			<b>Contact Hours</b>
<p>Introduction to Cybercrime: Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals?, Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens. Cyberoffenses: How Criminals Plan Them: How Criminals Plan the Attacks, Social Engineering, Cyberstalking, Cybercafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.</p>			<b>10 Hours</b>
			<b>RBT: L1,L2</b>
<b>Module -2</b>			
<p>Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops</p>			<b>10 Hours</b>
			<b>RBT: L1,L2</b>
<b>Module – 3</b>			
<p>Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks. Phishing and Identity Theft: Introduction, Phishing, Identity Theft (ID Theft).</p>			<b>10 Hours</b>
			<b>RBT: L1,L2,L3</b>
<b>Module-4</b>			
<p>Understanding Computer Forensics: Introduction, Historical Background of Cyberforensics, Digital Forensics Science, The Need for Computer Forensics, Cyberforensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Setting up a Computer Forensics Laboratory: Understanding the Requirements, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Computer Forensics from Compliance Perspective, Challenges in Computer Forensics, Special Tools and Techniques,</p>			<b>10 Hours</b>

Forensics Auditing, Antiforensics.	<b>RBT: L1,L2,L3</b>
<b>Module-5</b>	
Introduction to Security Policies and Cyber Laws: Need for An Information Security Policy, Information Security Standards – Iso, Introducing Various Security Policies and Their Review Process, Introduction to Indian Cyber Law, Objective and Scope of the it Act, 2000, Intellectual Property Issues, Overview of Intellectual - Property - Related Legislation in India, Patent, Copyright, Law Related to Semiconductor Layout and Design, Software License.	<b>10 Hours</b>
	<b>RBT: L1,L2,L3</b>
<b>Course outcomes:</b>	
By the end of this course the student acquire <ul style="list-style-type: none"> <li>• Define cyber security, cyber law and their roles</li> <li>• Demonstrate cyber security cybercrime and forensics.</li> <li>• Infer legal issues in cybercrime,</li> <li>• Demonstrate tools and methods used in cybercrime and security.</li> <li>• Illustrate evidence collection and legal challenges</li> </ul>	
<p>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.</p>	
<b>Text Books:</b>	
<ol style="list-style-type: none"> <li>1. Sunit Belapure and Nina Godbole, “Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives”, Wiley India Pvt Ltd, ISBN: 978-81-265-21791, Publish Date 2013</li> <li>2. Dr. Surya Prakash Tripathi, Ritendra Goyal, Praveen Kumar Shukla, KLSI. “Introduction to information security and cyber laws”. Dreamtech Press. ISBN: 9789351194736, 2015</li> </ol>	
<b>Reference Books:</b>	
<ol style="list-style-type: none"> <li>1. Thomas J. Mowbray, “Cybersecurity: Managing Systems, Conducting Testing, and Investigating Intrusions”, Copyright © 2014 by John Wiley &amp; Sons, Inc, ISBN: 978 -1-118 -84965 -1</li> <li>2. James Graham, Ryan Olson, Rick Howard, “Cyber Security Essentials”, CRC Press, 15-Dec-2010</li> </ol>	



**ADVANCES IN COMPUTER GRAPHICS**  
**[As per Choice Based Credit System (CBCS) scheme]**  
**(Effective from the academic year 2018 -2019)**  
**SEMESTER – II**

Subject Code	18SCS251/ 18SIT251	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

- 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.

<b>Module 1</b>	<b>Contact Hours</b>
<p>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, Bazier Surfaces B-Spline Curves, B-Spline Surfaces, Beta- Splines, Retional Splines, Conversion Between Spline Representations, Displaying Spline Curves and rfaces, OpenGL Approximation-Spline Functions, Sweep Representations, Constructive Solid –Geometry Method, Octrees, BSP T rees, Fractal-Geometry Methods, Shape Grammars and Others Procedural Methods, Particle Systems, Physically Based Modeling, Visualization Of Data Sets.</p> <p style="text-align: right;"><b>RBT: L1,L2</b></p>	<b>10 Hours</b>
<p><b>Module 2</b></p> <p>Visible-Surface Detection Methods: Classification Of Visible –Surface Detection Algorithms, Back-Face Method, Depth-Buffer Method, A-Buffer Method, Scan-Line Method, BSP-Tree Method, Area-Subdivision Method, Octree Methods, Ray-Casting Method, Comparison of Visibility –Detection Methods, Curved Surfaces, Wire-Frame Visibility –De tection Functions</p> <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>	<b>10 Hours</b>
<p><b>Module 3</b></p> <p>Illumination Models and Surface- Rendering Methods: Light Sources, Surface Lighting Effects, Basic Illumination Models, Transparent Surfaces, Atmospheric Effects, Shadows, Camera parameters, Displaying light intensities, Halftone patterns anddithering techniques, polygon rendering methods, ray-tracing methods, Radiosity lighting model, Environment mapping, Photon mapping, Adding surface details, Modeling surface details with polygons, Texture mapping, Bump mapping, OpenGL Illumination and surface-rendering functions, openGL texture functions.</p> <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>	<b>10 Hours</b>
<p><b>Module 4</b></p> <p>Color models, color applications and Computer animation: Properties of light, Color models, Standard primaries and the chromaticity diagram, The RGB color model, The YIQ and related color models, The CMY and CMYK color models, The HSV color model, The HLS color model, Color Selection and applications. Raster methods for computer animation, Design of animations sequences, Traditional animation techniques, General computer-animation functions, Computer-animation languages, Key-frame systems, Motion specification, Articulated figure animation, Periodic motions, OpenGL animation</p>	<b>10 Hours</b>

procedures.	<b>RBT: L1,L2,L3</b>	
<b>Module 5</b>		
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.	<b>RBT: L1,L2,L3</b>	<b>10 Hours</b>
<b>Course Outcomes</b>		
The students should be able to:		
<ul style="list-style-type: none"> <li>• Discuss and implement images and objects using 3D representation and OpenGL methodologies.</li> <li>• Design and develop surface detection using various detection methods.</li> <li>• Choose various illumination models for provides effective standards of objects.</li> <li>• Design of develop effective computer animations.</li> </ul>		
<b>Question paper pattern:</b>		
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.		
<b>Text Books:</b>		
<ol style="list-style-type: none"> <li>1. Computer Graphics with OpenGL-Hearn Baker 4<sup>rd</sup> edition, Pearson publication.2010.</li> <li>2. James D Foley,Andries van dam,Steven K Feiner,John F Hughes, Computer graphics, Pearson Education 3<sup>rd</sup> edition, 2013.</li> </ol>		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. Edward Angel: Interactive Computer graphics a top-down approach with OpenGL, Addison Wesley, 6th edition 2012.</li> <li>2. Advanced graphics programming using OpenGL: Tom Mc Reynolds-David Blythe. Elsevier.MK, 2005.</li> </ol>		

<b>BUSINESS INTELLIGENCE AND ITS APPLICATIONS</b> [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2018 -2019) <b>SEMESTER - II</b>			
Subject Code	18SCS243 / <b>18SIT252</b>	IA Marks	20
Number of Contact Hours/Week	04	Exam Marks	80
Total Number of Contact Hours	50	Exam Hours	03
<b>CREDITS - 04</b>			
<b>Course objectives:</b> This course will enable students to			
<ul style="list-style-type: none"> <li>• Evaluate the key elements of a successful business intelligence (BI) program</li> <li>• Apply a BI meta model that turns outcomes into actions</li> <li>• Extract and transform data from an operational data to a data business data</li> <li>• Evaluate business analytics and performance measurement tools</li> </ul>			
<b>Module -1</b>			<b>Contact Hours</b>
Development Steps, BI Definitions, BI Decision Support Initiatives, Development Approaches, Parallel Development Tracks, BI Project Team Structure, Business Justification, Business Divers, Business Analysis Issues, Cost – Benefit Analysis, Risk Assessment, Business Case Assessment Activities, Roles Involved In These Activities, Risks Of Not Performing Step, Hardware, Middleware, DBMS Platform, Non Technical Infrastructure Evaluation			<b>10 Hours</b>
<b>RBT: L1,L2</b>			
<b>Module -2</b>			<b>Contact Hours</b>
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			<b>10 Hours</b>
<b>RBT: L1,L2,L3</b>			
<b>Module – 3</b>			<b>Contact Hours</b>
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			<b>10 Hours</b>
<b>RBT: L1,L2,L3</b>			
<b>Module-4</b>			<b>Contact Hours</b>
Growth Management, Application Release Concept, Post Implementation Reviews, Release Evaluation Activities, The Information Asset and Data Valuation, Actionable Knowledge – ROI, BI Applications, The Intelligence Dashboard			<b>10 Hours</b>
<b>RBT: L1,L2,L3</b>			
<b>Module-5</b>			<b>Contact Hours</b>
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.			<b>10 Hours</b>
<b>RBT: L1,L2,L3</b>			
<b>Course outcomes:</b>			
Upon completion of the course, the students will be able to			
<ul style="list-style-type: none"> <li>• Explain the complete life cycle of BI/Analytical development</li> <li>• Illustrate technology and processes associated with Business Intelligence framework</li> <li>• Demonstrate a business scenario, identify the metrics, indicators and make recommendations to achieve the business goal.</li> </ul>			

**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. Larissa T Moss and ShakuAtre – Business Intelligence Roadmap : The Complete Project Lifecycle for Decision Support Applications, Addison Wesley Information Technology Series, 2003.
2. R N Prasad, SeemaAcharya – Fundamentals of Business Analytics , Wiley India, 2011.

**Reference Books:**

1. David Loshin - Business Intelligence: The Savvy Manager's Guide, Publisher: Morgan Kaufmann, ISBN 1-55860-196-4.
2. Brian Larson - Delivering Business Intelligence with Microsoft SQL Server 2005, McGraw Hill, 2006.
3. Lynn Langit - Foundations of SQL Server 2008 Business Intelligence –Apress, ISBN13: 978-1-4302-3324-4, 2011

<b>ADVANCES IN STORAGE AREA NETWORKS</b> <b>[As per Choice Based Credit System (CBCS) scheme]</b> <b>(Effective from the academic year 2018 -2019)</b> <b>SEMESTER – II</b>			
Subject Code	18LNI243 / 18SCE323 / 18SCN241 / 18SCS241 / <b>18SIT253</b> / 18SSE153	IA Marks	40
Number of Contact Hours/Week	04	Exam Marks	60
Total Number of Contact Hours	50	Exam Hours	03
CREDITS – 04			
<b>Course objectives:</b> This course will enable students to			
<ul style="list-style-type: none"> <li>• Define and contrast storage centric and server centric systems</li> <li>• Define metrics used for Designing storage area networks</li> <li>• Illustrate RAID concepts</li> <li>• Demonstrate, how data centers maintain the data with the concepts of backup mainly remote mirroring concepts for both simple and complex systems.</li> </ul>			
<b>Module 1</b>			<b>Contact Hours</b>
<b>Introduction:</b> 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.			<b>10 Hours</b>
			<b>RBT: L1,L2,L3</b>
<b>Module 2</b>			
<b>I/O Techniques:</b> 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.			<b>10 Hours</b>
			<b>RBT: L1,L2,L3</b>
<b>Module 3</b>			
<b>Storage Virtualization:</b> 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.			<b>10 Hours</b>
			<b>RBT: L1,L2,L3</b>
<b>Module 4</b>			
<b>SAN Architecture and Hardware devices:</b> 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.			<b>10 Hours</b>
			<b>RBT: L1,L2,L3</b>
<b>Module 5</b>			
<b>Management of Storage Network:</b> System Management, Requirement of management System, Support by Management System, Management Interface, Standardized			<b>10 Hours</b>

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	<b>RBT: L1,L2,L3</b>
<b>Course Outcomes</b>	
The students should be able to: <ul style="list-style-type: none"> <li>Identify the need for performance evaluation and the metrics used for it</li> <li>Apply the techniques used for data maintenance.</li> <li>Realize strong virtualization concepts</li> <li>Develop techniques for evaluating policies for LUN masking, file systems</li> </ul>	
<b>Question paper pattern:</b> 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.	
<b>Text Books:</b> <ol style="list-style-type: none"> <li>Ulf Troppens, Rainer Erkens and Wolfgang Muller: Storage Networks Explained, Wiley India,2013.</li> </ol>	
<b>Reference Books:</b> <ol style="list-style-type: none"> <li>Robert Spalding: “Storage Networks The Complete Reference”, Tata McGraw-Hill, 2011.</li> <li>Marc Farley: Storage Networking Fundamentals – An Introduction to Storage Devices, Subsystems, Applications, Management, and File Systems, Cisco Press, 2005.</li> <li>Richard Barker and Paul Massiglia: “Storage Area Network Essentials A Complete Guide to understanding and Implementing SANs”, Wiley India, 2006.</li> </ol>	

<b>SOFTWARE PROJECT PLANNING AND MANAGEMENT</b> [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2018 -2019) <b>SEMESTER - II</b>			
Subject Code	18SSE21 / 18SIT254	IA Marks	40
Number of Lecture Hours/Week	04	Exam Marks	60
Total Number of Lecture Hours	50	Exam Hours	03
<b>CREDITS - 04</b>			
<b>Course objectives:</b> This course will enable students to <ul style="list-style-type: none"> <li>Define and highlight importance of software project management.</li> <li>Formulate strategy in managing projects</li> <li>Estimate the cost associated with a project</li> <li>Plan, schedule and monitor projects for the risk management</li> <li>Define the software management metrics</li> </ul>			
<b>Module -1</b>			<b>Teaching Hours</b>
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			<b>10Hours</b>

<p>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.</p> <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>	
<b>Module -2</b>	
<p>Risk Management: Introduction, What is risk management and why is it important?, Risk management cycle, Risk identification: common tools and techniques, Risk Quantifications, Risk Monitoring, Risk Mitigation, Risks and Mitigation in the context of global project teams, some practical techniques risk management, Metrics in risk management. Project Planning and Tracking: Components of Project Planning and Tracking, The “What “ Part of a Project Plan, The “What Cost “ Part of a Project Plan, The “When “ Part of Project Planning, The “How “ Part of a Project Planning: Tailoring of Organizational Processes For the Project, The “ By Whom “ Part of the Project Management Plan : Assigning Resources, Putting it all together : The Software Management Plan, Activities Specific to Project Tracking, Interfaces to the Process Database. Project Closure: When Does Project Closure Happen?. Why Should We Explicitly do a Closure?, An Effective Closure Process, Issues that Get Discussed During Closure, Metrics for Project Closure, Interfaces to the Process Database.</p> <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>	<b>10 Hours</b>
<b>Module – 3</b>	
<p>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.</p> <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>	<b>10 Hours</b>
<b>Module-4</b>	
<p>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.</p>	<b>10 Hours</b>
<b>Module-5</b>	
<p>Globalization issues in project management: Evolution of globalization, challenges in</p>	<b>10 Hours</b>

<p>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?</p> <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>	
<b>Course outcomes:</b>	
At the end of this course students will be able to:	
<ul style="list-style-type: none"> <li>• Evaluate a project to develop the scope of work, provide accurate cost estimates and to plan the various activities</li> <li>• 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</li> <li>• Identify the resources required for a project and to produce a work plan and resource schedule</li> <li>• Monitor the progress of a project and to assess the risk of slippage, revising targets counteract drift</li> <li>• Use appropriate metrics to management the software development outcome</li> <li>• 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.</li> </ul>	
<b>Question paper pattern:</b>	
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.	
<b>Text Books:</b>	
1. Ramesh Gopaldaswamy: “Managing Global Projects ”, Tata McGraw Hill, 2013.	
<b>Reference Books:</b>	
1. Watts Humphrey, “Managing the Software Process “, Pearson Education, New Delhi, 2000	
2. Pankaj Jalote, “Software Project Management in practice”, Pearson Education, New Delhi, 2002.	

<b>MANAGING BIG DATA</b> <b>[As per Choice Based Credit System (CBCS) scheme]</b> <b>(Effective from the academic year 2018 -2019)</b> <b>SEMESTER – III</b>			
Subject Code	18LNI251 / 18SCE21 / 18SCN252 / 18SCS21 / 18SFC331 / <b>18SIT31</b> / 18SSE322	IA Marks	40
Number of Lecture Hours/Week	03	Exam Marks	60



Total Number of Lecture Hours	40	Exam Hours	03
<b>CREDITS – 04</b>			
<p><b>Course objectives:</b> This course will enable students to</p> <ul style="list-style-type: none"> <li>• Deal with Big data using Hadoop and SPARK technologies</li> <li>• Explain basic concepts of Map and Reduce</li> <li>• Explain basic concepts of Hadoop Distributed File System</li> <li>• Develop map-reduce analytics using Hadoop and related tools</li> </ul>			
<b>Module -1</b>			<b>Teaching Hours</b>
<p><b>Meet Hadoop:</b> Data!, Data Storage and Analysis, Querying All Your Data, Beyond Batch, Comparison with Other Systems: Relational Database Management Systems, Grid Computing, Volunteer Computing Hadoop Fundamentals MapReduce A Weather Dataset: Data Format, Analyzing the Data with Unix Tools, Analyzing the Data with Hadoop: Map and Reduce, Java MapReduce, Scaling Out: Data Flow, Combiner Functions, Running a Distributed MapReduce Job, Hadoop Streaming</p> <p><b>The Hadoop Distributed Filesystem</b> The Design of HDFS, HDFS Concepts: Blocks, Namenodes and Datanodes, HDFS Federation, HDFS High-Availability, The Command-Line Interface, Basic Filesystem Operations, Hadoop Filesystems Interfaces, The Java Interface, Reading Data from a Hadoop URL, Reading Data Using the FileSystem API, Writing Data, Directories, Querying the Filesystem, Deleting Data, Data Flow: Anatomy of a File Read, Anatomy of a File Write.</p> <p style="text-align: right;"><b>RBT: L1,L2</b></p>			<b>10 Hours</b>
<b>Module -2</b>			
<p><b>YARN</b> Anatomy of a YARN Application Run: Resource Requests, Application Lifespan, Building YARN Applications, YARN Compared to MapReduce, Scheduling in YARN: The FIFO Scheduler, The Capacity Scheduler, The Fair Scheduler, Delay Scheduling, Dominant Resource Fairness</p> <p><b>Hadoop I/O</b> Data Integrity, Data Integrity in HDFS, LocalFileSystem, ChecksumFileSystem, Compression, Codecs, Compression and Input Splits, Using Compression in MapReduce, Serialization, The Writable Interface, Writable Classes, Implementing a Custom Writable, Serialization Frameworks, File-Based Data Structures: SequenceFile</p> <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>			<b>10 Hours</b>
<b>Module – 3</b>			
<p><b>Developing a MapReduce Application</b> The Configuration API, Combining Resources, Variable Expansion, Setting Up the Development Environment, Managing Configuration, GenericOptionsParser, Tool, and ToolRunner, Writing a Unit Test with MRUnit: Mapper, Reducer, Running Locally on Test Data, Running a Job in a Local Job Runner, Testing the Driver, Running on a Cluster, Packaging a Job, Launching a Job, The MapReduce Web UI, Retrieving the Results, Debugging a Job, Hadoop Logs, Tuning a Job, Profiling Tasks, MapReduce Workflows: Decomposing a Problem into MapReduce Jobs, JobControl, Apache Oozie</p> <p><b>How MapReduce Works</b> Anatomy of a MapReduce Job Run, Job Submission, Job Initialization, Task Assignment, Task Execution, Progress and Status Updates, Job Completion, Failures: Task Failure, Application Master Failure, Node Manager Failure, Resource Manager Failure, Shuffle and Sort: The Map Side, The Reduce Side, Configuration Tuning, Task Execution: The Task Execution Environment, Speculative Execution, Output Committers</p> <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>			<b>10 Hours</b>

<b>Module-4</b>	
<p><b>MapReduce Types and Formats:</b> MapReduce Types, Input Formats: Input Splits and Record,s Text Input, Binary Input, Multiple Inputs, Database Input (and Output) Output Formats: Text Output, Binary Output, Multiple Outputs, Lazy Output, Database Output,</p> <p><b>Flume</b> Installing Flume, An Example,Transactions and Reliability, Batching, The HDFS Sink, Partitioning and Interceptors, File Formats, Fan Out, Delivery Guarantees, Replicating and Multiplexing Selectors, Distribution: Agent Tiers, Delivery Guarantees, Sink Groups, Integrating Flume with Applications, Component Catalog</p> <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>	<b>10 Hours</b>
<b>Module-5</b>	
<p><b>Pig</b> Installing and Running Pig, Execution Types, Running Pig Programs, Grunt, Pig Latin Editors, An Example: Generating Examples, Comparison with Databases, Pig Latin: Structure, Statements, Expressions, Types, Schemas, Functions, Data Processing Operators: Loading and Storing Data, Filtering Data, Grouping and Joining Data, Sorting Data, Combining and Splitting Data.</p> <p><b>Spark</b> An Example: Spark Applications, Jobs, Stages and Tasks, A Java Example, A Python Example, Resilient Distributed Datasets: Creation, Transformations and Actions, Persistence, Serialization, Shared Variables, Broadcast Variables, Accumulators, Anatomy of a Spark Job Run, Job Submission, DAG Construction, Task Scheduling, Task Execution, Executors and Cluster Managers: Spark on YARN</p> <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>	<b>10 Hours</b>
<b>Course outcomes:</b>	
<p>The students shall able to:</p> <ul style="list-style-type: none"> <li>• Understand managing big data using Hadoop and SPARK technologies</li> <li>• Explain HDFS and MapReduce concepts</li> <li>• Install, configure, and run Hadoop and HDFS.</li> <li>• Perform map-reduce analytics using Hadoop and related tools</li> <li>• Explain SPARK concepts</li> </ul>	
<b>Question paper pattern:</b>	
<p>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.</p>	
<b>Text Books:</b>	
<ol style="list-style-type: none"> <li>1. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.</li> </ol>	
<b>Reference Books:</b>	
<ol style="list-style-type: none"> <li>1. Matei Zaharia and Bill Chambers, SPARK: The Definitive Guide, Oreilly, 2018</li> <li>2. S. D'Souza and Steve Hoffman, Apache Flume: Distributed Log Collection for Hadoop, Oreilly. 2014</li> </ol>	

<b>SUPPLY CHAIN MANAGEMENT</b> <b>[As per Choice Based Credit System (CBCS) scheme]</b> <b>(Effective from the academic year 2018 -2019)</b> <b>SEMESTER – III</b>			
Subject Code	<b>18SIT321 / 18SSE324</b>	IA Marks	40
Number of Contact Hours/Week	04	Exam Marks	60
Total Number of Contact Hours	50	Exam Hours	03
<b>CREDITS – 04</b>			
<b>Course objectives:</b> This course will enable students to <ul style="list-style-type: none"> <li>• Define Model of SCM.</li> <li>• Compare and contrast QRM, CPFR.</li> <li>• Evaluate inventory Models and third party logistics.</li> <li>• Explain revenue management</li> </ul>			
<b>Module -1</b>			<b>Contact Hours</b>
<b>Introduction to Supply Chain Management :</b> Supply chain – objectives – importance – decision phases – process view – competitive and supply chain strategies – achieving strategic fit – supply chain drivers – obstacles – framework – facilities – inventory – transportation – information – sourcing – pricing.  <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>			<b>10 Hours</b>
<b>Module -2</b>			
<b>Designing the supply chain network :</b> Designing the distribution network – role of distribution – factors influencing distribution – design options – e-business and its impact – distribution networks in practice – network design in the supply chain – role of network – factors affecting the network design decisions – modeling for supply chain.  <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>			<b>10 Hours</b>
<b>Module – 3</b>			
<b>Designing and Planning Transportation Networks.:</b> Role of transportation - modes and their performance - transportation infrastructure and policies - design options and their trade-offs - Tailored transportation.  <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>			<b>10 Hours</b>
<b>Module-4</b>			
<b>Sourcing and Pricing:</b> Sourcing – In-house or Outsource – 3rd and 4th PLs – supplier scoring and assessment, selection – design collaboration – procurement process – sourcing planning and analysis. Pricing and revenue management for multiple customers, perishable products, seasonal demand, bulk and spot contracts.  <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>			<b>10 Hours</b>
<b>Module-5</b>			
<b>Information Technology in the supply chain:</b> IT Framework – customer relationship management – internal supply chain management – supplier relationship management – transaction management – future of IT.  <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>			<b>10 Hours</b>
<b>Course outcomes:</b>			
The student shall be able to <ul style="list-style-type: none"> <li>• Discuss SCM Models,</li> <li>• Formulate of QRM, CPFR.</li> <li>• Implement various Inventory Models and third party logistics.</li> </ul>			

**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. Sunil Chopra and Peter Meindl, Supply Chain Management – Strategy, Planning and Operation, Pearson/PHI, 3rd Edition, 2007.
2. Coyle, Bardi, Longley, The management of Business Logistics – A supply Chain Perspective, Thomson Press, 2006.
3. Supply Chain Management by Janat Shah Pearson Publication 2008.

**Reference Books:**

1. Donald J Bowersox, Dand J Closs, M Bixby Coluper, Supply Chain Logistics Management, TMH, Second Edition, 2008.
2. Wisner, Keong Leong and Keah-Choon Tan, Principles of Supply Chain Management A Balanced Approach, Thomson Press, 2005.
3. David Simchi-Levi et al, Designing and Managing the Supply Chain – Concepts, ISBN-13: 978-0072357561

<b>MACHINE LEARNING TECHNIQUES</b> <b>[As per Choice Based Credit System (CBCS) scheme]</b> <b>(Effective from the academic year 2018 -2019)</b> <b>SEMESTER - III</b>			
Subject Code	18LNI322 / 18SCE321 / 18SCN324 / 18SCS31 / 18SFC254 / <b>18SIT322</b> / 18SSE334	IA Marks	40
Number of Contact Hours/Week	04	Exam Marks	60
Total Number of Contact Hours	50	Exam Hours	03
<b>CREDITS – 04</b>			
<b>Course objectives:</b> This course will enable students to <ul style="list-style-type: none"> <li>• Explain basic concepts of learning and decision trees.</li> <li>• Compare and contrast neural networks and genetic algorithms</li> <li>• Apply the Bayesian techniques and instant based learning</li> <li>• Examine analytical learning and reinforced learning</li> </ul>			
<b>Module -1</b>			<b>Contact Hours</b>
<b>INTRODUCTION, CONCEPT LEARNING AND DECISION TREES</b> Learning Problems – Designing Learning systems, Perspectives and Issues – Concept Learning – Version Spaces and Candidate Elimination Algorithm – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>			<b>10Hours</b>
<b>Module -2</b>			
<b>NEURAL NETWORKS AND GENETIC ALGORITHMS:</b> Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evolution and Learning. <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>			<b>10 Hours</b>
<b>Module – 3</b>			
<b>BAYESIAN AND COMPUTATIONAL LEARNING</b> Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier– Bayesian Belief Network – EM Algorithm – Probably Learning – Sample Complexity for Finite and Infinite Hypothesis Spaces – Mistake Bound Model. <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>			<b>10 Hours</b>
<b>Module-4</b>			
<b>INSTANT BASED LEARNING AND LEARNING SET OF RULES:</b> K- Nearest Neighbor Learning – Locally Weighted Regression – Radial Basis Functions –Case-Based Reasoning – Sequential Covering Algorithms – Learning Rule Sets – Learning First Order Rules – Learning Sets of First Order Rules – Induction as Inverted Deduction – Inverting Resolution <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>			<b>10 Hours</b>
<b>Module-5</b>			
<b>ANALYTICAL LEARNING AND REINFORCED LEARNING:</b> Perfect Domain Theories – Explanation Based Learning – Inductive-Analytical Approaches - FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>			<b>10 Hours</b>
<b>Course outcomes:</b>			
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:**

1. Tom M. Mitchell, “Machine Learning”, McGraw-Hill Education (INDIAN EDITION), 2013.

**Reference Books:**

1. Ethem Alpaydin, “Introduction to Machine Learning”, 2<sup>nd</sup> Ed., PHI Learning Pvt. Ltd., 2013.
2. T. Hastie, R. Tibshirani, J. H. Friedman, “The Elements of Statistical Learning”, Springer; 1st edition, 2001.

<b>TRENDS IN ARTIFICIAL INTELLIGENCE AND SOFT COMPUTING</b> <b>[As per Choice Based Credit System (CBCS) scheme]</b> <b>(Effective from the academic year 2018 -2019)</b> <b>SEMESTER – III</b>			
Subject Code	18SCS252 / 18SIT323 / 18SSE254 / <b>18SIT323</b>	IA Marks	40
Number of Lecture Hours/Week	03	Exam Marks	60
Total Number of Lecture Hours	40	Exam Hours	03
<b>CREDITS – 04</b>			
<b>Course objectives:</b> This course will enable students to <ul style="list-style-type: none"> <li>• Describe Artificial Intelligence its utility and intelligent agents</li> <li>• Describe a problem as a state space</li> <li>• Use and implement search techniques</li> <li>• Use knowledge representation techniques for problem solving</li> <li>• Solve AI problems using symbolic reasoning and game theory</li> <li>• Describe and apply neural networks</li> <li>• Describe and apply Fuzzy systems to various problem domains</li> <li>• Describe and apply GA to different problem domains</li> </ul>			
<b>Module 1</b>			<b>Teaching Hours</b>
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			<b>10 Hours</b>

<p>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, Conjunctive Normal Form, conversion to normal form or clausal form</p> <p style="text-align: right;"><b>RBT: L1,L2</b></p>	
<b>Module 2</b>	
<p>Fundamental Problem of Logic: Logic Inadequacy: Fundamental Problem of Logic-Monotonicity with “Flying Penguin” example, General disadvantage of monotonicity property in logic, logic in search space problem, logic in decidability and Incompleteness, Logic in Uncertainty Modelling,</p> <p>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.</p> <p>Reasoning: Types of Reasoning, Methods of reasoning, Application of Reasoning, Forward and Backward Reasoning</p> <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>	<b>10 Hours</b>
<b>Module 3</b>	
<p>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, Simulated Annealing, Best-First Search, Branch and Bound Search, A* search</p> <p>Game Playing: Two player games, Minmax Search, Complexity of Minmax algorithm, Alpha-Beta Pruning</p> <p>Planning: Necessity of planning, Components of Planning, Planning Agents, Plan-generating schemes, Algorithm for planning, Planning Representation with STRIPS, BLOCKS WORLD, difficulties with planning</p> <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>	<b>10 Hours</b>
<b>Module 4</b>	
<p>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</p> <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>	<b>10 Hours</b>
<b>Module 5</b>	
<p>Advancement of AI: Expert System, Expert System structure, Knowledge acquisition, Knowledge representation, Inference control mechanism, User interface, Expert System Shell, Knowledge Representation, Inference Mechanism, Developer Interface and User Interface, Characteristics of Expert system, Advantages of an expert system, Production System, Artificial Neural Networks, Characteristics of Neural Networks, Architecture of neural networks, Types of neural networks, Application of neural networks.</p> <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>	<b>10 Hours</b>
<b>Course Outcomes</b>	
<p>The students should be able to:</p> <ul style="list-style-type: none"> <li>• Design intelligent agents for problem solving, reasoning, planning, decision making, and</li> </ul>	

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, 2<sup>nd</sup> edition

**Reference Books:**

1. Elaine Rich, Kevin Knight, Shivashanka B Nair: Artificial Intelligence, Tata McGraw Hill 3rd edition. 2013
2. Stuart Russel, Peter Norvig: Artificial Intelligence A Modern Approach, Pearson 3rd edition 2013.
3. Neural Networks, Fuzzy Logic and Genetic Algorithms by S. Rajasekaran, G. A. Vijayalakshmi Pai, PHI publication
4. Nils J. Nilsson: "Principles of Artificial Intelligence", Elsevier, ISBN-13: 9780934613101



<b>WEB ENGINEERING</b> <b>[As per Choice Based Credit System (CBCS) scheme]</b> <b>(Effective from the academic year 2018 -2019)</b> <b>SEMESTER - III</b>			
Subject Code	18SCN333 / <b>18SIT324</b>	IA Marks	40
Number of Contact Hours/Week	04	Exam Marks	60
Total Number of Contact Hours	50	Exam Hours	03
<b>CREDITS - 04</b>			
<b>Course objectives:</b> This course will enable students to <ul style="list-style-type: none"> <li>• Demonstrate modeling and requirements of a web application.</li> <li>• Develop technology-Aware Web Application.</li> <li>• Illustrate the web application development Process.</li> <li>• Analyze the performances of web applications</li> </ul>			
<b>Module -1</b>			<b>Contact Hours</b>
Introduction: Motivation, Categories of web applications, Characteristics of web applications. Requirements Engineering: Introduction, Fundamentals, RE specifics in web engineering, Principles of RE for web applications, Adapting RE methods to web application development, Outlook. Modeling Web Application: Introduction, Fundamentals, Modeling specifics in web engineering, Modeling requirements, Content modeling, Hypertext modeling, Presentation modeling, Customization modeling, Methods and tools, Outlook. <b>RBT: L1,L2</b>			<b>10 Hours</b>
<b>Module -2</b>			<b>Contact Hours</b>
Web Application Architectures: Introduction, Fundamentals, Specifics of web application architectures, Components of a generic web application architecture, Layered architectures, Data-aspect architectures. Technology-Aware Web Application Design: Introduction, Web design from an evolutionary perspective, Presentation design, Interaction design, Functional design, Outlook. Technologies for Web Applications: Introduction, Fundamentals, Client/Server communication on the web, Client side technologies, Document-specific technologies, Server-side technologies, Outlook. <b>RBT: L1,L2,L3</b>			<b>10 Hours</b>
<b>Module – 3</b>			<b>Contact Hours</b>
Testing Web Applications: Introduction, Fundamentals, Testing specifics in web engineering, Test approaches, Test scheme, Test methods and techniques, Test automation, Outlook. Operation and Maintenance of Web Applications: Introduction, Challenges following the launch of a web application, Content management, Usage analysis, Outlook. Web Project Management: From software project management to web project management, Challenges in web project management, Managing web teams, Managing the development process of a web application, Outlook. <b>RBT: L1,L2,L3</b>			<b>10 Hours</b>
<b>Module-4</b>			<b>Contact Hours</b>
The Web Application Development Process: Motivation, Fundamentals, Requirements for a web application development process, Analysis of the rational unified process, Analysis of extreme programming, Outlook. Usability of Web Applications: Motivation, What is usability? What characterizes the usability of web applications? Design guidelines, Web usability engineering methods, Web usability engineering trends, Outlook. <b>RBT: L1,L2,L3</b>			<b>10 Hours</b>
<b>Module-5</b>			

<p>Performance of Web Applications: Introduction, What is performance? What characterizes performance of web applications, System definition and indicators, Characterizing the work load, Analytical techniques, Representing and interpreting results, Performance optimization methods, Outlook. Security for web Applications: Introduction, Aspects of security, Encryption, digital signatures, and certificates, Secure Client/Server interaction, Client security issues, Service provider security issues, Outlook. The Semantic Web: Fundamentals of the semantic web, Technological concepts, Specifics of semantic web applications, Tools, Outlook.</p> <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>	<b>10 Hours</b>
<p><b>Course outcomes:</b></p>	
<p>Students will be able to</p> <ul style="list-style-type: none"> <li>• Ability to Model the requirements of a web application.</li> <li>• Contrast technology-aware Web Application.</li> <li>• Ability to analyze the performances of web applications</li> </ul>	
<p><b>Question paper pattern:</b>  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.</p>	
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Gerti Kappel, Birgit Proll, SiegfriedReich, Werner Retschitzegeer (Editors): Web Engineering, Wiley India, 2007.</li> </ol>	
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Roger Pressman, David Lowe: Web Engineering: A Practitioner’s Approach, McGraw Hill, 2008.</li> </ol>	

<b>AGILE TECHNOLOGIES</b> <b>[As per Choice Based Credit System (CBCS) scheme]</b> <b>(Effective from the academic year 2018 -2019)</b> <b>SEMESTER – III</b>			
Subject Code	18SCE324 / 18SCS242 / <b>18SIT331</b> / 18SSE323	IA Marks	40
Number of Contact Hours/Week	04	Exam Marks	60
Total Number of Contact Hours	50	Exam Hours	03
<b>CREDITS – 04</b>			
<b>Course objectives:</b> This course will enable students to <ul style="list-style-type: none"> <li>• Explain iterative, incremental development process leads to faster delivery of more useful software</li> <li>• Evaluate essence of agile development methods</li> <li>• Illustrate the principles and practices of extreme programming</li> <li>• Show the roles of prototyping in the software process</li> <li>• Explain the Mastering Agility</li> </ul>			
<b>Module -1</b>			<b>Contact Hours</b>
<b>Why Agile?:</b> Understanding Success, Beyond Deadlines, The Importance of Organizational Success, Enter Agility, <b>How to Be Agile?:</b> Agile Methods, Don't Make Your Own Method, The Road to Mastery, Find a Mentor  <b>RBT: L1,L2</b>			<b>10 Hours</b>
<b>Module -2</b>			
<b>Understanding XP:</b> The XP Lifecycle, The XP Team, XP Concepts, <b>Adopting XP:</b> Is XP Right for Us?, Go!, Assess Your Agility  <b>RBT: L1,L2,L3</b>			<b>10 Hours</b>
<b>Module – 3</b>			
<b>Practicing XP: Thinking:</b> Pair Programming, Energized Work, Informative Workspace, Root-Cause Analysis, Retrospectives, <b>Collaborating:</b> Trust, Sit Together, Real Customer Involvement, Ubiquitous Language, Stand-Up Meetings, Coding Standards, Iteration Demo, Reporting, <b>Releasing:</b> “Done Done”, No Bugs, Version Control, Ten-Minute Build, Continuous Integration, Collective Code Ownership, Documentation. <b>Planning:</b> Vision, Release Planning, The Planning Game, Risk Management, Iteration Planning, Slack, Stories, Estimating. <b>Developing:</b> Incremental requirements, Customer Tests, Test-Driven Development, Refactoring, Simple Design ,Incremental Design and Architecture, Spike Solutions, Performance Optimization, Exploratory Testing  <b>RBT: L1,L2,L3</b>			<b>10 Hours</b>
<b>Module-4</b>			
<b>Mastering Agility: Values and Principles:</b> Commonalities, About Values, Principles, and Practices, Further Reading, <b>Improve the Process:</b> Understand Your Project, Tune and Adapt, Break the Rules, <b>Rely on People :</b> Build Effective Relationships, Let the Right People Do the Right Things, Build the Process for the People, <b>Eliminate Waste :</b> Work in Small, Reversible Steps, Fail Fast, Maximize Work Not Done, Pursue Throughput  <b>RBT: L1,L2,L3</b>			<b>10 Hours</b>
<b>Module-5</b>			
<b>Deliver Value:</b> Exploit Your Agility, Only Releasable Code Has Value, Deliver Business Results, Deliver Frequently, <b>Seek Technical Excellence :</b> Software Doesn't Exist, Design Is			<b>10 Hours</b>

for Understanding, Design Trade-offs, Quality with a Name, Great Design, Universal Design Principles, Principles in Practice, Pursue Mastery	<b>RBT: L1,L2,L3</b>
<b>Course outcomes:</b>	
Students should be able to	
<ul style="list-style-type: none"> <li>• Define XP Lifecycle, XP Concepts, Adopting XP</li> <li>• Evaluate on Pair Programming, Root-Cause Analysis, Retrospectives, Planning, Incremental Requirements, Customer Tests</li> <li>• Demonstrate concepts to Eliminate Waste</li> </ul>	
<b>Question paper pattern:</b>	
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.	
<b>Text Books:</b>	
1. <b>The Art of Agile Development</b> (Pragmatic guide to agile software development), James shore, Chromatic, O'Reilly Media, Shroff Publishers & Distributors, 2007.	
<b>Reference Books:</b>	
1. Agile Software Development, Principles, Patterns, and Practices, Robert C. Martin, Prentice Hall; 1st edition, 2002.	
2. Agile and Iterative Development A Manger's Guide", Craig Larman Pearson Education, First Edition, India, 2004.	

<b>DATABASE SECURITY</b>			
[As per Choice Based Credit System (CBCS) scheme]			
(Effective from the academic year 2018 -2019)			
<b>SEMESTER – III</b>			
<b>Subject Code</b>	18SCE332 / 18SFC252 / <b>18SIT332</b>	<b>IA Marks</b>	40
<b>Number of Lecture Hours/Week</b>	03	<b>Exam Marks</b>	60
<b>Total Number of Lecture Hours</b>	40	<b>Exam Hours</b>	03
<b>CREDITS – 04</b>			
<b>Course objectives:</b> This course will enable students to			
<ul style="list-style-type: none"> <li>• Fundamental security concepts and architectures that serve as building blocks to database security</li> <li>• Concepts of user account management and administration, including security risks</li> <li>• To use current database management system to design and configure the user and data permissions</li> <li>• Operational components necessary to maximize database security using various security models</li> </ul>			
<b>Module 1</b>			<b>Teaching Hours</b>
Introduction: Introduction to Databases, Security Problems in Databases Security Controls Conclusions. Security Models 1: Introduction, Access Matrix Model, Take-Grant Model, Acten Model, PN Model, Hartson and Hsiao's Model, Fernandez's Model, Bussolati and			<b>8 Hours</b>

Martella's Model for Distributed databases.	<b>RBT: L1,L2</b>
<b>Module 2</b>	
Security Models 2: Bell and LaPadula's Model, Biba's Model, Dion's Model, Sea View Model, Jajodia and Sandhu's Model, The Lattice Model for the Flow Control conclusion. Security Mechanisms: Introduction, User Identification/Authentication, Memory Protection, Resource Protection, Control Flow Mechanisms, Isolation, Security Functionalities in Some Operating Systems, Trusted Computer System, Evaluation Criteria.	<b>8 Hours</b>  <b>RBT: L1,L2</b>
<b>Module 3</b>	
Security Software Design: Introduction, A Methodological Approach to Security, Software Design, Secure Operating System Design, Secure DBMS Design, Security Packages, Database Security Design.	<b>8 Hours</b>  <b>RBT: L1,L2,L3</b>
<b>Module 4</b>	
Statistical Database Protection & Intrusion Detection Systems: Introduction, Statistics, Concepts and Definitions, Types of Attacks, Inference Controls, evaluation Criteria for Control Comparison, Introduction IDES System, RETISS System, ASES System Discovery.	<b>8 Hours</b>  <b>RBT: L1,L2,L3</b>
<b>Module 5</b>	
Models For The Protection Of New Generation Database Systems 1: Introduction, A Model for the Protection of Frame Based Systems, A Model for the Protection of Object-Oriented Systems, SORION Model for the Protection of Object-Oriented Databases. Models For The Protection Of New Generation Database Systems 2: A Model for the Protection of New Generation Database Systems, the Orion Model, Jajodia and Kogan's Model, A Model for the Protection of Active Databases Conclusions.	<b>8 Hours</b>  <b>RBT: L1,L2,L3</b>
<b>Course Outcomes</b>	
The students should be able to: <ul style="list-style-type: none"> <li>• Carry out a risk analysis for a large database</li> <li>• Implement identification and authentication procedures, fine-grained access control and data encryption techniques</li> <li>• Set up accounts with privileges and roles</li> <li>• Audit accounts and the database system</li> </ul>	
<b>Question paper pattern:</b> 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.	
<b>Text Books</b> <ol style="list-style-type: none"> <li>1. Database Security and Auditing, Hassan A. Afyoun i, India Edition, CENGAGE Learning, 2009.</li> <li>2. Database Security, Castano, Second edition, Pearson Education.</li> </ol>	
<b>Reference Books:</b> <ol style="list-style-type: none"> <li>1. Database security by Alfred Basta, Melissa Zgola , CENGAGE learning..</li> </ol>	

<b>OBJECT ORIENTED SOFTWARE ENGINEERING</b> <b>[As per Choice Based Credit System (CBCS) scheme]</b> <b>(Effective from the academic year 2018 -2019)</b> <b>SEMESTER – III</b>			
Subject Code	18SCE334 / 18 SCS253 / <b>18SIT333</b> / 18SSE13	IA Marks	40
Number of Contact Hours/Week	04	Exam Marks	60
Total Number of Contact Hours	50	Exam Hours	03
CREDITS – 04			
<b>Course objectives:</b> This course will enable students to			
<ul style="list-style-type: none"> <li>• Discuss the fundamental principles underlying Object-Oriented software design</li> <li>• Illustrate the requirements of various domain applications</li> <li>• Interpret object-oriented analysis and to familiarize UML concepts</li> <li>• Design, implement and test the software in object oriented approach</li> <li>• Explore the factors related to software maintenance and software configuration management</li> </ul>			
<b>Module 1</b>			<b>Contact Hours</b>
<b>INTRODUCTION:</b> What is software engineering? Software Engineering Concepts, Development Activities, Managing Software Development, Modeling with UML, Project Organization and Communication.  <b>RBT: L1,L2</b>			<b>10 Hours</b>
<b>Module 2</b>			
<b>REQUIREMENT ELICITATION AND ANALYSIS: Requirements Elicitation:</b> Requirements Elicitation Concepts, Requirements Elicitation Activities, Managing Requirements Elicitation, <b>Analysis:</b> Analysis Concepts, Analysis Activities, Managing Analysis.  <b>RBT: L1,L2,L3</b>			<b>10 Hours</b>
<b>Module 3</b>			
<b>SYSTEM DESIGN : System design-Decomposing the system:</b> Overview of System Design, System Design Concepts, System Design Activities: Objects to Subsystems, <b>System Design –Addressing design goals:</b> Activities: An overview of system design actives, UML deployment diagrams, Addressing Design Goals, Managing System Design.  <b>RBT: L1,L2,L3</b>			<b>10 Hours</b>
<b>Module 4</b>			
<b>OBJECT DESIGN, IMPLEMENTATION AND TESTING : Object design-Reusing pattern solutions:</b> An Overview of Object Design, Reuse Concepts: Design Patterns, Reuse Activities, Managing Reuse, <b>Object design-Specifying interface:</b> An overview of interface specification, Interfaces Specification Concepts, Interfaces Specification Activities, Managing Object Design, <b>Mapping model to code:</b> Mapping Models to Code Overview, Mapping Concepts, Mapping Activities, Managing Implementation, Testing: An overview of testing, Testing concepts, Managing testing.  <b>RBT: L1,L2,L3</b>			<b>10 Hours</b>
<b>Module 5</b>			
<b>SOFTWARE MAINTENANCE AND SOFTWARE CONFIGURATION MANAGEMENT: Software maintenance:</b> What is Software Maintenance?, Factors that Mandate Change, Lehman’s Laws of system evolution, Types of software maintenance, Software maintenance process and actives, Reverse Engineering, Software Re-engineering, Patterns for Software Maintenance, Tool support for Software Maintenance. <b>Software</b>			<b>10 Hours</b>

<p><b>Configuration Management:</b> The baseline of Software Life Cycle, What is Software Configuration Management, Why Software Configuration Management, Software Configuration Management Functions, Software Configuration Management Tools.</p> <p style="text-align: right;"><b>RBT: L1,L2,L3</b></p>
<p><b>Course Outcomes</b></p> <p>The students should be able to:</p> <ul style="list-style-type: none"> <li>• Apply Object Oriented Software Engineering approach in every aspect of software project</li> <li>• Analyze the requirements from various domains</li> <li>• Adapt appropriate object oriented design aspects in the development process</li> <li>• Implement and test the software projects using object oriented approach</li> <li>• Learn the issues and concepts relating to maintenance of software projects</li> <li>• Adapt the concepts and tools related to software configuration management</li> </ul>
<p><b>Question paper pattern:</b></p> <p>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.</p>
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>2. Bernd Bruegge, Alan H Dutoit, Object-Oriented Software Engineering, Pearson Education, 3<sup>rd</sup> edition, 2014.</li> <li>3. David C. Kung, “Object oriented software engineering”, Tata McGraw Hill, 2015</li> </ol>
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>2. Stephan R. Schach, “Object oriented software engineering”, Tata McGraw Hill, 2008</li> <li>3. Craig Larman, Applying UML and Patterns, 3rd ed, Pearson Education, 2005.</li> </ol>

<p><b>ADVANCES IN OPERATING SYSTEMS</b>  <b>[As per Choice Based Credit System (CBCS) scheme]</b>  <b>(Effective from the academic year 2018 -2019)</b>  <b>SEMESTER – III</b></p>			
Subject Code	18SCS12 / <b>18SIT334</b>	IA Marks	40
Number of Lecture Hours/Week	04	Exam Marks	60
Total Number of Lecture Hours	50	Exam Hours	03
<b>CREDITS – 04</b>			
<p><b>Course objectives:</b> This course will enable students to</p> <ul style="list-style-type: none"> <li>• Define the fundamentals of Operating Systems.</li> <li>• Explain distributed operating system concepts that includes architecture, Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols</li> <li>• Illustrate distributed resource management components viz. the algorithms for implementation of distributed shared memory, recovery and commit protocols</li> <li>• Identify the components and management aspects of Real time, Mobile operating Systems</li> </ul>			
<b>Module 1</b>			<b>Teaching Hours</b>
<b>Operating System Overview, Process description &amp; Control:</b> Operating System			<b>10 Hours</b>

Objectives and Functions, The Evolution of Operating Systems, Major Achievements, Developments Leading to Modern Operating Systems, Microsoft Windows Overview, Traditional UNIX Systems, Modern UNIX Systems, What is a Process?, Process States, Process Description, Process Control, Execution of the Operating System, Security Issues. <b>RBT: L1,L2</b>	
<b>Module 2</b>	
<b>Threads, SMP, and Microkernel, Virtual Memory:</b> Processes and Threads, Symmetric Multiprocessing (SMP), Micro Kernels, Windows Vista Thread and SMP Hours Management, Linux Process and Thread Management. Hardware and Control Structures, Operating System Software, UNIX Memory Management, Windows Vista Memory Management, Summary <b>RBT: L1,L2,L3</b>	<b>10 Hours</b>
<b>Module 3</b>	
<b>Multiprocessor and Real-Time Scheduling:</b> Multiprocessor Scheduling, Real-Time Scheduling, Linux Scheduling, UNIX PreclsSI) Scheduling, Windows Vista Hours Scheduling, Process Migration, Distributed Global States, Distributed Mutual Exclusion, Distributed Deadlock <b>RBT: L1,L2,L3</b>	<b>10 Hours</b>
<b>Module 4</b>	
<b>Embedded Operating Systems:</b> Embedded Systems, Characteristics of Embedded Operating Systems, eCOS, TinyOS, Computer Security Concepts, Threats, Attacks, and Assets, Intruders, Malicious Software Overview, Viruses, Worms, and Bots, Rootkits. <b>RBT: L1,L2,L3</b>	<b>10 Hours</b>
<b>Module 5</b>	
<b>Kernel Organization:</b> Using Kernel Services, Daemons, Starting the Kernel, Control in the Machine , Modules and Device Management, MODULE Organization, MODULE Installation and Removal, Process and Resource Management,Running Process Manager, Creating a new Task , IPC and Synchronization, The Scheduler , Memory Manager , The Virtual Address Space, The Page Fault Handler , File Management. The windows NT/2000/XP kernel: Introduction, The NT kernel, Objects , Threads, Multiplication Synchronization,Traps,Interrupts and Exceptions, The NT executive , Object Manager, Process and Thread Manager , Virtual Memory Manager, I/o Manager, The cache Manager Kernel local procedure calls and IPC, The native API, subsystems. <b>RBT: L1,L2,L3</b>	<b>10 Hours</b>
<b>Course Outcomes</b>	
The students should be able to: <ul style="list-style-type: none"> <li>• Demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system</li> <li>• Learn the various resource management techniques for distributed systems</li> <li>• Identify the different features of real time and mobile operating system</li> <li>• Modify existing open source kernels in terms of functionality or features used</li> </ul>	
<b>Question paper pattern:</b> 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.	
<b>Text Books:</b> <ol style="list-style-type: none"> <li>1. William Stallings: Operating Systems: Internals and Design Principles, 6th Edition, Prentice Hall, 2013.</li> <li>2. Gary Nutt: Operating Systems, 3rd Edition, Pearson, 2014.</li> </ol>	



**Reference Books:**

1. Silberschatz, Galvin, Gagne: Operating System Concepts, 8th Edition, Wiley, 2008
2. Andrew S. Tanenbaum, Albert S. Woodhull: Operating Systems, Design and Implementation, 3<sup>rd</sup> Edition, Prentice Hall, 2006.
3. Pradeep K Sinha: Distribute Operating Systems, Concept and Design, PHI, 2007