VISVESVARAYA TECHNOLOGICAL UNIVERSITY BELAGAVI

Scheme of Teaching and Examinations and Syllabus
M.Tech Information Technology (SIT)
(Effective from Academic year 2020 - 21)

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
Scheme of Teaching and Examinations – 2020 - 21
M.Tech in Information Technology (SIT)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

I SEMESTER

SL. No.	Course	Course Code	Course Title	Teaching Hours / Week			Examination				Credits
				Theory	Practical / Seminar	Skill Development	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
1	PCC	20SIT11	Mathematical Foundations of Computer Science	03	--	02	03	40	60	100	4
2	PCC	20SIT12	Enterprise Application Programming	03	--	02	03	40	60	100	4
3	PCC	20SIT13	Data Compression	03	--	02	03	40	60	100	4
4	PCC	20SIT14	Advances in Data Base Management System	03	--	02	03	40	60	100	4
5	PCC	20SIT15	Distributed Operating System	03	--	02	03	40	60	100	4
6	PCC	20SITL16	ADBMS Laboratory	--	04	--	03	40	60	100	2
7	PCC	20RMI17	Research Methodology and IPR	01	--	02	03	40	60	100	2
			TOTAL	**16**	**04**	**12**	**21**	**280**	**420**	**700**	**24**

Note: PCC: Profession Core

Skill development activities:
Students and course instructor/s to involve either individually or in groups to interact together to enhance the learning and application skills. The students should interact with industry (small, medium and large), understand their problems or foresee what can be undertaken for study in the form of research/ testing / projects, and for creative and innovative methods to solve the identified problem. The students shall

1. Gain confidence in modelling of systems and algorithms.
2. Work on different software/s (tools) to Simulate, analyze and authenticate the output to interpret and conclude. Operate the simulated system under changed parameter conditions to study the system with respect to thermal study, transient and steady state operations, etc.
3. Handle advanced instruments to enhance technical talent.
4. Involve in case studies and field visits/ field work.
5. Accustom with the use of standards/codes etc., to narrow the gap between academia and industry.

All activities should enhance student's abilities to employment and/or self-employment opportunities, management skills, Statistical analysis, fiscal expertise, etc.

Internship: All the students have to undergo mandatory internship of 6 weeks during the vacation of I and II semesters and /or II and III semesters. A University examination shall be conducted during III semester and the prescribed credit shall be counted for the same semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take-up/complete the internship shall be declared as fail in internship course and have to complete the same during the subsequent University examination after satisfying the internship requirements.

Note: (i) Four credit courses are designed for 50 hours Teaching – Learning process.

(ii) Three credit courses are designed for 40 hours Teaching – Learning process.

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M.Tech in Information Technology (SIT)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

II SEMESTER

SL. No.	Course	Course Code	Course Title	Teaching Hours / Week			Examination				Credits
				Theory	Practical / Seminar	Skill Development Activity	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
1	PCC	20SIT21	Web Services	03	--	02	03	40	60	100	4
2	PCC	20SIT22	Cloud Computing	03	--	02	03	40	60	100	4
3	PCC	20SIT23	Data Mining & Data Warehousing	03	--	02	03	40	60	100	4
4	PEC	20SIT24X	Professional elective 1	04	--	--	03	40	60	100	4
5	PEC	20SIT25X	Professional elective 2	04	--	--	03	40	60	100	4
6	PCC	20SITL26	Mini Project	--	04	--	03	40	60	100	2
7	PCC	20SIT27	Technical Seminar	--	02	--	--	100	--	100	2
			TOTAL	**17**	**06**	**06**	**18**	**340**	**360**	**700**	**24**

Note: PCC: Profession Core, PEC: Professional Elective Course

Professional Elective-1		Professional Elective-2	
Course Code 20SIT24X	**Course Title**	**Course Code 20SIT25X**	**Course Title**
20SIT241	Mobile Application Development	20SIT251	Advances in Computer Graphics
20SIT242	Bioinformatics	20SIT252	Business Intelligence and its Applications
20SIT243	Software Metrics & Quality Assurance	20SIT253	Advances in Storage Area Network
20SIT244	Cyber Security and Cyber law	20SIT254	Software Project Planning & Management

Note:

1. Technical Seminar: CIE marks shall be awarded by a committee comprising of HoD as Chairman, Guide/co-guide, if any, and a senior faculty of the department. Participation in the seminar by all postgraduate students of the program shall be mandatory.
The CIE marks awarded for Technical Seminar, shall be based on the evaluation of Seminar Report, Presentation skill and performance in Question and Answer session in the ratio 50:25:25.

2. Internship: All the students shall have to undergo mandatory internship of 6 weeks during the vacation of I and II semesters and /or II and III semesters. A University examination shall be conducted during III semester and the prescribed internship credit shall be counted in the same semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take-up/complete the internship shall be declared as fail in internship course and have to complete the same during the subsequent University examination after satisfying the internship
requirements.

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III SEMESTER

SL. No.	Course	Course Code	Course Title	Teaching Hours / Week			Examination				Credits
				Theory	Practical / Seminar	Skill Development	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
1	PCC	20SIT31	Managing Big Data	03	--	02	03	40	60	100	4
2	PEC	20SIT32X	Professional elective 3	03	--	--	03	40	60	100	3
3	PEC	20SIT33X	Professional elective 4	03	--	--	03	40	60	100	3
4	Project	20SIT34	Project Work phase -1	--	02	--	--	100	--	100	2
5	PCC	20SIT35	Mini-Project	--	02	--	--	100	--	100	2
6	Internship	20SITI36	Internship	(Completed during the intervening vacation of I and II semesters and /or II and III semesters.)			03	40	60	100	6
			TOTAL	09	04	02	12	360	240	600	20

Note: PCC: Profession Core, PEC: Professional Elective Course

Professional Elective-3		Professional Elective-4	
Course Code 20SIT32X	Course Title	Course Code 20SIT33X	Course Title
20SIT321	Supply Chain Management	20SIT331	Agile Technologies
20SIT322	Machine Learning Techniques	20SIT332	Database Security
20SIT323	Trends in Artificial Intelligence and Soft Computing	20SIT333	Object Oriented Software Engineering
20SIT324	Web Engineering	20SIT334	Advances In Operating Systems

Note:
1. Project Work Phase-1: Students in consultation with the guide/co-guide if any, shall pursue literature survey and complete the preliminary requirements of selected Project work. Each student shall prepare relevant introductory project document and present a seminar.
CIE marks shall be awarded by a committee comprising of HoD as Chairman, Guide/co-guide if any, and a senior faculty of the department. The CIE marks awarded for project work phase -1, shall be based on the evaluation of Project Report, Project Presentation skill and Question and Answer session in the ratio 50:25:25. SEE (University examination) shall be as per the University norms.
2. Internship: Those, who have not pursued /completed the internship shall be declared as fail in internship course and have to complete the same during subsequent University examinations after satisfying the internship requirements. Internship SEE (University examination) shall be as per the University norms.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
Scheme of Teaching and Examinations – 2020 - 21
M.Tech in Information Technology (SIT)
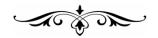**Choice Based Credit System (CBCS) and Outcome Based Education (OBE)**

IV SEMESTER

SL. No.	Course	Course Code	Course Title	Theory	Practical / Seminar	Skill Development Activity	Duration in Hours	CIE Marks	SEE Marks	Total Marks	Credits
				Teaching Hours / Week			**Examination**				
1	Project	20SIT41	Project work phase 2	--	04	03	03	40	60	100	20
			TOTAL	**--**	**04**	**03**	**03**	**40**	**60**	**100**	**20**

Note:
Project Work Phase-2:
CIE marks shall be awarded by a committee comprising of HoD as Chairman, Guide/co-guide, if any, and a Senior faculty of the department. The CIE marks awarded for project work phase -2, shall be based on the evaluation of Project Report subjected to plagiarism check, Project Presentation skill and Question and Answer session in the ratio 50:25:25.

SEE shall be at the end of IV semester. Project work evaluation and Viva-Voce examination (SEE), after satisfying the plagiarism check, shall be as per the University norms.

M.TECH IN NETWORK AND INTERNET ENGINEERING (LNI) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER -I MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE			
Course Code	20LNI11, 20SCS11, 20SCE11, 20SFC11, 20SCN11, 20SSE11, 20SIT11, 20SAM11, 20SIS11	CIE Marks	40
Teaching Hours/Week (L:P:S)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Vector Spaces: Vector spaces; subspaces Linearly independent and dependent vectors Basis and dimension; coordinate vectors-Illustrative examples. Linear transformations, Representation of transformations by matrices;
(RBT Levels: **L1 & L2)** (Textbook:1)

Module-2

Orthogonality and least squares: Inner product, orthogonal sets, orthogonal projections, orthogonal bases. Gram-Schmidt orthogonalization process. QR factorizations of a matrices, least square problems, applications to linear models (least square lines and least square fitting of other curves).
(RBT Levels: **L2 & L3)** (Textbook:1)

Module-3

Symmetric and Quadratic Forms: Diagonalization, Quadratic forms, Constrained Optimization, The Singular value decomposition. Applications to image processing and statistics, Principal Component Analysis
(RBT Levels: **L2 & L3)** (Textbook:1)

Module-4

Statistical Inference: Introduction to multivariate statistical models: Correlation and Regression analysis, Curve fitting (Linear and Non-linear)
(RBT Levels: **L2 & L3)** (Textbook:3)

Module-5

ProbabilityTheory: Random variable (discrete and continuous), Probability mass function (pmf), Probability density function (pdf), Mathematical expectation, Sampling theory: testing of hypothesis by t-test, χ^2- test.
(RBT Levels: **L1 & L2)** (Textbook:3)

Course Outcomes:

On completion of this course, students are able to:
1. Understand the numerical methods to solve and find the roots of the equations.
2. Apply the technique of singular value decomposition for data compression, least square approximation in solving inconsistent linear systems
3. Understand vector spaces and related topics arising in magnification and rotation of images.
4. Utilize the statistical tools in multi variable distributions.
5. Use probability formulations for new predictions with discrete and continuous RV's.

Question Paper Pattern:
- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have ten full questions carrying equal marks.
- Each full question consisting of 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbooks:

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Linear Algebra and its Applications	David C. Lay, Steven R. Lay and J. J. McDonald	Pearson Education Ltd	5th Edition 2015.
2	Numerical methods for Scientific and Engg. Computation	M K Jain, S.R.K Iyengar, R K. Jain	New Age International	6th Ed., 2014

3	Probability, Statistics and Random Process	T. Veerarajan	Tata Mc-Graw Hill Co	3rd Edition 2016
Reference books:				
Sl No	**Title of the book**	**Name of the Author/s**	**Publisher Name**	**Edition and year**
1	Optimization: Theory & Applications Techniques	Rao. S.S	Wiley Eastern Ltd New Delhi.	
2	Signals, Systems, and Inference	Alan V. Oppenheim and George C. Verghese	Spring	2010.
3	Foundation Mathematics for Computer Science	John Vince	Springer International	
4	Higher Engineering Mathematics	B.S. Grewal	Khanna Publishers	44th Ed.,2017

M.TECH INFORMATION TECHNOLOGY (SIT)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - I
ENTERPRISE APPLICATION PROGRAMMING

Course Code	**20SIT12**, 20SFC253, 20SSE22	CIE Marks	40
TeachingHours/Week (L:P:S)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Web application and java EE 6: Exploring the HTTP Protocol, Introducing web applications, describing web containers, exploring web architecture models, exploring the MVC architecture. **Working with servlets 3.0** 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.

Module 2

Handling sessions in servlet 3.0: Describing a session, introducing session tracking, Exploring the session tracking, mechanisms, using the java servlet API for session tracking, creating login application using session tracking. **Implementing event handling** Introducing events, Introducing event handling, working with the servlet events, developing the online shop web application. **Working with java server pages:** Introducing JSP technology, Exploring new features of JSP2.1, listing advantages of JSP over java servlet, Exploring the architecture of a JSP page, Describing the life cycle of a JSP page, working with JSP basic tags and implicit objects, working with the action tags in JSP, exploring the JSP unified EL, using functions with EL.

Module 3

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

Module 4

Persistence Management and Design Patterns: Implementing java persistence using hibernate Introducing hibernate, exploring the architecture of hibernate, downloading hibernate, exploring HQL, understanding hibernate O/R mapping, working with hibernate,Implementing O/R mapping with hibernate. **Java EE design patterns:** Describing the java EE application architecture, Introducing a design patterns, discussing the role of design patterns, exploring types of patterns.

Module 5

Web Frameworks: Working with struts 2 Introducing struts 2, understanding actions in struts 2.**Working with java server faces 2.0:** Introducing JSF, Explaining the features of JSF, Exploring the JSF architecture, describing JSF elements, Exploring the JSF request processing life cycle. **Working with spring 3.0:** Introducing features of the spring framework, exploring the spring framework architecture,

exploring dependency injection & inversion of control, exploring AOP with spring, managing transactions. **Securing java EE 6 applications:** Introducing security in java EE 6, exploring security mechanisms, implementing security on an application server.

Course outcomes:

At the end of the course the student will be able to:

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

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	JAVA SERVER PROGRAMMING JAVA EE6(J2EE 1.6),	Kogent learning solution	Dreamtech press	2014

Reference Books

1.	Java Complete Reference	Herbert Schildt	McGraw Hill	

M.TECH INFORMATION TECHNOLOGY (SIT)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - I
DATA COMPRESSION

Course Code	**20SIT13**	CIE Marks	40
TeachingHours/Week (L:P:S)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

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

Module 2

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

Module 3

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

Module 4

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

Module 5

 Video Compression: 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.

Course outcomes:

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

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Introduction to data compression	Khalid sayood	Elsevier	4th edition, 2014
Reference Books				
2	Data compression, The complete reference	David Salomon	Springer	4th edition 2014

M.TECH INFORMATION TECHNOLOGY (SIT)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - I
ADVANCES IN DATA BASE MANAGEMENT SYSTEM

Course Code	**20SIT14,** 20SCE252, 20SSE15	CIE Marks	40
TeachingHours/Week (L:P:S)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Review of Relational Data Model and Relational Database Constraints:
Relational model concepts; Relational model constraints and relational database schemas; Update operations, anomalies, dealing with constraint violations, Types and violations.

Object and Object-Relational Databases:
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.

Module-2

Disk Storage, Basic File Structures, Hashing, and Modern Storage Architectures:
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.

Distributed Database Concepts:
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.

Module-3

NOSQL Databases and Big Data Storage Systems:
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.

Big Data Technologies Based on MapReduce and Hadoop:
What Is Big Data? Introduction to MapReduce and Hadoop, Hadoop Distributed File System (HDFS), MapReduce: Additional Details Hadoop v2 alias YARN, General Discussion

Module-4

Enhanced Data Models: Introduction to Active, Temporal, Spatial, Multimedia, and Deductive Databases:
Active Database Concepts and Triggers, Temporal Database Concepts, Spatial Database Concepts, Multimedia Database Concepts, Introduction to Deductive Databases.

Introduction to Information Retrieval and Web Search:
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

Module-5

Data Mining Concepts:
Overview of Data Mining Technology, Association Rules, Classification, Clustering, Approaches to Other Data Mining Problems, Applications of Data Mining, Commercial Data Mining Tools

Overview of Data Warehousing and OLAP:
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.

Course outcomes:
At the end of the course the student will be able to:
- Select the appropriate high performance database like parallel and distributed database
- Infer and represent the real world data using object oriented database
- Interpret rule set in the database to implement data warehousing of mining
- Discover and design database for recent applications database for better interoperability

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Fundamentals of Database Systems	Elmasri and Navathe	Pearson Education	2013
2	Database Management Systems	Raghu Ramakrishnan and Johannes Gehrke	McGraw-Hill	3rd Edition, 2013.

Reference Books

1	Database System Concepts	Abraham Silberschatz, Henry F. Korth, S. Sudarshan	McGraw Hill	6th Edition, 2010

M.TECH INFORMATION TECHNOLOGY (SIT)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - I
DISTRIBUTED OPERATING SYSTEM

Course Code	**20SIT15**, 20SCE15	CIE Marks	40

TeachingHours/Week (L:P:S)	3:0:2		SEE Marks	60
Credits	04		Exam Hours	03

Module-1

Fundamentals: 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).

　　　　Message Passing: 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.

Module 2

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

Module 3

Distributed Shared Memory: 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. **Synchronization:** Introduction, Clock Synchronization, Event Ordering, Mutual Exclusion, Dead Lock, Election Algorithms.

Module 4

Resource Management: Introduction, Desirable Features of a Good Global Scheduling Algorithm, Task Assignment Approach, Load – Balancing Approach, Load – Sharing Approach **Process Management:** Introductjion, Process Migration, Threads.

Module 5

Distributed File Systems: 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.

Course outcomes:

At the end of the course the student will be able to:

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

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Distributed Operating Systems: Concepts and Design	Pradeep. K. Sinha	PHI	2007

Reference Books

1	Distributed Operating Systems	Andrew S. Tanenbaum	Pearson Education	2013

M.TECH INFORMATION TECHNOLOGY (SIT)			
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)			
SEMESTER - I			
ADBMS LABORATORY			
Course Code	**20SITL16**	CIE Marks	40
TeachingHours/Week (L:P:S)	0:4:0	SEE Marks	60
Credits	02	Exam Hours	03

List of Experiments	

Note:
PART A: The following experiments may be implemented on MySQL/ORACLE or any other suitable RDBMS with support for Object features
PART B: Mini project

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."

PART B: Develop a mini project
Course outcomes:
At the end of the course the student will 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) aretobeincludedforpracticalexamination.   Evaluation: 50% of the marks allotted for lab experiment execution and remaining 50% marks for the project demo.   Students are allowed to pick one experimentfrom **list of the experiment**   Strictlyfollow theinstructions 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.**

RESEARCH METHODOLOGY AND IPR			
Course Code	20RMI17	CIE Marks	40
Teaching Hours/Week (L:P:SDA)	1:0:2	SEE Marks	60
Credits	02	Exam Hours	03
Module-1			

Research Methodology: Introduction, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, and Problems Encountered by Researchers in India.
Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration. ⍰

Module-2

Reviewing the literature: Place of the literature review in research, Bringing clarity and focus to your research problem, Improving research methodology, Broadening knowledge base in research area, Enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed.

Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs.

Module-3

Design of Sampling: Introduction, Sample Design, Sampling and Non-sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs.

Measurement and Scaling: Qualitative and Quantitative Data, Classifications of Measurement Scales, Goodness of Measurement Scales, Sources of Error in Measurement Tools, Scaling, Scale Classification Bases, Scaling Technics, Multidimensional Scaling, Deciding the Scale.

Data Collection: Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method.

Module-4

Testing of Hypotheses: Hypothesis, Basic Concepts Concerning Testing of Hypotheses, Testing of Hypothesis, Test Statistics and Critical Region, Critical Value and Decision Rule, Procedure for Hypothesis Testing, Hypothesis Testing for Mean, Proportion, Variance, for Difference of Two Mean, for Difference of Two Proportions, for Difference of Two Variances, P-Value approach, Power of Test, Limitations of the Tests of Hypothesis.

Chi-square Test: Test of Difference of more than Two Proportions, Test of Independence of Attributes, Test of Goodness of Fit, Cautions in Using Chi Square Tests.

Module-5

Interpretation and Report Writing: Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports.

Intellectual Property: The Concept, Intellectual Property System in India, Development of TRIPS Complied Regime in India, Patents Act, 1970, Trade Mark Act, 1999,The Designs Act, 2000, The Geographical Indications of Goods (Registration and Protection) Act1999, Copyright Act,1957,The Protection of Plant Varieties and Farmers' Rights Act, 2001,The Semi-Conductor Integrated Circuits Layout Design Act, 2000, Trade Secrets, Utility Models, IPR and Biodiversity, The Convention on Biological Diversity (CBD) 1992, Competing Rationales for Protection of IPRs, Leading International Instruments Concerning IPR, World Intellectual Property Organisation (WIPO),WIPO and WTO, Paris Convention for the Protection of Industrial Property, National Treatment, Right of Priority, Common Rules, Patents, Marks, Industrial Designs, Trade Names, Indications of Source, Unfair Competition, Patent Cooperation Treaty (PCT), Advantages of PCT Filing, Berne Convention for the Protection of Literary and Artistic Works, Basic Principles, Duration of Protection, Trade Related Aspects of Intellectual Property Rights(TRIPS) Agreement, Covered under TRIPS Agreement, Features of the Agreement, Protection of Intellectual Property under TRIPS, Copyright and Related Rights, Trademarks, Geographical indications, Industrial Designs, Patents, Patentable Subject Matter, Rights Conferred, Exceptions, Term of protection, Conditions on Patent Applicants, Process Patents, Other Use without Authorization of the Right Holder, Layout-Designs of Integrated Circuits, Protection of Undisclosed Information, Enforcement of Intellectual Property Rights, UNSECO.

Course outcomes:

At the end of the course the student will be able to:

- Discuss research methodology and the technique of defining a research problem
- Explain the functions of the literature review in research, carrying out a literature search, developing theoretical and conceptual frameworks and writing a review.
- Explain various research designs, sampling designs, measurement and scaling techniques and also different methods of data collections.
- Explain several parametric tests of hypotheses, Chi-square test, art of interpretation and writing research reports
- Discuss various forms of the intellectual property, its relevance and business impact in the changing global business environment and leading International Instruments concerning IPR.

Question paper pattern:

- The question paper will have ten questions.
- Each full question is for 20 marks.
- There will be 2full questions (with a maximum of four sub questions in one full question) from each module.
- Each full question with sub questions will cover the contents under a module.
- Students will have to answer 5 full questions, selecting one full question from each module.

Textbooks

(1) Research Methodology: Methods and Techniques, C.R. Kothari, Gaurav Garg,New Age International,4th Edition, 2018.

(2) Research Methodology a step-by-step guide for beginners. (For the topic Reviewing the literature under module 2), RanjitKumar,SAGE Publications,3rd Edition, 2011.

(3) Study Material (For the topic Intellectual Property under module 5),
Professional Programme Intellectual Property Rights, Law and Practice, The Institute of Company Secretaries of India, Statutory Body Under an Act of Parliament, September 2013.

Reference Books

(1) Research Methods: the concise knowledge base, Trochim, Atomic Dog Publishing, 2005.

(2) Conducting Research Literature Reviews: From the Internet to Paper, Fink A, Sage Publications, 2009.

M.TECH INFORMATION TECHNOLOGY (SIT)			
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)			
SEMESTER - II			
WEB SERVICES			
Course Code	**20SIT21**, 20LNI242	CIE Marks	40
TeachingHours/Week (L:P:S)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03
Module-1			
Middleware: Understanding the middle ware, RPC and Related Middle ware, TP Monitors, Object Brokers, Message-Oriented Middleware.			
Module 2			
Web Services: Web Services Technologies, Web Services Architecture.			
Module 3			
Basic Web Services Technology: WSDL Web Services Description Language, UDDI Universal Description Discovery and Integration, Web Services at work interactions between the Specifications, Related Standards.			
Module 4			

Service Coordination Protocols: Infrastructure for Coordination Protocols, WS- Coordination, WS-Transaction, Rosetta Net and Other Standards Related to Coordination Protocols.

Module 5

Service Composition: 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.

Course outcomes:

At the end of the course the student will be able to:

- Bind and unbind services in UDDI.
- Develop WSDL document
- Implement web service client to call public service.
- Implement a service and exposing it as public service.

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Web Services(Concepts ,Architectures and Applications),	Gustavo A, F Casati, Harumi Kuno, Vijay M	Springer	International Edition 2009.

Reference Books

1	Web Services	Guruge Anura	Elsvier	

M.TECH INFORMATION TECHNOLOGY (SIT)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - II
CLOUD COMPUTING

Course Code	**20SIT22** , 20LNI15, 20SCE14, 20SSE251, 20SCN31, 20SCS243, 20SIS12	CIE Marks	40
TeachingHours/Week (L:P:S)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

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

Module 2

Cloud Computing: Application Paradigms.: 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.

Module 3

Cloud Resource Virtualization: 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

Module 4
Cloud Resource Management and Scheduling: Policies and mechanisms for resource management, Application of control theory to task scheduling on a cloud, Stability of a two-level resource allocation architecture, Feedback control based on dynamic thresholds, Coordination of specialized autonomic performance managers, A utility-based model for cloud-based Web services, Resourcing bundling: Combinatorial auctions for cloud resources, Scheduling algorithms for computing clouds, Fair queuing, Start-time fair queuing, Borrowed virtual time, Cloud scheduling subject to deadlines, Scheduling MapReduce applications subject to deadlines, Resource management and dynamic scaling, Exercises and problems.
Module 5
Cloud Security, Cloud Application Development: 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.

Course outcomes:

At the end of the course the student will be able to:

- Compare the strengths and limitations of cloud computing
- Identify the architecture, infrastructure and delivery models of cloud computing
- Apply suitable virtualization concept.
- Choose the appropriate cloud player
- Address the core issues of cloud computing such as security, privacy and interoperability
- Design Cloud Services
- Set a private cloud

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Cloud Computing Theory and Practice	Dan C Marinescu	Elsevier(MK)	2013.

Reference Books

1	RajkumarBuyya , James Broberg, AndrzejGoscinski	Computing Principles and Paradigms	Willey	2014
2	Cloud Computing Implementation, Management and Security	John W Rittinghouse, James F Ransome	CRC Press	2013

M.TECH INFORMATION TECHNOLOGY (SIT)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - II
DATA MINING & DATA WAREHOUSING

Course Code	**20SIT23,** 20SFC251, 20SSE241, 20SIS331	CIE Marks	40

TeachingHours/Week (L:P:S)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

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

Module -2

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

Module – 3

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

Module-4

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

Module-5

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

Course outcomes:

At the end of the course the student will be able to:

- Demonstrate Storing voluminous data for online processing, Preprocess the data for mining applications
- Apply the association rules for mining the data
- Design and deploy appropriate classification techniques
- Cluster the high dimensional data for better organization of the data
- Discover the knowledge imbibed in the high dimensional system

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Data Mining Concepts and Techniques	Jiawei Han, MichelineKamber, Jian Pei	ELSEVIER	3rd edition 2012

Reference Books

M.TECH INFORMATION TECHNOLOGY (SIT)			
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)			
SEMESTER - II			
MOBILE APPLICATION DEVELOPMENT			
Course Code	**20SIT241**, 20LNI323, 20SCN244, 20SFC332 , 20SIS2	CIE Marks	40
TeachingHours/Week (L:P:S)	4:0:0	SEE Marks	60

Credits	04		Exam Hours	03

Module-1

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.

Module -2

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.

Module – 3

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.

Module-4

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.

Module-5

Displaying web pages and maps, communicating with SMS and emails. Creating and using content providers: Creating and consuming services, publishing android applications

Course outcomes:

At the end of the course the student will be able to:

- Describe the requirements for mobile applications
- Explain the challenges in mobile application design and development
- Develop design for mobile applications for specific requirements
- 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 SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Mobile Computing: (technologies and Applications	N. N. Jani	S chand	
2	Android programming	B.M.Hirwani	Pearson publications	2013
3	Android in Action	W. Frank Ableson, RobiSen and C. E. Ortiz	DreamTech Publisher	Third Edition-2012

Reference Books

M.TECH INFORMATION TECHNOLOGY (SIT)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - II

BIOINFORMATICS			
Course Code	**20SIT242**, 20LNI253	CIE Marks	40
TeachingHours/Week (L:P:S)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

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.

Module -2

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.

Module – 3

MODELING FOR BIOINFORMATICS : Hidden markovmodeling 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.

Module-4

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.

Module-5

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

Course outcomes:

At the end of the course the student will be able to:

- Deploy the data warehousing and data mining techniques in Bioinformatics
- 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 SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Bio Informatics Technologies	Yi-Ping Phoebe Chen	Springer Verlag	2014

Reference Books

1	Bioinformatics Concepts Skills and Applications	Rastogi S c		

M.TECH INFORMATION TECHNOLOGY (SIT)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - II

SOFTWARE METRICS & QUALITY ASSURANCE			
Course Code	**20SIT243**, 20SFC334, 20SSE242	CIE Marks	40

TeachingHours/Week (L:P:S)	4:0:0		SEE Marks	60
Credits	04		Exam Hours	03

Module-1

What Is Software Quality: Quality: Popular Views, Quality Professional Views, Software Quality, Total Quality Management and Summary. **Fundamentals Of Measurement Theory:** Definition, Operational Definition, And Measurement, Level Of Measurement, Some Basic Measures, Reliability And Validity, Measurement Errors, Be Careful With Correlation, Criteria For Causality, Summary. **Software Quality Metrics Overview:** Product Quality Metrics, In Process Quality Metrics, Metrics for Software Maintenance, Examples For Metrics Programs, Collecting Software Engineering Data.

Module -2

Applying The Seven Basic Quality Tools In Software Development : Ishikawa's Seven Basic Tools, Checklist, Pareo Diagram, Histogram, Run Charts , Scatter Diagram, Control Chart, Cause And Effect Diagram. **The Rayleigh Model:** Reliability Models, The Rayleigh Model Basic Assumptions, Implementation, Reliability And Predictive Validity.

Module – 3

Complexity Metrics And Models: Lines Of Code, Halstead's Software Science ,Cyclomatic Complexity Syntactic Metrics, An Example Of Module Design Metrics In Practice .**Metric And Lessons Learned For Object Oriented Projects:** Object Oriented Concepts And Constructs, Design And Complexity Metrics, Productivity Metrics, Quality And Quality Management Metrics, Lessons Learned For object oriented Projects.

Module-4

Availability Metrics: 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 .**Conducting Software Project Assessment :**Audit Ad Assessment , Software Process Maturity Assessment And Software Project Assessment , Software Process Assessment A Proponed Software Project Assessment Method.

Module-5

Dos And Don'ts Of Software Process Improvement : 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. **Using Function Point Metrics to Measure Software Process Improvement: Software** Process Improvement Sequences, Process Improvement Economies, Measuring Process Improvement at Activity Levels

Course outcomes:

At the end of the course the student will be able to:

- Identify and apply various software metrics, which determines the quality level of software
- Identify and evaluate the quality level of internal and external attributes of the software product
- Compare and Pick out the right reliability model for evaluating the software
- Evaluate the reliability of any given software product
- Design new metrics and reliability models for evaluating the quality level of the software based on the requirement

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Metrics and Models in Software	Stephen H Khan	Pearson	2nd edition 2013

	Quality Engineering,			
Reference Books				
1	Software Metrics	Norman E-Fentorand Share Lawrence Pflieger	International Thomson Computer Press	1997
2	Software quality and Testing Market,.	S.A.Kelkar	PHI Learing, Pvt, Ltd	2012
3	Managing the Software Inc,.	Watts S Humphrey	Process Pearson Education	2008
4	CMMI	Mary Beth Chrissis, Mike Konrad and Sandy	Pearson Education(Singapore	2003
5	Quality is Free: The Art of Making Quality Certain	Philip B Crosby	Mass Market	1992

M.TECH INFORMATION TECHNOLOGY (SIT)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - II
CYBER SECURITY AND CYBER LAW

Course Code	**20SIT244,** 20LNI244, 20SCE244,20SAM244	CIE Marks	40
TeachingHours/Week (L:P:S)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

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.

Module -2

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

Module – 3

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).

Module-4

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, Forensics Auditing, Antiforensics.

Module-5

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.

Course outcomes:
At the end of the course the student will be able to:
- Define cyber security, cyber law and their roles
- Demonstrate cyber security cybercrime and forensics.
- Infer legal issues in cybercrime,
- Demonstrate tools and methods used in cybercrime and security.
- Illustrate evidence collection and legal challenges

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives	SunitBelapure and Nina Godbole	Wiley India Pvt Ltd	2013
2	Introduction to information security and cyber laws	Surya PrakashTripathi, RitendraGoyal, Praveen Kumar Shukla	Dreamtech Press	2015

Reference Books

1	Cybersecurity: Managing Systems, Conducting Testing, and Investigating Intrusions	Thomas J. Mowbray	John Wiley & Sons,	
2	Cyber Security Essentials	James Graham, Ryan Olson, Rick Howard	CRC Press	2010

M.TECH INFORMATION TECHNOLOGY (SIT)	
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)	
SEMESTER - II	
ADVANCES IN COMPUTER GRAPHICS	

Course Code	**20SIT251**	CIE Marks	40
TeachingHours/Week (L:P:S)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

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.

Module-2

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	

Module-3

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.

Module-4

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 procedures.

Module-5

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.

Course outcomes:

At the end of the course the student will be able to:

- Discuss and implement images and objects using 3D representation and openGL methodologies.
- Design and develop surface detection using various detection methods.
- Choose various illumination models for provides effective standards of objects.
- Design of develop effective computer animations.

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Computer Graphics with openGL	Hearn Baker	Pearson publication	4rd edition 2010
2	Computer graphics	James D Foley,Andries van dam,Steven K Feiner,John F Hughes	Pearson Education	3rd edition, 2013

Reference Books

1	Interactive Computer graphics a top-down approach with openGL	Edward Angel	Addison Wesley	6th edition 2012
2	Advanced graphics programming using openGL	Tom Mc Reynolds-David Blythe	Elesvier.MK	2005

M.TECH INFORMATION TECHNOLOGY (SIT)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - II
BUSINESS INTELLIGENCE AND ITS APPLICATIONS

Course Code	**20SIT252**, 20SCS331	CIE Marks	40

TeachingHours/Week (L:P:S)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

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

Module -2

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

Module – 3

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

Module-4

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

Module-5

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

Course outcomes:

At the end of the course the student will be able to:

- Explain the complete life cycle of BI/Analytical development
- Illustrate technology and processes associated with Business Intelligence framework
- Demonstrate a business scenario, identify the metrics, indicators and make recommendations to achieve the business goal.

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Business Intelligence Roadmap : The Complete Project Lifecycle for Decision Support Applications	Larissa T Moss and ShakuAtre	Addison Wesley Information Technology Series	2003.
2	Fundamentals of Business Analytics	R N Prasad, SeemaAcharya	Wiley India	2011.

Reference Books

1	Business Intelligence: The Savvy Manager's Guide	David Loshin	Morgan Kaufmann	
2	Delivering Business Intelligence with Microsoft SQL Server 2005	Brian Larson	McGraw Hill	2006
3	Foundations of SQL Server 2008 Business Intelligence	Lynn Langit	Apress	2011

M.TECH INFORMATION TECHNOLOGY (SIT)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

SEMESTER - II				
ADVANCES IN STORAGE AREA NETWORK				
Course Code	**20SIT253**, 20SCN241, 20LNI243, 20SCE323		CIE Marks	40
TeachingHours/Week (L:P:S)	4:0:0		SEE Marks	60
Credits	04		Exam Hours	03

Module-1

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

Module 2

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

Module 3

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

Module 4

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

Module 5

Management of Storage Network: System Management, Requirement of management System, Support by Management System, Management Interface, Standardized Mechanisms, Property Mechanisms, In-band Management, Use of SNMP, CIM and WBEM, Storage Management Initiative Specification (SMI-S), CMIP and DMI, Optional Aspects of the Management of Storage Networks, Summary

Course outcomes:

At the end of the course the student will be able to:

- The students should be able to:
- Identify the need for performance evaluation and the metrics used for it
- Apply the techniques used for data maintenance.
- Realize strong virtualization concepts
- Develop techniques for evaluating policies for LUN masking, file systems

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Storage Networks Explained	Ulf Troppens, Rainer Erkens and Wolfgang Muller	Wiley India	2013

Reference Books

| 1 | Storage Networks The Complete Reference | Robert Spalding | Tata McGraw- | 2011 |

			Hill	
2	Storage Networking Fundamentals – An Introduction to Storage Devices, Subsystems, Applications, Management, and File Systems	Marc Farley	Cisco Press,	2005
3	Storage Area Network Essentials A Complete Guide to understanding and Implementing SANs	Richard Barker and Paul Massiglia	Wiley India,	2006

M.TECH INFORMATION TECHNOLOGY (SIT)				
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)				
SEMESTER - II				
SOFTWARE PROJECT PLANNING & MANAGEMENT				
Course Code	**20SIT254**, 20SSE21	CIE Marks		40
TeachingHours/Week (L:P:S)	4:0:0	SEE Marks		60
Credits	04	Exam Hours		03

Module-1

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

Module -2

Risk Management: Introduction, What is risk management and why is it important?, Risk management cycle, Risk identification: common tools and techniques, Risk Quantifications, 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.

Module – 3

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

Module-4

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

Module-5
Globalization issues in project management: Evolution of globalization, challenges in building global teams, Models for the execution of global projects, some effective management techniques for managing global teams. Impact of the internet on project management: Introduction, the effect of internet on project management, managing projects for the internet, Effect on the project management activities. People focused process models: Growing emphasis on people centric models, people capability maturity model(P-CMM), other people focused models in the literature, how does an organization choose the models to use?

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

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.   - The question paper will have ten full questions carrying equal marks.   - Each full question is for 20 marks.   - There will be two full questions (with a maximum of four sub questions) from each module.   - Each full question will have sub question covering all the topics under a module.   - The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Managing Global Projects	Ramesh Gopalaswamy	Tata McGraw Hill	2013

Reference Books

1	Managing the Software Process	Watts Humphrey	Pearson Education	2000
2	Software Project Management in practice,	PankajJalote	Pearson Education	2002

TECHNICAL SEMINAR			
Course Code	20SIT27	CIE Marks	100
Number of contact Hours/week (L:P:SDA)	0:0:2	SEE Marks	--
Credits	02	Exam Hours	--

Course objectives:

The objective of the seminar is to inculcate self-learning, face audience confidently, enhance communication skill, involve in group discussion and present and exchange ideas.

Each student, under the guidance of a Faculty, is required to

- Choose, preferably through peer reviewed journals, a recent topic of his/her interest relevant to the Course of Specialization.
- Carryout literature survey, organize the Course topics in a systematic order.
- Prepare the report with own sentences.
- Type the matter to acquaint with the use of Micro-soft equation and drawing tools or any such facilities.
- Present the seminar topic orally and/or through power point slides.
- Answer the queries and involve in debate/discussion.
- Submit two copies of the typed report with a list of references.

The participants shall take part in discussion to foster friendly and stimulating environment in which the students are motivated to reach high standards and become self-confident.

The CIE marks for the seminar shall be awarded (based on the relevance of the topic, presentation skill, participation in the question and answer session and quality of report) by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three faculties from the department with the senior most acting as the Chairperson.

Marks distribution for CIE of the course 20XXX27 seminar:

Seminar Report: 30 marks
Presentation skill:50 marks
Question and Answer:20 marks

M.TECH INFORMATION TECHNOLOGY (SIT)			
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)			
SEMESTER - III			
MANAGING BIG DATA			
Course Code	20SIT31, 20LNI251, 20SCE21, 20SFC331, 20SIS332	CIE Marks	40
TeachingHours/Week (L:P:S)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Meet Hadoop: 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

The Hadoop Distributed Filesystem The Design of HDFS, HDFS Concepts: Blocks, Namenodes and Datanodes, HDFS Federation, HDFS High-Availability, The Command-Line Interface, Basic Filesystem Operations, HadoopFilesystems 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.

Module -2

YARN 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

Hadoop I/O 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

Module – 3

Developing a MapReduce Application 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

How MapReduce Works 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

Module-4

MapReduce Types and Formats: 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,

Flume 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

Module-5

Pig 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.

Spark 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

Course outcomes:
At the end of the course the student will be able to:
- Understand managing big data using Hadoop and SPARK technologies
- Explain HDFS and MapReduce concepts
- Install, configure, and run Hadoop and HDFS.
- Perform map-reduce analytics using Hadoop and related tools
- Explain SPARK concepts

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Hadoop: The Definitive Guide	Tom White	O'Reilley	Third Edition, 2012

Reference Books

1	SPARK: The Definitive Guide	MateiZaharia and Bill Chambers	Oreilly	2018
2	Apache Flume: Distributed Log Collection for Hadoop	. D'Souza and Steve Hoffman	Oreilly	2014

M.TECH INFORMATION TECHNOLOGY (SIT)	
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)	
SEMESTER - III	
SUPPLY CHAIN MANAGEMENT	

Course Code	20SSE324, 20SIT321	CIE Marks	40
TeachingHours/Week (L:P:S)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Introduction to Supply Chain Management : 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.

Module -2

Designing the supply chain network : 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.

Module – 3

Designing and Planning Transportation Networks.: Role of transportation - modes and their performance - transportation infrastructure and policies - design options and their trade-offs - Tailored transportation.

Module-4

Sourcing and Pricing: 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.

Module-5
Information Technology in the supply chain: IT Framework – customer relationship management – internal supply chain management – supplier relationship management –transaction management – future of IT.

Course outcomes:
At the end of the course the student will be able to:
- Discuss SCM Models,   - Formulate of QRM, CPFR.   - Implement various Inventory Models and third party logistics.

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have ten full questions carrying equal marks.   - Each full question is for 20 marks.   - There will be two full questions (with a maximum of four sub questions) from each module.   - Each full question will have sub question covering all the topics under a module.   - The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Supply Chain Management – Strategy, Planning and Operation	Sunil Chopra and Peter Meindl	Pearson/PHI	3rd Edition, 2007
2	The management of Business Logistics – A supply Chain Perspective	Coyle, Bardi, Longley	Thomson Press	2006
3	Supply Chain Management	Janat Shah	Pearson Publication	2008

Reference Books

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

M.TECH INFORMATION TECHNOLOGY (SIT)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - III
MACHINE LEARNING TECHNIQUES

Course Code	20SSE334, 20LNI322, 20SCE321, 20SCN324, 20SFC254, 20SIT322, 20SAM21	CIE Marks	40
TeachingHours/Week (L:P:S)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1
INTRODUCTION, CONCEPT LEARNING AND DECISION TREES
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

Module -2
NEURAL NETWORKS AND GENETIC ALGORITHMS: 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.
Module – 3
BAYESIAN AND COMPUTATIONAL LEARNINGL 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.
Module-4
INSTANT BASED LEARNING AND LEARNING SET OF RULES: 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
Module-5
ANALYTICAL LEARNING AND REINFORCED LEARNING: Perfect Domain Theories – Explanation Based Learning – Inductive-Analytical Approaches - FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning

Course outcomes:
At the end of the course the student 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 SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Machine Learning	Tom M. Mitchell	McGraw-Hill Education	2013

Reference Books

1	Introduction to Machine Learning	EthemAlpaydin	PHI Learning Pvt. Ltd	2nd Ed., 2013
2	The Elements of Statistical Learning	T. Hastie, R. Tibshirani, J. H. Friedman	Springer	1st edition, 2001

M.TECH INFORMATION TECHNOLOGY (SIT) **Choice Based Credit System (CBCS) and Outcome Based Education (OBE)** **SEMESTER - III**			
TRENDS IN ARTIFICIAL INTELLIGENCE AND SOFT COMPUTING			
Course Code	20SIT323	CIE Marks	40
TeachingHours/Week (L:P:S)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03
Module-1			
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, Limitaions of Ai, Agent, Performance Evaluation, Task environment of an Agent, Agents Classification, Agent Architecture Logic Programming, Logic Representation, Propositional Logic, Predicate Logic and Predicate Calculus, Horn Clauses, Well formd Formula, Computable functions and predicate, Quantifiers, Universe of			

discourse, Applications of Predicate Logic, Unification,Resolution, Conjuctive Normal Form, conversion to normal form or clausal form

Module 2
Fundamental Problem of Logic: Logic Inadequacy: FundamentaProblem of Logic-Monotonicity wuith "Flying Penguin" example, General disadvantage of monotonicity property in logic , logic in search space problem, logic in decidability and Incompleteness, Logic in Uncertainty Modelling,   Knowledge representation: Knowledge, Need to represent knowledge, Knowledge representation with mapping scheme, properties of a good knowledge base system, Knowledge representation issues, AND-OR graphs, Types of knowledge, Knowledge representation schemes, , semantic nets, Frames, conceptual graphs, conceptual dependence theory, script, weak and strong slot filler.   Reasoning: Types of Reasoning, Methods of reasoning, Application of Reasoning, Forward and Backward Reasoning

Module 3
Search Techniques: Search, Representation techniques, Categories of Search, Disadvantage of state space search, Issues in design of search programs, General Search examples, Classification of search diagram representation, Hill climbing method and Hill climbing search ,Simulates Annealing, Best-First Search, Branch and Bound Search, A* search   Game Playing: Two player games, Minmax Search, Complexity of Minmax algorithm, Alpha-Beta Pruning   Planning: Necessity of planning, Components of Planning, Planning Agents, Plan-gererating schemes, Algorithm for planning, Planning Representation with STRIPS, BlOCKS WORLD, difficulties with planning

Module 4
Fuzzy Sets and Uncertainties: Fuzzy set and fuzzy logic, set and fuzzy operators, , Extended fuzzy operations, Fuzzy relations, Properties of fuzzy relations, Fuzzy system and design, Linguistic hedges, Syntax for IF and Then rules, , Types of fuzzy rule based system, Fuzzy linguistic controller, Fuzzy Inference, Graphical techniques of Inference, How, Fuzzy logic is used, Fuzzification, De-fuzzification. Unique features of Fuzzy Logic, Application of Fuzzy Logic, Fuzzy logic uncertainty and probability, Advantages and Limitations of Fuzzy logic and Fuzzy Systems

Module 5
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.

Course outcomes:
At the end of the course the student will be able to:
- Design intelligent agents for problem solving, reasoning, planning, decision making, and learning. specific design and performance constraints, and when needed, design variants of existing algorithms.   - Apply AI technique to current applications.   - Apply Problem solving, knowledge representation, reasoning, and learning techniques to solve real world problems   - Design and build expert systems for various application domains.   - Apply Soft Computing techniques such as neural networks, fuzzy logic to solve problems in various application domains
Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.   - The question paper will have ten full questions carrying equal marks.   - Each full question is for 20 marks.   - There will be two full questions (with a maximum of four sub questions) from each module.   - Each full question will have sub question covering all the topics under a module.   - The students will have to answer five full questions, selecting one full question from each

	module.			
Textbook/ Textbooks				
Sl No	**Title of the book**	**Name of the Author/s**	**Publisher Name**	**Edition and year**
1	Artificial Intelligence and Softcomputing for Beginners	Anindita Das Battacharjee	Shroff Publishers	2nd edition
Reference Books				
1	Artificial Intelligence	Elaine Rich,Kevin Knight, Shivashanka B Nair	Tata CGraw Hill	3rd edition. 2013
2	Artificial Intelligence A Modern Approach	Stuart Russel, Peter Norvig	Pearson	3rd edition 2013
3	Neural Networks, Fuzzy Logic and Genetic	S. Rajasekaran, G. A. VijayalakshmiPaiAlgorithms	PHI publication	
4	Principles of Artificial Intelligence	Nils J. Nilsson	Elsevier	

M.TECH IN COMPUTER NETWORK ENGINEERING (SCN) **Choice Based Credit System (CBCS) and Outcome Based Education (OBE)** **SEMESTER - III**			
WEB ENGINEERING			
Course Code	**20SCN333**, 20SIT324	CIE Marks	40
Teaching Hours/Week (L:P:S)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03
Module-1			
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. Modelling Web Application: Introduction, Fundamentals, Modelling specifics in web engineering, Modelling requirements, Content modelling, Hypertext modelling, Presentation modelling, Customization modelling, Methods and tools, Outlook.			
Module-2			
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, clientside technologies, Document-specific technologies, Server-side technologies, Outlook.			
Module-3			
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.			
Module-4			
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.			
Module-5			
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.			

Course outcomes:
At the end of the course the student will be able to:
• Ability to Model the requirements of a web application.
• Contrast technology-aware Web Application.
• Ability to analyze the performances of web applications

Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
• The question paper will have ten full questions carrying equal marks.
• Each full question is for 20 marks.
• There will be two full questions (with a maximum of four sub questions) from each module.
• Each full question will have sub question covering all the topics under a module.
• The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Web Engineering	GertiKappel, Birgit Proll, SiegfriedReich, Werner Retschitzegeer	Wiley India	2007

Reference Books

1	Web Engineering: A Practitioner's Approach	Roger Pressman, David Lowe	McGraw Hill	2008

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M.TECH INFORMATION TECHNOLOGY (SIT)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - III
AGILE TECHNOLOGIES

Course Code	20SCE324, 20SIT331, 20SAM322	CIE Marks	40
TeachingHours/Week (L:P:S)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

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

Module -2

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

Module – 3

Practicing XP: Thinking: Pair Programming, Energized Work, Informative Workspace, Root-Cause Analysis, Retrospectives, **Collaborating:** Trust, Sit Together, Real Customer Involvement, Ubiquitous Language, Stand-Up Meetings, Coding Standards, Iteration Demo, Reporting,**Releasing:**"Done Done", No Bugs, Version Control, Ten-Minute Build, Continuous Integration, Collective Code Ownership, Documentation. **Planning:** Vision, Release Planning, The Planning Game, Risk Management, Iteration Planning, Slack, Stories, Estimating. **Developing:** Incremental requirements, Customer Tests, Test-Driven Development, Refactoring, Simple Design ,Incremental Design and Architecture, Spike Solutions, Performance Optimization, Exploratory Testing

Module-4

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

Module-5
Deliver Value: Exploit Your Agility, Only Releasable Code Has Value, Deliver Business Results, Deliver Frequently, **Seek Technical Excellence :**Software Doesn't Exist, Design Is for Understanding, Design Trade-offs, Quality with a Name, Great Design, Universal Design Principles, Principles in Practice, Pursue Mastery
Course outcomes:
At the end of the course the student will be able to: - Define XP Lifecycle, XP Concepts, Adopting XP   - Evaluate on Pair Programming, Root-Cause Analysis, Retrospectives, Planning, Incremental Requirements, Customer Tests   - Demonstrate concepts to Eliminate Waste
Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.   - The question paper will have ten full questions carrying equal marks.   - Each full question is for 20 marks.   - There will be two full questions (with a maximum of four sub questions) from each module.   - Each full question will have sub question covering all the topics under a module.   - The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	The Art of Agile Development	James shore, Chromatic,	O'Reilly	2007

Reference Books

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

M.TECH INFORMATION TECHNOLOGY (SIT)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - III
DATABASE SECURITY

Course Code	20SSE333, 20SCE332, 20SFC252, 20SIT332	CIE Marks	40
TeachingHours/Week (L:P:S)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1
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 Martella's Model for Distributed databases.
Module 2
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.
Module 3
Security Software Design: Introduction, A Methodological Approach to Security, Software Design, Secure Operating System Design, Secure DBMS Design, Security Packages, Database Security Design.
Module 4
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.

Module 5
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.

Course outcomes:

At the end of the course the student will be able to:

- Carry out a risk analysis for a large database
- Implement identification and authentication procedures, fine-grained access control and data encryption techniques
- Set up accounts with privileges and roles
- Audit accounts and the database system

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Database Security and Auditing	Hassan A. Afyoun	CENGAGE Learning	2009
2	Database Security	Castano	Pearson Education	

Reference Books

1	Database security	Alfred Basta, Melissa Zgola	CENGAGE learning	

M.TECH INFORMATION TECHNOLOGY (SIT)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - III
OBJECT ORIENTED SOFTWARE ENGINEERING

Course Code	20SCE334, 20SIT333, 20SSE13, 20SIS254	CIE Marks	40
TeachingHours/Week (L:P:S)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1
INTRODUCTION: What is software engineering? Software Engineering Concepts, Development Activities, Managing Software Development, Modeling with UML, Project Organization and Communication.

Module 2
REQUIREMENT ELICITATION AND ANALYSIS: Requirements Elicitation: Requirements Elicitation Concepts, Requirements Elicitation Activities, Managing Requirements Elicitation, **Analysis:** Analysis Concepts, Analysis Activities, Managing Analysis.

Module 3
SYSTEM DESIGN :System design-Decomposing the system: Overview of System Design, System Design Concepts, System Design Activities: Objects to Subsystems, **System Design –Addressing design goals**: Activities: An overview of system design actives, UML deployment diagrams, Addressing Design Goals, Managing System Design.

Module 4

OBJECT DESIGN, IMPLEMENTATION AND TESTING : **Object design-Reusing pattern solutions:** An Overview of Object Design, Reuse Concepts: Design Patterns, Reuse Activities, Managing Reuse, **Object design-Specifying interface:** An overview of interface specification, Interfaces Specification Concepts, Interfaces Specification Activities, Managing Object Design, **Mapping model to code**: Mapping Models to Code Overview, Mapping Concepts, Mapping Activities, Managing Implementation, Testing: An overview of testing, Testing concepts, Managing testing.

Module 5

SOFTWARE MAINTENANCE AND SOFTWARE CONFIGURATION MANAGEMENT: Software maintenance: 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**. Software Configuration Management:** The baseline of Software Life Cycle, What is Software Configuration Management, Why Software Configuration Management, Software Configuration Management Functions, Software Configuration Management Tools.

Course outcomes:

At the end of the course the student will be able to:

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

Question paper pattern:

The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.

- The question paper will have ten full questions carrying equal marks.
- Each full question is for 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Object-Oriented Software Engineering	Bernd Bruegge, Alan H Dutoit	Pearson Education	3rd edition, 2014
2	Object oriented software engineering	David C. Kung	Tata McGraw Hill	2015

Reference Books

1	Object oriented software engineering	Stephan R. Schach	Tata McGraw Hill	2008
2	Applying UML and Patterns	Craig Larman	Pearson Education	3rd ed, 2005

M.TECH INFORMATION TECHNOLOGY (SIT)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER - III
ADVANCES IN OPERATING SYSTEMS

Course Code	**20SIT334**, 20SSE332	CIE Marks	40
TeachingHours/Week (L:P:S)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Operating System Overview, Process description & Control: Operating System 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.

Module-2
Threads, SMP, and Microkernel, Virtual Memory: 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
Module-3
Multiprocessor and Real-Time Scheduling: Multiprocessor Scheduling, Real-Time Scheduling, Linux Scheduling, UNIX PreclsSl) Scheduling, Windows Vista Hours Scheduling, Process Migration, Distributed Global States, Distributed Mutual Exclusion, Distributed Deadlock
Module-4
Embedded Operating Systems: 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.
Module-5
Kernel Organization: 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.

Course outcomes:
At the end of the course the student will be able to:
- Demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system   - Learn the various resource management techniques for distributed systems   - Identify the different features of real time and mobile operating system   - Modify existing open source kernels in terms of functionality or features used
Question paper pattern:
The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.   - The question paper will have ten full questions carrying equal marks.   - Each full question is for 20 marks.   - There will be two full questions (with a maximum of four sub questions) from each module.   - Each full question will have sub question covering all the topics under a module.   - The students will have to answer five full questions, selecting one full question from each module.

Textbook/ Textbooks

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Operating Systems: Internals and Design Principles	William Stallings	Prentice Hall,	6th Edition, 2013
2	Operating Systems	Gary Nutt	Pearson	3rd Edition2014

Reference Books

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

PROJECT WORK PHASE – 1			
Course Code	20SIT34	CIE Marks	100
Number of contact Hours/Week	2	SEE Marks	--
Credits	02	Exam Hours	--

Course objectives:
- Support independent learning.
- Guide to select and utilize adequate information from varied resources maintaining ethics.
- Guide to organize the work in the appropriate manner and present information (acknowledging the sources) clearly.
- Develop interactive, communication, organisation, time management, and presentation skills.
- Impart flexibility and adaptability.
- Inspire independent and team working.
- Expand intellectual capacity, credibility, judgement, intuition.
- Adhere to punctuality, setting and meeting deadlines.
- Instil responsibilities to oneself and others.
- Train students to present the topic of project work in a seminar without any fear, face audience confidently, enhance communication skill, involve in group discussion to present and exchange ideas.

Project Phase-1 Students in consultation with the guide/s shall carry out literature survey/ visit industries to finalize the topic of the Project. Subsequently, the students shall collect the material required for the selected project, prepare synopsis and narrate the methodology to carry out the project work.

Seminar: Each student, under the guidance of a Faculty, is required to
- Present the seminar on the selected project orally and/or through power point slides.
- Answer the queries and involve in debate/discussion.
- Submit two copies of the typed report with a list of references.

The participants shall take part in discussion to foster friendly and stimulating environment in which the students are motivated to reach high standards and become self-confident.

Course outcomes:
At the end of the course the student will be able to:
- Demonstrate a sound technical knowledge of their selected project topic.
- Undertake problem identification, formulation, and solution.
- Design engineering solutions to complex problems utilising a systems approach.
- Communicate with engineers and the community at large in written an oral forms.
- Demonstrate the knowledge, skills and attitudes of a professional engineer.

Continuous Internal Evaluation
CIE marks for the project report (50 marks), seminar (30 marks) and question and answer (20 marks) shall be awarded (based on the quality of report and presentation skill, participation in the question and answer session by the student) by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three faculty from the department with the senior most acting as the Chairperson.

MINI PROJECT			
Course Code	20SIT35	CIE Marks	40
Number of contact Hours/Week	2	SEE Marks	60
Credits	02	Exam Hours/Batch	03

Course objectives:
- To support independent learning and innovative attitude.
- To guide to select and utilize adequate information from varied resources upholding ethics.
- To guide to organize the work in the appropriate manner and present information (acknowledging the sources) clearly.
- To develop interactive, communication, organisation, time management, and presentation skills.
- To impart flexibility and adaptability.
- To inspire independent and team working.
- To expand intellectual capacity, credibility, judgement, intuition.
- To adhere to punctuality, setting and meeting deadlines.
- To instil responsibilities to oneself and others.
- To train students to present the topic of project work in a seminar without any fear, face audience confidently, enhance communication skill, involve in group discussion to present and exchange ideas.

Mini-Project: Each student of the project batch shall involve in carrying out the project work jointly in constant consultation with internal guide, co-guide, and external guide and prepare the project report as per the norms avoiding plagiarism.

Course outcomes:
At the end of the course the student will be able to:
- Present the mini-project and be able to defend it.
- Make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.
- Habituated to critical thinking and use problem solving skills.
- Communicate effectively and to present ideas clearly and coherently in both the written and oral forms.
- Work in a team to achieve common goal.
- Learn on their own, reflect on their learning and take appropriate actions to improve it.

CIE procedure for Mini - Project:
The CIE marks awarded for Mini - Project, shall be based on the evaluation of Mini - Project Report, Project Presentation skill and Question and Answer session in the ratio 50:25:25.The marks awarded for Mini - Project report shall be the same for all the batch mates.

Semester End Examination
SEE marks for the mini-project shall be awarded based on the evaluation of Mini-Project Report, Presentation skill and Question and Answer session in the ratio 50:25:25 by the examiners appointed by the University.

INTERNSHIP / PROFESSIONAL PRACTICE			
Course Code	20SITI36	CIE Marks	40
Number of contact Hours/Week	2	SEE Marks	60
Credits	06	Exam Hours	03

Course objectives:

Internship/Professional practice provide students the opportunity of hands-on experience that include personal training, time and stress management, interactive skills, presentations, budgeting, marketing, liability and risk management, paperwork, equipment ordering, maintenance, responding to emergencies etc. The objective are further,

To put theory into practice.

To expand thinking and broaden the knowledge and skills acquired through course work in the field.

To relate to, interact with, and learn from current professionals in the field.

To gain a greater understanding of the duties and responsibilities of a professional.

To understand and adhere to professional standards in the field.

To gain insight to professional communication including meetings, memos, reading, writing, public speaking, research, client interaction, input of ideas, and confidentiality.

To identify personal strengths and weaknesses.

To develop the initiative and motivation to be a self-starter and work independently.⏎

Internship/Professional practice: Students under the guidance of internal guide/s and external guide shall take part in all the activities regularly to acquire as much knowledge as possible without causing any inconvenience at the place of internship.

Seminar: Each student, is required to

- Present the seminar on the internship orally and/or through power point slides.
- Answer the queries and involve in debate/discussion.
- Submit the report duly certified by the external guide.
- The participants shall take part in discussion to foster friendly and stimulating environment in which the students are motivated to reach high standards and become self-confident. ⏎

Course outcomes:

At the end of the course the student will be able to:

- Gain practical experience within industry in which the internship is done.
- Acquire knowledge of the industry in which the internship is done.
- Apply knowledge and skills learned to classroom work.
- Develop a greater understanding about career options while more clearly defining personal career goals.
- Experience the activities and functions of professionals.
- Develop and refine oral and written communication skills.
- Identify areas for future knowledge and skill development.
- Expand intellectual capacity, credibility, judgment, intuition.
- Acquire the knowledge of administration, marketing, finance and economics. ⏎

Continuous Internal Evaluation

CIE marks for the Internship/Professional practice report (20 marks), seminar (10 marks) and question and answer session (10 marks) shall be awarded (based on the quality of report and presentation skill, participation in the question and answer session by the student) by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three faculty from the department with the senior most acting as the Chairperson. ⏎

Semester End Examination

SEE marks for the internship report (30 marks), seminar (20 marks) and question and answer session (10 marks) shall be awarded (based on the quality of report and presentation skill, participation in the question and answer session) by the examiners appointed by the University. ⏎

PROJECT WORK PHASE -2			
Course Code	20SIT41	CIE Marks	40
Number of contact Hours/Week	4	SEE Marks	60
Credits	20	Exam Hours	03

Course objectives:

- To support independent learning.
- To guide to select and utilize adequate information from varied resources maintaining ethics.
- To guide to organize the work in the appropriate manner and present information (acknowledging the sources) clearly.
- To develop interactive, communication, organisation, time management, and presentation skills.
- To impart flexibility and adaptability.
- To inspire independent and team working.
- To expand intellectual capacity, credibility, judgement, intuition.
- To adhere to punctuality, setting and meeting deadlines.
- To instil responsibilities to oneself and others.
- To train students to present the topic of project work in a seminar without any fear, face audience confidently, enhance communication skill, involve in group discussion to present and exchange ideas.

Project Work Phase - II: Each student of the project batch shall involve in carrying out the project work jointly in constant consultation with internal guide, co-guide, and external guide and prepare the project report as per the norms avoiding plagiarism.

Course outcomes:

At the end of the course the student will be able to:

- Present the project and be able to defend it.
- Make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.
- Habituated to critical thinking and use problem solving skills
- Communicate effectively and to present ideas clearly and coherently in both the written and oral forms.
- Work in a team to achieve common goal.
- Learn on their own, reflect on their learning and take appropriate actions to improve it.

Continuous Internal Evaluation:

Project Report: 20 marks. The basis for awarding the marks shall be the involvement of the student in the project and in the preparation of project report. To be awarded by the internal guide in consultation with external guide if any.

Project Presentation: 10 marks.

The Project Presentation marks of the Project Work Phase -II shall be awarded by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three faculty from the department with the senior most acting as the Chairperson.

Question and Answer: 10 marks.

The student shall be evaluated based on the ability in the Question and Answer session for 10 marks.

Semester End Examination

SEE marks for the project report (30 marks), seminar (20 marks) and question and answer session (10 marks) shall be awarded (based on the quality of report and presentation skill, participation in the question and answer session) by the examiners appointed by the University.