VISVESVARAYA TECHNOLOGICAL UNIVERSITY
BELAGAVI

Scheme of Teaching and Examinations and Syllabus

M.TechSoftware Engineering (SSE)

(Effective from Academic year 2020 - 21)

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
Scheme of Teaching and Examinations – 2020 - 21
M.Tech in Software Engineering (SSE)
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 Activity	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
1	PCC	20SSE11	Mathematical Foundations of Computer Science	03	--	02	03	40	60	100	4
2	PCC	20SSE12	Advances in Software Testing	03	--	02	03	40	60	100	4
3	PCC	20SSE13	Object Oriented Software Engineering	03	--	02	03	40	60	100	4
4	PCC	20SSE14	Service Oriented Architecture	03	--	02	03	40	60	100	4
5	PCC	20SSE15	Advances in Data Base Management System	03	--	02	03	40	60	100	4
6	PCC	20SSEL16	Data Base Management Systems 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.

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
Scheme of Teaching and Examinations – 2020 - 21
M.Tech in Software Engineering (SSE)
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	20SSE21	Software Project Planning & Management	03	--	02	03	40	60	100	4
2	PCC	20SSE22	Enterprise Application Programming	03	--	02	03	40	60	100	4
3	PCC	20SSE23	Software Design Patterns	03	--	02	03	40	60	100	4
4	PEC	20SSE24X	Professional elective 1	04	--	--	03	40	60	100	4
5	PEC	20SSE25X	Professional elective 2	04	--	--	03	40	60	100	4
6	PCC	20SSEL26	Mini Project	--	04	--	03	40	60	100	2
7	PCC	20SSE27	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 20SSE24X	**Course Title**	**Course Code 20SSE25X**	**Course Title**
20SSE241	Data Mining & Data Warehousing	20SSE251	Cloud Computing
20SSE242	Software Metrics & Quality Assurance	20SSE252	Software Agents
20SSE243	Information Retrieval	20SSE253	Trust Management In E-Commerce
20SSE244	Advanced Algorithms	**20SSE254**	**Artificial Intelligence & Machine Learning**

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.

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

III 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	20SSE31	Soft Computing	03	--	02	03	40	60	100	4
2	PEC	20SSE32X	Professional elective 3	03	--	--	03	40	60	100	3
3	PEC	20SSE33X	Professional elective 4	03	--	--	03	40	60	100	3
4	Project	20SSE34	Project work phase - 1	--	02	--	--	100	--	100	2
5	PCC	20SSE35	Mini-Project	--	02	--	--	100	--	100	2
6	Internship	20SSEI36	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 20SSE32X	**Course Title**	**Course Code 20SSE33X**	**Course Title**
20SSE321	Internet of Things	20SSE331	Web Mining
20SSE322	Managing Big Data	20SSE332	Advances In Operating Systems
20SSE323	Agile Technologies	20SSE333	Database Security
20SSE324	Supply Chain Management	20SSE334	Machine Learning Techniques

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 Software Engineering (SSE)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

IV 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	Project	20SSE41	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:SDA)	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 SOFTWARE ENGINEERING (SSE)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)
SEMESTER - I

ADVANCES IN SOFTWARE TESTING

Course Code	**20SSE12**	CIE Marks	40
TeachingHours/Week (L:T:P)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Basics of Software Testing and Examples: Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Levels of testing. Examples: Generalized pseudocode, The triangle problem, The NextDate function, The commission problem, The SATM (Simple Automatic Teller Machine) problem.

Module-2

Decision Table-Based Testing: Decision tables, Test cases for the triangle problem, Test cases for the NextDate function, Test cases for the commission problem, Guidelines and observations. **Data Flow Testing:** Definition-Use testing, Slice-based testing, Guidelines and observations. **Levels of Testing:** Traditional view of testing levels, Alternative life-cycle models, The SATM system, Separating integration and system testing. **Integration Testing:** A closer look at the SATM system, Decomposition-based, call graph-based, Path-based integrations, Case study.

Module-3

System Testing: Threads, Basic concepts for requirements specification, Finding threads, Structural strategies and functional strategies for thread testing, SATM test threads, System testing guidelines, ASF (Atomic System Functions) testing example. **Interaction Testing:** Context of interaction, A taxonomy of interactions, Interaction, composition, and determinism, Client/Server Testing,.**Issues in Object-Oriented Testing:** Units for object-oriented testing, Implications of composition and encapsulation, inheritance, and polymorphism, Levels of object-oriented testing, GUI testing, Dataflow testing for object-oriented software, Examples. **Class Testing:** Methods as units, Classes as units.

Module-4

Object-Oriented Integration Testing: UML support for integration testing, MM-paths for object-oriented software, A framework for object-oriented dataflow integration testing.**GUI Testing:** The currency conversion program, Unit testing, Integration Testing and System testing for the currency conversion program. **Object-Oriented System Testing:** Currency converter UML description, UML-based system testing,Statechart-based system testing.

Module-5

Exploratory Testing: The context-driven school, Exploring exploratory testing, Exploring a familiar example, Exploratory and context-driven testing observations. **Model-Based Testing:**

Testing based on models, Appropriate models, Use case-based testing, Commercial tool support for model-based testing. **Test-Driven Development:** Test-then-code cycles, Automated test execution, Java and JUnit example, Remaining questions, Pros, cons, and open questions of TDD, Retrospective on MDD versus TDD.

Course outcomes:

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

- 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
- Automate the testing process by using several testing tools
- Establish a quality environment as specified in standards for developing quality software
- Analyze and improve the quality procedures based on the past experience

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	Software Testing, A Craftsman's Approach	Paul C. Jorgensen	Auerbach Publications	3rd Edition, 2013
Reference Books				
1	Foundations of Software Testing	Aditya P Mathur	Pearson	2008
2	Software Testing and Analysis – Process, Principles and Techniques	Mauro Pezze, Michal Young	John Wiley & Sons	2008

M.TECH SOFTWARE ENGINEERING (SSE)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)
SEMESTER - I

OBJECT ORIENTED SOFTWARE ENGINEERING

Course Code	**20SSE13**, 20SCE334, 20SIT333, 20SIS254	CIE Marks	40
TeachingHours/Week (L:T:P)	3:0:2	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 SOFTWARE ENGINEERING (SSE) **Choice Based Credit System (CBCS) and Outcome Based Education(OBE)** **SEMESTER - I**			
SERVICE ORIENTED ARCHITECTURE			
Course Code	**20SSE14**	CIE Marks	40

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

Module-1

SOA BASICS:Software Architecture – Types of IT Architecture – SOA – Evolution – Key components – perspective of SOA – Enterprise-wide SOA – Architecture – Enterprise Applications – Solution Architecture for enterprise application – Software platforms for enterprise Applications – Patterns for SOA – SOA programming models.

Module 2

SOA ANALYSIS AND DESIGN: Service-oriented Analysis and Design – Design of Activity, Data, Client and business process services – Technologies of SOA – SOAP – WSDL – JAX – WS – XML WS for .NET – Service integration with ESB – Scenario – Business case for SOA – stakeholder OBJECTIVES – benefits of SPA – Cost Savings.

Module 3

SOA GOVERNANCE:SOA implementation and Governance – strategy – SOA development – SOA governance – trends in SOA – event-driven architecture – software s a service – SOA technologies – proof-of-concept – process orchestration – SOA best practices.

Module 4

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

Module 5

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

Course outcomes:

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

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

Question paper pattern:

The 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	Service–Oriented Architecture for Enterprise Applications	Shankar Kambhampaly	Wiley	2008
Reference Books				
1	SOA using Java Web Services	Mark D. Hansen	Practice Hall	2007
2	SOA-Based Enterprise Integration	WaseemRoshen	Tata McGraw-HILL	2009

M.TECH SOFTWARE ENGINEERING (SSE)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)
SEMESTER - I

ADVANCES IN DATA BASE MANAGEMENT SYSTEM

Course Code	**20SSE15**, 20SCE252, 20SIT14	CIE Marks	40
TeachingHours/Week (L:T:P)	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 SOFTWARE ENGINEERING (SSE)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)
SEMESTER - I

DATABASE MANAGEMENT SYSTEMS LABORATORY

Course Code	**20SSEL16**	CIE Marks	40
TeachingHours/Week (L:T:P)	0:4:0	SEE Marks	60
Credits	02	Exam Hours	03

Note:
Part A: The following experiments may be implemented on MySQL/ORACLE or any other suitable RDBMS with support for Object features
Part B: Develop a 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."

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:

Part A: All laboratory experiments (nos) aretobeincludedforpracticalexamination.

Students are allowed to pick one experiment from the above list (50% of the total marks allotted)
Part B : Demonstrate the mini project developed in the laboratory (50% of the total marks allotted)
Strictly follow the instructions as printed on the cover page of answer script for breakup of marks
Change of experiment is allowed only once and marks allotted to the procedure part to be made zero.

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 SOFTWARE ENGINEERING (SSE) **Choice Based Credit System (CBCS) and Outcome Based Education(OBE)** **SEMESTER - II**			
SOFTWARE PROJECT PLANNING & MANAGEMENT			
Course Code	**20SSE21**, 20SIT254	CIE Marks	40
TeachingHours/Week (L:T:P)	3:0:2	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

M.TECH SOFTWARE ENGINEERING (SSE)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)
SEMESTER - II

ENTERPRISE APPLICATION PROGRAMMING

Course Code	**20SSE22**, 20SFC253, 20SIT12	CIE Marks	40
TeachingHours/Week (L:T:P)	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 the Complete reference	Herbert Schildt	Mc Graw hill	

M.TECH SOFTWARE ENGINEERING (SSE)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)
SEMESTER - II

SOFTWARE DESIGN PATTERNS

Course Code	**20SSE23**	CIE Marks	40
TeachingHours/Week (L:T:P)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Introduction: what is a design pattern? describing design patterns, the catalog of design pattern, organizing the catalog, how design patterns solve design problems, how to select a design pattern, how to use a design pattern. What is object-oriented development? , key concepts of object oriented design other related concepts, benefits and drawbacks of the paradigm

Module -2

Analysis a System: overview of the analysis phase, stage 1: gathering the requirements functional requirements specification, defining conceptual classes and relationships, using the knowledge of the domain. Design and Implementation, discussions and further reading.

Module – 3

Design Pattern Catalog: Structural patterns, Adapter, bridge, composite, decorator, facade, flyweight, proxy.

Module-4

Interactive systems and the MVC architecture:Introduction , The MVC architectural pattern, analyzing a simple drawing program , designing the system, designing of the subsystems, getting into implementation , implementing undo operation , drawing incomplete items, adding a new feature , pattern based solutions.

Module-5

Designing with Distributed Objects: Client server system, java remote method invocation, implementing an object oriented system on the web (discussions and further reading) a note on input and output, selection statements, loops arrays.

Course outcomes:

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

- Discover code qualities needed to keep code flexible
- Assess the quality of a design with respect to these principles.
- Apply principles in the design of object oriented systems.
- Demonstrate an understanding of a range of design patterns.
- Comprehending a design presented using this vocabulary.
- Select and apply suitable patterns in specific contexts

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 analysis, design and implementation	Brahma Dathan, SarnathRammath	Universities Press	2013
2	Design patterns	Erich Gamma, Richard Helan, Ralph Johman , John Vlissides	PEARSON	2013
Reference Books				
1	Pattern Oriented Software Architecture Volume 1	Frank Bachmann, ReginеMeunier, Hans Rohnert		1996
2	Anti-Patterns: Refactoring Software, Architectures and Projects in Crisis	William J Brown et al	John Wiley	1998

M.TECH SOFTWARE ENGINEERING (SSE)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)
SEMESTER - II

DATA MINING & DATA WAREHOUSING

Course Code	**20SSE241**, 20SFC251, 20SIT23, 20SIS331	CIE Marks	40
TeachingHours/Week (L:T:P)	4:0:0	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				
1	DATA WAREHOUSING, DATA MINING, & OLAP	Alex and Stephen	PHI	

M.TECH SOFTWARE ENGINEERING (SSE)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)
SEMESTER - II

SOFTWARE METRICS & QUALITY ASSURANCE

Course Code	**20SSE242,** 20SFC334, 20SIT243	CIE Marks	40
TeachingHours/Week (L:T:P)	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 Quality Engineering,	Stephen H Khan	Pearson	2nd edition 2013
Reference Books				
1	Software Metrics	Norman E-Fentor and 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 SOFTWARE ENGINEERING (SSE)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)
SEMESTER - II

INFORMATION RETRIEVAL			
Course Code	**20SSE243**	CIE Marks	40
TeachingHours/Week (L:T:P)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Introduction: Motivation, Basic concepts, Past, present, and future, The retrieval process. **Modeling: Introduction, A taxonomy of information retrieval models, Retrieval:** Adhoc and filtering, A formal characterization of IR models, Classic information retrieval, Alternative set theoretic models, Alternative algebraic models, Alternative probabilistic models, Structured text retrieval models, Models for browsing.

Module -2

Retrieval Evaluation: Introduction, Retrieval performance evaluation, Reference collections. **Query Languages:** Introduction, keyword-based querying, Pattern matching, Structural queries, Query protocols. **Query Operations:** Introduction, User relevance feedback, Automatic local analysis, Automatic global analysis.

Module – 3

Text and Multimedia Languages and Properties: Introduction, Metadata, Text, Markup languages, Multimedia. **Text Operations:** Introduction, Document preprocessing, Document clustering, Text compression, Comparing text compression techniques.

Module-4

User Interfaces and Visualization: Introduction, Human-Computer interaction, The information access process, Starting pints, Query specification, Context, Using relevance judgments, Interface support for the search process. **Searching the Web:** Introduction, Challenges, Characterizing the web, Search engines, Browsing, Meta searchers, Finding the needle in the haystack, Searching using hyperlinks.

Module-5

Indexing and Searching: Introduction; Inverted Files; Other indices for text; Boolean queries; Sequential searching; Pattern matching; Structural queries; Compression. **Parallel and Distributed IR:** Introduction, Parallel IR, Distributed IR.

Course outcomes:

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

- Upon completion of the course, the students will be able to
- Build an Information Retrieval system using the available tools
- Identify and design the various components of an Information Retrieval system
- Apply machine learning techniques to text classification and clustering which is used for efficient Information Retrieval
- Analyze the Web content structure
- Design an efficient search engine

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	Modern Information Retrieval	Ricardo Baeza-Yates,	Pearson	1999

		BerthierRibeiro-Neto		
Reference Books				
1	Information Retrieval Algorithms and Heuristics,	David A. Grossman, OphirFrieder	Springer	2nd Edition 2004

M.TECH SOFTWARE ENGINEERING (SSE) **Choice Based Credit System (CBCS) and Outcome Based Education(OBE)** **SEMESTER - II**			
ADVANCED ALGORITHMS			
Course Code	**20SSE244**, 20SCS14, 20SIS321	CIE Marks	40
TeachingHours/Week (L:T:P)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Review of Analysis Techniques: Growth of Functions: Asymptotic notations; Standard notations and common functions; Recurrences and Solution of Recurrence equations- The substitution method, The recurrence – tree method, The master method; Amortized Analysis: Aggregate, Accounting and Potential Methods.

Module-2

Graph Algorithms: Bellman - Ford Algorithm; Single source shortest paths in a DAG; Johnson's Algorithm for sparse graphs; Flow networks and Ford-Fulkerson method; Maximum bipartite matching. **Polynomials and the FFT:** Representation of polynomials; The DFT and FFT; Efficient implementation of FFT.

Module-3

Number -Theoretic Algorithms: Elementary notions; GCD; Modular Arithmetic; Solving modular linear equations; The Chinese remainder theorem; Powers of an element; RSA cryptosystem; Primality testing; Integer factorization

Module-4

String-Matching Algorithms: Naïve string Matching; Rabin - Karp algorithm; String matching with finite automata; Knuth-Morris-Pratt algorithm; Boyer – Moore algorithms.

Module-5

Probabilistic and Randomized Algorithms: Probabilistic algorithms; Randomizing deterministic algorithms, Monte Carlo and Las Vegas algorithms; Probabilistic numeric algorithms

Course outcomes:

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

- Design and apply iterative and recursive algorithms.
- Design and implement optimization algorithms in specific applications.
- Design appropriate shared objects and concurrent objects for applications.

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 Algorithms	T. H Cormen, C E Leiserson, R L Rivest and C Stein	Prentice-Hall of India	3rd Edition, 2010
2	Algorithms	Kenneth A. Berman	Cengage Learning	2002.
Reference Books				
1	Fundamentals of Computer Algorithms	Ellis Horowitz, SartajSahni, S.Rajasekharan	Universities press	2nd Edition, 2007

M.TECH SOFTWARE ENGINEERING (SSE)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)
SEMESTER - II

CLOUD COMPUTING

Course Code	**20SSE251**, 20LNI15, 20SCE14, 20SIT22, 20SCN31, 20SCS243, 20SIS12	CIE Marks	40
TeachingHours/Week (L:T:P)	4:0:0	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 SOFTWARE ENGINEERING (SSE)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)
SEMESTER - II

SOFTWARE AGENTS

Course Code	**20SSE252**, 20LNI252	CIE Marks	40
TeachingHours/Week (L:T:P)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

An introduction to Software Agents Why Software Agents? Simplifying Computing, Barriers to Intelligent Interoperability, Incorporating Agents as Resource Managers, Overcoming user Interface Problems, Toward Agent-Enabled System Architectures. Agents: From Direct Manipulation to Delegation Introduction, Intelligent Interfaces, Digital Butlers, Personal Filters, Digital sisters-in-Law, Artificial Intelligence, Decentralization, Why Linking works, The Theatrical Metaphor, Conclusion: Direct Manipulation and Digital Butlers, Acknowledgements. Interfaces Agents Metaphors with Character Introduction, Objections to Agents, In Defense of Anthropomorphism, Key Characteristics of Interface Agents, Agency, Responsiveness, Competence, Accessibility, Design and Dramatic Character, An R & D Agenda

Module -2

Designing Agents as if People Mattered: What does “Agents” Mean?, Adaptive Functionality:

Three Design Issues, The Agent Metaphor: Reactions and Expectations The Agent Conceptual Model. Direct Manipulation versus Agents: Paths to Predict able, Controllable, and Comprehensible Interfaces: Introduction, General Concerns About Intelligent Interfaces, Learning From History, What Is an Agent?, Looking at the Components, Realizing a New Vision, Tree Maps, Dynamic Queries, Back to a Scientific Approach, Acknowledgements. Agents for Information Sharing and Coordination: A History and some Reflections: Information, Lens: An Intelligent Tool for Managing Electronic Messages, Semiformal Systems an d Radical Tailorability, Oval: A Radically Tailorable Tool for Information Management and Cooperative Work, Examples of Application and Agents in Oval, Conclusions: An Addendum: The Relationship between Oval and Objects Lens

Module – 3

Agents that Reduce Work and Information Overload Introduction, Approaches to Building Agents, Training a Personal Digital Assistant, Some Example of Existing Agents, Electronic Mail Agents, Meeting Scheduling Agent, News Filtering Agent, Entertainment Selection Agent, Discussion, Acknowledgements Software Agents for Cooperative Learning: Computer-Supported Cooperative Learning, Examples of Software Agents for Cooperative Learning, Examples of Software Agents for Cooperative Learning, Developing an Example, Discussion and Perspectives.

Module-4

An Overview of Agent-Oriented Programming: Agent-Oriented Programming: Software with Mental State, Two Scenarios, On the Mental state of agents, Generic Agent Interpreter, AGENT-0: A Simple Language and its Interpreter, KQML as an Agent Communication Language: The approach of knowledge sharing effort(KSE), The Solution of the knowledge sharing efforts, knowledge Query Manipulation Language (KQML),Implementation, Application of KQML , Other Communication Language, The Approach of Knowledge-Sharing Effect,(KSE),The Solutions of the Sharing Effect.

Module-5

Agent for Information Gathering: Agent Organization, The Knowledge of an Agent, The Domain Model of an Agent, Modeling other Agent, communication language and protocol, query processing, an information goal, information source selection, generating a query access plan, interleaving planning and execution , semantic query optimization, learning, caching retrieved data, related work, discursion, acknowledgement. Mobile Agents: Enabling Mobile Agents, Programming Mobile Agents, Using Mobile Agents.

Course outcomes:

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

- Identify and explore the advantages of agents and design the architecture for an agent
- Analyze the agent in details in a view for the implementation
- Analyze communicative actions with agents.
- Analyze typical agents using a tool for different types of 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	Software Agents	Jeffrey M. Bradshaw	PHI(MIT Press)	2012
Reference Books				
1	Developing In telligent Agent Systems: A Practical Guide	Lin Padgham and Michael Winikoff	John Wiley & sons Publication	2004
2	Agent-Based and Individual Based modeling: A Practical Introduction	Steven F. RailsBack and Volker Grimm	Princeton University Press	2012
3	Disappearing Cryptography – Information Hiding: Steganography & Watermarking	Peter Wayner	Morgan Kaufmann Publishers	2002
4	Multimedia Secuirty, Watermarking, Steganography and Forensics	Frank Y. Shih	CRC Press	2012

M.TECH SOFTWARE ENGINEERING (SSE)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)
SEMESTER - II

TRUST MANAGEMENT IN E-COMMERCE

Course Code	**20SSE253**, 20SFC244	CIE Marks	40
TeachingHours/Week (L:T:P)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Introduction to E-Commerce: Network and E-Commerce, Types of E-Commerce. Ecommerce Business Models: B2C, B2B, C2C, P2P and M-commerce business models. Ecommerce Payment systems: Types of payment system, Credit card E-Commerce transactions, B2C E-Commerce Digital payment systems, B2B payment system.

Module 2

Security and Encryption: E-Commerce Security Environment, Security threats in Ecommerce environment, Policies, Procedures and Laws.

Module 3

Inter-organizational trust in E-Commerce: Need, Trading partner trust, Perceived benefits and risks of E-Commerce, Technology trust mechanism in E-Commerce, Perspectives of organizational, economic and political theories of inter-organizational trust, Conceptual model of inter-organizational trust in E-Commerce participation.

Module 4

Introduction to trusted computing platform: Overview, Usage Scenarios, Key components of trusted platform, Trust mechanisms in a trusted platform.

Module 5

Trusted platforms for organizations and individuals: Trust models and the E-Commerce domain.

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

- Explain the types of E-Commerce, E-Commerce business models and E-commerce payment systems.
- Illustrate the Policies, Procedures and Laws and Security threats in E-Commerce environment.
- Analysis and explain the issues, risks and challenges in inter-organisational trust in E-Commerce
- Explain the Key components and Trust mechanisms of trusted computing platform.
- Describe the Trusted platforms for organizations and individuals

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	Study Guide to E-Commerce Business Technology Society	Kenneth C. Laudon and Carol GuercioTrave	Pearson Education	2005
2	Inter-Organizational Trust for Business-to-Business E-Commerce	Pauline Ratnasingam	IRM Press	2005
Reference Books				
1	Trusted Computing Platforms: TCPA Technology in Context	Siani Pearson, et al	Prentice Hall PTR	2002

M.TECH SOFTWARE ENGINEERING (SSE)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)
SEMESTER - II

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Course Code	20SCS12, 20SSE254, 20SAM12, 20SIS31	CIE Marks	40
TeachingHours/Week (L:T:P)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Introduction, problem Solving: state space search and control strategies

Module-2

Problem reduction and Game playing, Logic concepts and logic programming

Module-3

Advanced problem solving paradigm: planning
Knowledge representation

Module-4

Uncertainty Measure: Probability Theory, Bayesian Belief Networks,
Machine Learning Paradigms: Machine learning system, supervised and unsupervised learnings, Inductive, deductive learning, Clustering

Module-5

Support vector Machine, case based reasoning and learning.
ANN: Single Layer, Multilayer. RBF, Design issues in ANN, Recurrent Network

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

- Define Artificial intelligence and identify problems for AI. Charcterize the search techniques to solve problems and recognize the scope of classical search techniques
- Define knowledge and its role in AI. Demonstrate the use of Logic in solving AI problems
- Demonstrate handling of uncertiain knowledge and reasnong in probability theory.
- Understanding of Learning methods

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:	SarojKaushik	Cengage Learning	2014 Edition
Reference Books				
1	Artificial Intelligence: Structures and Stategies for Complex Problem Solving	George F Luger	Pearson Addison Wesley	6th Ed, 2008
2	Artificial Intelligence	E Rich, K Knight, and S B Nair	Tata Mc-GRaw Hill	3rd Ed, 2009
3	Artificial Intelligence: A Modern Approach	Stuart Russell and Peter Norvig	Prentice Hall	3rd, 2009

M.TECH SOFTWARE ENGINEERING (SSE)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)
SEMESTER - II

SOFT AND EVALTIONARY COMPUTING

Course Code	**20SSE31,** 20SCS23, 20SAM22	CIE Marks	40
Teaching Hours/Week (L:T:P)	3:0:2	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

Introduction to Soft computing: Neural networks, Fuzzy logic, Genetic algorithms, Hybrid systems and its applications.
Introduction to classical sets and fuzzy sets: Classical relations and fuzzy relations, Membership functions.

Module 2

Defuzzification, Fuzzy decision making, and applications.

Module 3

Genetic algorithms: Introduction, Basic operations, Traditional algorithms, Simple GA General genetic algorithms, The schema theorem, Genetic programming, applications.

Module 4

Swarm Intelligence System: Introduction, background of SI, Ant colony system
Working of ant colony optimization, ant colony for TSP.
(Text book 2)

Module 5

Unit commitment problem, particle Swarm Intelligence system
Artificial bee colony system, Cuckoo search system.
(text book 2)

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

- Implement machine learning through neural networks.
- Design Genetic Algorithm to solve the optimization problem.
- Develop a Fuzzy expert system.

Model Neuro Fuzzy system for clustering and classification

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	Principles of Soft computing	Shivanandam, Deepa S. N	Wiley India	2011
2	Soft Computing with MATLAB Programming	N. P. Padhy S.P. Simon	Oxford	2015
Reference Books				
1	Neuro-fuzzy and soft computing	.S.R. Jang, C.T. Sun, E. Mizutani	Phi (EEE edition),	2012
2	Soft Computing	SarojKaushik SunitaTiwari	McGrawHill	2018

TECHNICAL SEMINAR			
Course Code	20SSE27	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 SOFTWARE ENGINEERING (SSE) **Choice Based Credit System (CBCS) and Outcome Based Education(OBE)** **SEMESTER - III**			
INTERNET OF THINGS			
Course Code	**20SSE321** 20SCS15, 20LNI22, 20SCE23, 20SCN14	CIE Marks	40
TeachingHours/Week (L:T:P)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

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

Module -2

Fundamental IoT Mechanism and Key Technologies-Identification of IoT Object and Services, Structural Aspects of the IoT, Key IoT Technologies. Evolving IoT Standards-Overview and Approaches, IETF IPV6 Routing Protocol for RPL Roll, Constrained Application Protocol, Representational State Transfer, ETSI M2M,Third Generation Partnership Project Service Requirements for Machine-Type Communications, CENELEC, IETF IPv6 Over Low power WPAN, Zigbee IP(ZIP),IPSO

Module – 3

Layer ½ Connectivity: Wireless Technologies for the IoT-WPAN Technologies for IoT/M2M, Cellular and Mobile Network Technologies for IoT/M2M,Layer 3 Connectivity :IPv6 Technologies for the IoT: Overview and Motivations. Address Capabilities,IPv6 Protocol Overview, IPv6 Tunneling, IPsec in IPv6,Header Compression Schemes, Quality of Service in IPv6, Migration Strategies to IPv6.

Module-4

Case Studies illustrating IoT Design-Introduction, Home Automation, Cities, Environment, Agriculture, Productivity Applications.

Module-5

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

Course outcomes:

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

- Develop schemes for the applications of IOT in real time scenarios
- Manage the Internet resources
- Model the Internet of things to business
- Understand the practical knowledge through different case studies
- Understand data sets received through IoT devices and tools used for analysis

Question paper pattern:

The 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	Building the Internet of Things with IPv6 and MIPv6:The Evolving World of M2M Communications	Daniel Minoli	Wiley	2013
2	Internet of Things: A Hands on Approach	ArshdeepBahga, Vijay Madisetti	Universities Press	2015
Reference Books				
1	The Internet of Things	Michael Miller	Pearson	2015 First Edition
2	Designing Connected Products	Claire Rowland,Elizabeth Goodman et.al	O'Reilly	First Edition, 2015

M.TECH SOFTWARE ENGINEERING (SSE)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)
SEMESTER - III

MANAGING BIG DATA

Course Code	**20SSE322** 20SIT31, 20LNI251, 20SCE21, 20SFC331	CIE Marks	40
TeachingHours/Week (L:T:P)	4:0:0	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 SOFTWARE ENGINEERING (SSE) **Choice Based Credit System (CBCS) and Outcome Based Education(OBE)** **SEMESTER - III**			
AGILE TECHNOLOGIES			
Course Code	**20SSE323**. 20SCE324, 20SIT331	CIE Marks	40
TeachingHours/Week (L:T:P)	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 SOFTWARE ENGINEERING (SSE)
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:T:P)	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	Coyle, Bardi,	Thomson Press	2006

	Logistics – A supply Chain Perspective	Longley		
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 SOFTWARE ENGINEERING (SSE)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)
SEMESTER - III

WEB MINING

Course Code	**20SSE331**, 20SCN334	CIE Marks	40
TeachingHours/Week (L:T:P)	4:0:0	SEE Marks	60
Credits	04	Exam Hours	03

Module-1

INTRODUCTION: Crawling and Indexing, Topic Directories, Clustering and Classification, Hyperlink Analysis, Resource Discovery and VerticalPortals, Structured vs. Unstructured DataMining .**INFRASTRUCTURE and WEB SEARCH** -- Crawling the web – HTML and HTTP Basics – Crawling Basics – Engineering Large ScaleCrawlers- Putting together a Crawler-Boolean Queries and the Inverted Index – RelevanceRanking – Similarity Search.

Module -2

INFORMATION RETRIEVAL: Information Retrieval and Text Mining - Keyword Search - Nearest-Neighbor Methods -Measuring Similarity - Web-Based Document Search - Document–Matching - Inverted Lists -Evaluation of Performance - Structure in a Document Collection - Clustering Documents by Similarity- Evaluation of Performance - Information Extraction - Patterns and Entities from Text- Co reference and Relationship Extraction - Template Filling and Database Construction

Module – 3

LEARNING I: Similarity and Clustering – Formulations and approaches- Bottom up and Top down Partitioning Paradigms – Clustering and Visualization via Embedding's – Probabilistic Approaches to clustering – Collaborative Filtering,
SUPERVISED LEARNING: The Supervised Learning Scenario, Overview of Classification Strategies, Evaluating Text Classifiers, Nearest Neighbor Learners, Feature Selection.

Module-4

LEARNING II : SUPERVISED LEARNING – Bayesian Learners, Exploiting Hierarchy among Topics, Maximum Entropy Learners, Discriminative Classification, Hypertext Classification,
SEMI SUPERVISEDLEARNING-- Expectation Maximization, Labeling Hypertext Graphs and Co- training.

Module-5

APPLICATIONS: Social Network Analysis- Social Sciences and Bibliometry – Page Rank and HITS – Shortcomings of coarse Grained Graph model- Enhanced Models and Techniques- Evaluation of Topic Distillation- Measuring and Modeling the Web – Resource Discovery – Collecting Important Pages Preferentially – Similarity Search Using Link Topology – Topical

Locality and Focused Crawling – Discovering Communities- The Future of Web Mining.

Course outcomes:

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

- Identify the application areas for web content mining, web structure mining and webusage mining.
- Design to retrieval the web data
- Develop schemes to crawl the web data, organize and index
- Cluster the documents for fast access
- Develop algorithms used by web mining applications.
- Select between different approaches and techniques of web mining

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	Text Mining: Predictive Methods for Analyzing Unstructured Information	Sholom Weiss	Springer	2005
2	Mining the Web: Discovery Knowledge from Hypertext Data	SoumenChakrabarti	Elsevier Science	2003
Reference Books				
1	Handbook of Research on Text and Web Mining Technologies", Vol I & II	Min Song, Yi-fang Brrok Wu	Information Science Reference (IGI),	2009
2	Insight into Data Mining Theory and Practice	K.P.Soman, ShyamDiwakar, V.Ajay	Prentice Hall of India	2006
3	Web Mining Applications and Techniques	Anthony Scime	Idea Group Publishing	2005
4	DATA MINING - Introductory and Advanced Concepts	Margret H.Dunham	PearsonEducation	2003

M.TECH SOFTWARE ENGINEERING (SSE)
Choice Based Credit System (CBCS) and Outcome Based Education(OBE)
SEMESTER - III

ADVANCES IN OPERATING SYSTEMS

Course Code	**20SSE332**, 20SIT334	CIE Marks	40
TeachingHours/Week (L:T:P)	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	Pradeep K Sinha	PHI	2007

	Systems, Concept and Design			

M.TECH SOFTWARE ENGINEERING (SSE) 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:T:P)	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 SOFTWARE ENGINEERING (SSE) **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:T:P)	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

PROJECT WORK PHASE – 1			
Course Code	20SSE34	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	20SSE35	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	20SSEI36	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	20SSE41	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. ■