POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING,
KALABURAGI
Choice Based Credit System (CBCS)
Scheme of Teaching and Examination 2019 – 20
(Effective from the academic year 2019 – 20)

V Semester

Sl. No.	Course and Course Code		Course Title	Teaching Department	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self Study	Duration in hours	SEE Marks	CIE Marks	Total Marks	
1.	PC	19IS51	Operating System	ISE	3	-	--	--	03	50	50	100	3
2.	PC	19IS52	Data Communication	ISE	3	-	--	0.5	03	50	50	100	3
3.	PC	19IS53	Data Base Management System	ISE	3	-	--	--	03	50	50	100	3
4.	PC	19IS54	Java Programming	ISE	4	-	--	0.5	03	50	50	100	4
5.	PC	19IS55	Software Engineering	ISE	3	-	--	--	03	50	50	100	3
6.	PC	19IS56	Compiler Design	ISE	4	-	--	--	03	50	50	100	4
7.	HU	19HU01	Recruitment Process Training -1	Humanities	2	-	--	--	02	50	50	100	1
8.	PC	19ISL51	Operating System Lab	ISE	--	--	2	--	03	50	50	100	1
9.	PC	19ISL52	Data Base Management System Lab	ISE	--	--	2	--	03	50	50	100	1
10.	PC	19ISL53	Java Programming Lab	ISE	--	--	2	--	03	50	50	100	1
Total					**22**	**--**	**06**	**1.0**	**29**	**500**	**500**	**1000**	**24**

Note: Hu: Humanities, PC: Professional core, NCMC: Non-credit mandatory course.
Note: Management and Entrepreneurship course shall be offered by CV, ME, IP, Auto and CCT Departments at V semester level and E&CE, CSE, IS, IT and E&E
departments at VI semester level

POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING,
KALABURAGI
Scheme of Teaching and Examination
2019 – 20 (Effective from the academic year 2019 – 20)

VI Semester

Sl. No.	Course and Course Code		Course Title	Teaching Department	Teaching Hours/Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self Study	Duration in	SEE	CIE	Total Mark	
1.	PC	19IS61	Management and Entrepreneurship	Humanities/ Program	3	-	--		03	50	50	100	3
2.	PC	19IS62	Artificial /ntelligence	ISE	4	-	--		03	50	50	100	4
3.	PE	19IS63X	Elective A	ISE	3	--	--		03	50	50	100	3
4.	PE	19IS64X	Elective B	ISE	3	--	--		03	50	50	100	3
5.	IE	19IS65X	Industrial Elective	ISE	3	--	--		03	50	50	100	3
6.	OE	19IS6OE	Open Elective	ISE	3	--	--		03	50	50	100	3
7.	HU	19HU02	Recruitment Process Training -2	Humanities	--	2	--		02	50	50	100	1
8.	PC2	19ISL61	Network Programming Lab	ISE	--	-	02		03	50	50	100	1
9.	PC	19ISL62	Artificial Intelligence Lab	ISE	--	--	02		03	50	50	100	1
10.	MP	19ISMP63	Mini-project	ISE					03	50	50	100	2
11.	INT	19ISIN64	Internship	(To be carried out during the intervening vacations of VI and VII semesters)					-	--	--	--	-
Total					**19**	**02**	**04**	**-**	**29**	**500**	**500**	**1000**	**24**

Note: PC: Professional core, PE: Professional Elective, OE: Open Elective, MP: Mini-project, INT: Internship.

Internship: All the students admitted to III year of BE/ B.Tech have to undergo mandatory internship of 4 weeks during the vacations of VI and VII semesters and /or VII and VIII semesters.

Note Management and Entrepreneurship course shall be offered by CV, ME, IP, Auto and CCT Departments at V semester level and E&CE, CSE, IS, IT and E&E
departments at VI semester level

ELECTIVE - A		
Sl.No.	**Course**	**Course-ID**
1	Computer Networks	19IS631
2	Open-Source tools and Techniques	19IS632
3	System Software	19IS633

ELECTIVE - B		
Sl.No.	**Course**	**Course-ID**
1	System Simulation and Modeling	19IS641
2	Network Management System	19IS642
3	Data mining and warehousing	19IS643

INDUSTRY ELECTIVE		
Sl.No.	**Course**	**Course-ID**
1	Cryptography and Block Chain Technology	19IS651
2	Web Technology & J2EE	19IS652
3	Cloud Computing	19IS653

OPEN ELECTIVE		
Sl.No.	**Course**	**Course-ID**
1	Software Testing Tools & Techniques	19IS6OE

P D A College of Engineering, Kalaburagi
Autonomous College under VTU
Fifth semester

OPERATING SYSTEMS		
Subject Code	**19IS51**	Credits:03
CIE:50	SEE:50	SEE: 03 hrs
Hours/Week: 03 hrs (Theory)		Total Hours:42 hrs

Prerequisite: The Students should have the knowledge of Computer Organization, C, Programming
Principles, Data Structure and Algorithms.

Course Objectives:

To enable the students to obtain the knowledge of Operating System in the following topics.

- The basic components and fundamentals of Operating system
- The mechanisms to handle processes and threads and their communication.
- To gain knowledge on scheduling, process Synchronization, deadlock Handling techniques.
- To understand file handling, memory management, and OS mechanisms.

Modules	**Teaching Hours**
Module-I **Introduction to operating systems:** What operating systems do; Operating System structure; Operating System operations. **System Structures:** Operating System Services; User - Operating System interface; System calls; Types of system calls; System programs; Operating System design and implementation; Operating System structure; Virtual machines; **Process Management:** Process concept; Process scheduling; Operations on processes; Inter-process communication. **Multi-Threaded Programming:** Overview; Multithreading models; Thread Libraries; Threading issues.	**8 Hours**

Module-II **Process Scheduling:** Basic concepts; Scheduling criteria; Scheduling algorithms; Multiple-Processor scheduling; Thread scheduling. **Process synchronization:** Synchronization: The Critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors. **Deadlocks:** System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.	**9 Hours**
Module-III **Memory Management:** Memory Management Strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation. **Virtual Memory Management:** Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing.	**8 Hours**
Module-IV **Storage Management: File system:** File concept; Access methods; Directory structure; File system mounting; File sharing; Protection. **Implementing File System:** File system structure; File system implementation; Directory implementation; Allocation methods; Free space management. **Secondary storage structures:** Overview of Mass storage structures; Disk structure; Disk attachment, Disk scheduling; Disk management; Swap space management.	**9 Hours**
Module-V **System Protection:** Goals of protection; Principles of protection; Domain of protection; Access matrix; Implementation of access matrix; Access control; Revocation of access rights; Capability-Based systems. **Case Studies:** The Linux System: Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, File Systems, Inter process Communication.	**8 Hours**
Question paper pattern: 1. The question paper will have TEN questions. 2. There will be TWO questions in each module, covering all the topics. 3. The student need to answer FIVE full questions, selecting ONE full question from each module.	
Text books: 1. **Operating System Concepts** - Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, 9th edition, Wiley-India, 2013.	
Reference Books: **1. Operating Systems: A Concept Based Approach** - D.M. Dhamdhere, 9th Edition, Tata McGraw- Hill,2012. **2. Tanenbaum A. S.**, Modern Operating Systems, 3rd Edition, Pearson Education,2008. **3. Operating Systems** - P.C.P. Bhatt, 2nd Edition, PHI,2006.	

4. Operating Systems - Harvey M Deital, 3rd Edition, Addison Wesley, 1990.		
Course outcomes: **On completion of the course, the student will have the ability to:**		
Course Code	**CO #**	**Course Outcome (CO)**
	CO1	Interpret the fundamental concepts of operating system and its functions
	CO2	Analyze Scheduling algorithms and measure their performance
	CO3	Implement the system model for accessing shared data and handling deadlock in process synchronization
	CO4	Analyze the memory management strategies, file organizations and disk scheduling algorithms. .
	CO5	Analyze the information protection mechanisms in OS and illustrate the working of modern operating system.

DATA COMMUNICATION		
Subject Code	**19IS52**	Credits:03
CIE: 50	SEE:50	SEE: 03 hrs
Hours/week: 3 hrs (Theory)		Total Hours:42 Hrs
Prerequisite: The students should have fundamental knowledge of Information technology.		
Course Objectives: To enable the students to obtain the knowledge of data communication in the following topics. • Comprehend the transmission technique of digital data between two or more computers and a computer network that allows computers to exchange data. • Explain with the basics of data communication and various types of computer networks. • Illustrate TCP/IP protocol suite and switching criteria. • Demonstrate Medium Access Control protocols for reliable and noisy channels. • Expose wireless and wired LANs along with IP version.		
Modules		**Teaching Hours**
Module-I **Introduction:** Data Communications; Networks; Network Types, The Internet; Protocols and Standards; **Network Models** Layered tasks; The OSI Model and the layers in the OSI model; TCP / IP Protocol Suite**. Introduction to Physical Layer-1**Data and Signals and Analog and digital signals, Transmission impairment, Data rate		**8 Hours**

limits, Performance. Digital transmission Digital to digital conversion only (Only line coding, Polar, Bipolar and Manchester coding)	
Module-II Physical Layer-2: Analog to digital conversion (only PCM), Transmission Modes, Analog Transmission: Digital to analog conversion, Bandwidth Utilization: Multiplexing and Spread Spectrum, Switching: Introduction, Circuit Switched Networks and Packet switching	**9 Hours**
Module-III **Error Detection and Correction:** Introduction, Block coding, Cycli codes, Checksum, Forward error correction**, Data link control: DLC services,** Data lin layer protocols, HDLC, and Point to Point protocol (Framing, Transition phases only).	**8 Hours**
Module-IV **Media Access control**: Random Access, Controlled Access an Channelization, **Wired LANs Ethernet**: Ethernet Protocol, Standard Ethernet, Fast Ethernet, Gigabit Ethernet and 10 Gigabit Ethernet, Wireless LANs Introduction, IEEE 802.11 Project and Bluetooth.	**9 Hours**
Module-V **Other wireless Networks:** WIMAX, Cellular Telephony, Satellite networks, NetworklayerProtocols:InternetProtocol,ICMPv4,MobileIP,Nex generation IP: IPv6 addressing, The IPv6 Protocol, The ICMPv Protocol and Transition from IPv4 to IPv6.	**8 Hours**
Question paper pattern: 1. The question paper will have TEN questions 2. There will be TWO questions in each module, covering all the topics. 3. The student need to answer FIVE full questions, selecting ONE full question from each module.	
Text books: **1. Data Communications and Networking** - Behrouz A. Forouzan, 4th Edition, Tata McGraw Hill, 2006.	
Reference Books: **1. Communication Networks: Fundamental Concepts and Key Architectures**– Albert	

Leon, Garcia and Indra Widjaja, 3rd Edition, Tata McGraw- Hill, 2004.
2. **Dataand Computer Communication,**William Stallings,8thEdition,PearsoEducation,2007.
3. **ComputerNetworks:A Systems Approach**-LarryL.PetersonandBruceS.David, 4tEdition, Elsevier,2007.
4. **Introduction to Data Communications and Networking -** Wayne Tomasi, Pearson Education,2005.
5. **Computer and Communication Networks -** Nader F. Mir, Pearson Education,2000

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
	CO1	Demonstrate the working principles and features of different protocols used in data communication.
	CO2	Analyze the transmission modes and explain the bandwidth utilization and spread spectrum techniques.
	CO3	Analyze the various error detection and error correction techniques used in communication protocols.
	CO4	Apply the working principles of different MAC techniques.
	CO5	Analyze different wireless network layer protocols.

DATABASE MANAGEMENT SYSTEMS		
Subject Code	**19IS53**	Credits: 3
CIE:50	SEE:50	SEE: 03 hrs
Hours/Week: 3hrs (Theory)		Total Hours: 42 Hrs

Prerequisite: The Students should have the knowledge of Data Structures, Computer Organization and C++ Programming Principles.

Course Objectives:

To enable the students to obtain the knowledge of Data Base Management System in the following topics.

- Understand the Data Base Management Principles and relational models.
- Understand the relational algebraic approach and data base implementation and interaction techniques using SQL.
- Understand the functional dependency and Normalization Techniques.
- Understand the online transaction processing and recovery methods.

Modules	Teaching Hours
Module I **Introduction:** Introduction; An example; Characteristics of Database approach; Actors on the screen; Workers behind the scene; Advantages of using DBMS approach; A brief history of database applications; when not to use a DBMS. Data models, schemas and instances; Three-schema architecture and data independence; Database languages and interfaces; The database system environment; Centralized and client-server architectures; Classification of Database Management systems.	**8 Hours**
Module II **Entity-Relationship Model:** Using High-Level Conceptual Data Models for Database Design; An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; Refining the ER Design; ER Diagrams, Naming Conventions and Design Issues; Relationship types of degree higher than two.	**8 Hours**
Module III **Relational Model and Relational Algebra:** Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions and dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational. Operations: JOIN and DIVISION; Additional Relational Operations; Examples of Queries in Relational Algebra; Relational Database Design Using ER- to-Relational Mapping. **SQL:** SQL Data Definition and Data Types; Specifying basic constraints in SQL; Schema change statements in SQL; Basic queries in SQL; More complex SQL Queries .Insert, Delete and Update statements in SQL; Specifying constraints as Assertion and Trigger; Views (Virtual Tables) in SQL.	**9 Hours**
Module IV **Database Design:** Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form. Properties of Relational Decompositions; Algorithms for Relational Database Schema Design; Multivalued Dependencies and Fourth Normal Form; Join Dependencies and Fifth Normal Form.	**8 Hours**

Module V	9 Hours
Transaction Management: The ACID Properties; Transactions and Schedules; Concurrent Execution of Transactions; Lock – Based Concurrency Control; Performance of locking; Transaction support in SQL. Introduction to Crash Recovery; 2PL, Serializability and Recoverability; Lock Management; Introduction to ARIES; The log; Other recovery-related structures; The write-ahead log protocol; Check pointing; Recovering from a System Crash.	

Question paper pattern:

1. The question paper will have TEN questions.
2. There will be TWO questions in each module, covering all the topics.
3. The student need to answer FIVE full questions, selecting ONE full question from each module.

Text books:

1. Fundamentals of Database Systems - Elmasri and Navathe, 5th Edition, Addison- Wesley,2007
2. Database Management Systems - Raghu Ramakrishnan and Johannes Gehrke – 3rd Edition. McGraw-Hill, 2014.

Reference Books:

1. Data Base System Concepts- Silberschatz, Korth and Sudharshan,6th Edition, Mc-Graw Hill,2010.
2. An Introduction to Database Systems - C.J. Date, A. Kannan,S. Swamynatham, 8th Edition, Pearson Education, 2006.

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
	CO1	Express the fundamentals and applications of data base management system.
	CO2	Apply good database design principles for the design of ER diagram and relational models.
	CO3	Implement and interact data base using SQL and relational algebra.
	CO4	Design data base by applying the functional dependency and Normalization techniques
	CO5	Demonstrate the data base transaction and recovery management process.

JAVA PROGRAMMING		
Subject Code	**19IS54**	Credits:04
CIE:50	SEE:50	SEE: 03hours
Hours/Week:4hours(Theory)		Total Hours:52

Prerequisite: The students should have the thorough knowledge of Object Oriented and Procedure Oriented Programming Paradigm

Course Objectives:

To enable the students to obtain the knowledge of Object-Oriented Programming with JAVA in the following topics.

- Understand the concepts of exception handling and Event Handling Mechanism.
- Understand the importance of Packages and Multithreading Concepts.
- Understand Stream Handling Mechanism and Handling I/O Files.
- Understand the Programming Principles of Applet programming and Implementing Applications using JAVA Principals.

Modules	Teaching Hours
Module-I **Introduction to JAVA:** Overview of JAVA, Java applications, JDK, Compiling Java Program, Java Interpreter, Byte code, JVM, Simple JAVA Programs. Primitive, non-primitive data types, Type casting, Arrays and strings. **Operators & Expressions:** Arithmetic operators, Bitwise operators, Relational Operators, Logical Operators, The Assignment Operators, The? : Operators, Operator precedence; Logical expression; Control statements, Selection statements, Iteration statements, Jump statements.	**10 Hours**
Module-II **Class, Objects, Methods:** Classes in Java, Class fundamentals, Super classes, Constructors; Creating instances of class; Methods; Method overloading. **Inheritance :** Simple, Multiple and multilevel inheritance, overriding, overloading, using abstract classes, using final with inheritance.	**11 Hours**
Module-III **Packages:** Creating package, Access package, importing package; defining Interfaces, implanting interfaces, Accessing interface variables. **Exception Handling:** Exception type, Multiple catch statements, uncaught exceptions, using try and catch block, Nested try statements, Multiple catch statements Java built in exceptions.	**10 Hours**
Module-IV **Event Handling:** Event handling mechanisms, The delegation event model, event classes, source of events, Event listener interfaces, Adapter classes, inner classes. **Multithread Programming :** Java thread model, thread priorities, Synchronization, Messaging, thread class and runnable interface, main	**11 Hours**

thread, creating a thread, multiple, threads, stopping and blocking a thread, Thread life cycle, thread methods, thread exceptions.	
Module-V **Applet Programming :** The Applet Class: Applet basics, Two types of Applets; Applet Architecture; An Applet skeleton; Applet lifecycle, Simple Applet display methods; Requesting repainting; Using the Status Window; Designing the web page, The HTML APPLET tag; Adding applet to HTML File, Passing parameters to the APPLETS; getDocumentbase() and showDocument( ), The AudioClip Interface; The AppletStub Interface; Output to the Console. **Managing I/O Files in JAVA:** Stream classes, byte stream classes, character stream classes, other I/O classes, I/O exceptions, Reading writing character, Reading writing bytes. Other stream classes.	**10 Hours**
Question paper pattern: 1.The question paper will have TEN questions. 2.There will be TWO questions in each module, covering all the topics. 3.The student need to answer FIVE full questions, selecting ONE full question from each module.	
Text books: 1. Java the Complete Reference - Herbert Schildt, 7th Edition, Tata McGraw Hill, 2007. 2. Programming with Java 5th Edition – E. Balaguruswamy, Tata McGraw Hill.	
Reference Books: 1. Introduction to JAVA Programming - Y. Daniel Liang, 6th Edition, Pearson Education, 2007	
E-Books and Course Materials **Thinking in JAVA** Author : Bruce Eckel Download Link: http://www.mindview.net/Books/TIJ **The JAVA Language Specification, Author:** James Gosling, Bill Joy, Guy Steele, Gilad Bracha, and Alex Buckley. **Read Online:** http://docs.oracle.com/javase/specs/jls/se8/html/index.html **Download PDF:** http://docs.oracle.com/javase/specs/jls/se8/jls8.pdf **Publish Date:** March 2014 **The JAVA Tutorials** **Author:** Raymond Gallardo, Scott Hommel, Sowmya Kannan, Joni Gordon, and Sharon BioccaZakhour. **Read Online:** http://docs.oracle.com/javase/tutorial **Download Link:** http://www.oracle.com/technetwork/java/javase/java-tutorial-downloads-2005894.html, **Publish Date:** August 2014 **Think JAVA** **Author:** Allen B. Downey **Read Online:** http://greenteapress.com/thinkapjava/html/index.html **Download PDF:** http://greenteapress.com/thinkapjava/thinkapjava.pdf **Publish Date:** July 2011 (5th edition).	

Course outcomes: **On completion of the course, the student will have the ability to:**		
Course Code	**CO #**	**Course Outcome (CO)**
	CO1	Analyze and implement the OOP principles using class and objects.
	CO2	Implement the inheritance modules using JAVA principles
	CO3	Analyzing the built-in packages, exceptions and event handling mechanism
	CO4	Applying the multithreading and applet programming principles to design JAVA based applications.
	CO5	Analyzing the stream handling mechanism and implementing the real time JAVA applications.

SOFTWARE ENGINEERING		
Subject Code	**19IS55**	Credits: 3
CIE:50	SEE:50	SEE: 03 hrs
Hours/Week: 3 hrs (Theory)		Total Hours: 42 hrs
Prerequisite:		
Course Objectives: To enable the students to obtain the knowledge on. • Software engineering principles and activities involved in building large software programs. • Identify ethical and professional issues and explain why they are of concern to software engineers. • Recognize the importance of software maintenance and describe the intricacies involved in software evolution. • Apply estimation techniques, schedule project activities and compute pricing.		
Modules		**Teaching Hours**
Module I Overview Introduction: FAQ's about software engineering, Professional and ethical responsibility. Socio-Technical systems: Emergent system properties; Systems engineering; Organizations, people and computer systems. Critical System, Software Processes : Critical Systems: A simple safety-critical system; System dependability; Availability and reliability.		**9 Hours**

Module II Software Processes: Models, Process iteration, Process activities; The Rational Unified Process; Computer-Aided Software Engineering. Requirements: Software Requirements: Functional and Non-functional requirements; User requirements; System requirements; Interface specification; the software requirements document. Requirements Engineering Processes: Feasibility studies; Requirements elicitation and analysis; Requirements validation	**8 Hours**
Module III System models, Project Management: System Models: Context models; Behavioral models; Data models; Object models; Structured methods. Project Management: Management activities; Project planning. Software Design: Architectural Design: Architectural design decisions; System organization; Modular decomposition styles; Control styles.	**8 Hours**
Module IV Object-Oriented design: Objects and Object Classes; An Object-Oriented design process. Development: Rapid Software Development: Agile methods; Extreme programming; Rapid application development. Software Evolution: Program evolution dynamics; Software maintenance; Evolution processes**.**	**8 Hours**
Module V Verification and Validation: Verification and Validation: Planning: Software inspections; Automated static analysis; Verification and formal methods. Software testing: System testing; Component testing. Management: Managing People: Selecting staff; Motivating people; Managing people; The People Capability Maturity Model. Software Cost Estimation: Productivity; Estimation techniques; Algorithmic cost modeling.	**9 Hours**

Question paper pattern:

1. The question paper will have TEN questions.
2. There will be TWO questions in each module, covering all the topics.
3. The student need to answer FIVE full questions, selecting ONE full question from each module.

Text books:

1. Software Engineering by Ian Sommerville, 9th Edition, Pearson Education, 2012

Reference Books:

1. **Roger.S.Pressman:** Software Engineering-A Practitioners approach, 7th Edition, Tata McGrawHill
2. **PankajJalote**: An Integrated Approach to Software Engineering, WileyIndia

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
	CO1	Describe software development life cycle processes.

	CO2	Analyze software requirements and generate SRS.
	CO3	Describe design concepts and develop design document
	CO4	Describe SQA tasks, goals, and metrics, and test strategies.
	CO5	Demonstrate Project management concepts and metrics.

COMPILER DESIGN		
Subject Code	**19IS56**	Credits: 04
CIE: 50	SEE: 50	SEE Hours: 03
Hours/Week: 04 (Theory)		Total Hours: 52
Prerequisite: The students should have knowledge of basic assembly level language instructions, FAFL and graph theory concepts.		
Course Objectives: To enable the students to obtain the knowledge of Compiler Design in the following topics: • To introduce principal structure of compiler, basic theories and methods used for different parts of compiler. • To impart knowledge of fundamentals of language translator, structure of a typical compiler, parsing method set c. • To design various phases of compiler such as Lexical analyzer, parser etc. • To distinguish different optimization techniques in the design of compiler.		
Modules		**Teaching Hours**
Module I **Introduction, Lexical Analysis: Language processors:** The structure of a Compilers; The evolution of programming languages; The science of building a compiler; Applications of Compiler technology; Programming language basics; **Lexical Analysis:** The Role of Lexical Analyzer; Input Buffering; Specifications of Tokens; Recognition of Tokens.		**10 Hours**
Module II **Syntax Analysis:** Introduction; Context-free Grammars Writing a Grammar; Top-down Parsing. Bottom-up Parsing.		**11 Hours**
Module III **Syntax Analysis** contd.**:** Introduction to LR Parsing: Simple LR. More powerful LR parsers; Using ambiguous grammars; Parser Generators.		**10 Hours**

Module IV **Syntax-Directed Translation:** Syntax-Directed definitions; Evaluation order for SDDs; Applications of Syntax-directed translation; Syntax- directed translation schemes. **Intermediate Code Generation:** Variants of syntax trees; Three-address code; Types and declarations; Translation of expressions; Type checking; Control flow; Back patching; Switch statements; Intermediate code for procedures.	**11 Hours**
Module V **Code Generation:** Issues in the design of Code Generator; The Target Language; Addresses in the target code; Basics blocks and Flow graphs; Optimization of basic blocks; A Simple Code Generator.	**10 Hours**

Question paper pattern:

The question paper will have TEN questions.

There will be TWO questions in each module, covering all the topics.

The student need to answer FIVE full questions, selecting ONE full question from each module.

Text books:

Compilers- Principles, Techniques and Tools-Alfred V Aho,MonicaS.Lam, Ravi Sethi, Jeffrey D Ullmam, 2nd Edition, Addison Wesley, 2007

Reference Books:

1.Crafting a Compiler with C-Charles N.Fischer,RichardJ.leBlanc, Jr, Pearson Education, 1991

2.Modern Compiler Implementation in C-Andrew W Apple,Cambridge University Press, 1997

3.Compiler Construction Principles & Practice-Kenneth C. L., Thomson Education, 1997.

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
	CO1	Describe the design of a compiler and the phases of program translation from source code to executable code and the files produced by these phases.
	CO2	Discuss lexical analysis phase and its underlying formal models such as finite state automata, push-down automata and their connection to language definition through regular expressions and grammars.

	CO3	Identify the syntax analysis phase and identify the similarities and differences among various parsing techniques and grammar transformation techniques.
	CO4	Apply formal attributed grammars for specifying the syntax and semantics of programming languages.
	CO5	Identify the effectiveness of optimization and explain the differences between machine -dependent and machine -independent translation and to use the powerful compiler generation tools such as Lex and YACC

Recruitment Process Training – I		
Subject Code	**19HU01**	Credits : 01
CIE : 50	SEE : 50	SEE: 03
Hours/Week : 02 hrs (Theory)		Total Hours: 28
Modules		**Teaching Hours**

Topics	**Take Away**	**Methodology**	**Application**	**Duration (Hours)**
Quantitative aptitude				
Simple equations and ages				
LCM and HCF Ratio,Proportions and Variations Divisibility rules and Unitdigit Remainder theorem	Focus on the concepts of - Simple equation, ages, median and mode	Problem Solving, Blended Learning	Understanding the concepts and short cuts related to the Topics	11 hours
Verbal				
Reading comprehension				
Synonyms and antonyms	Focus on the mentioned topics and application of	Blended	Understanding the application of the	

Subject verb agreement Verbal analogies Verbal sequence	the concepts related to the same	Learning and NLP	verbal topics through Examples	8 hours
Communication Skills				
Presentation skill Preparing presentation Organizing the materials Maintaining and preparing sequence of visual aids Dealing with the questions'	Understanding the basics of presentation skill, ways to present effectively , Do's and Don'ts of presentation skill	NLP,Blended Learning, Presentation	What is presentation Skills? Ways of effective presentation, managing visual aids during presentation	7 hours
Career Marketing				
Interview Skills Introduction to interview Skills	Introduction to interview	Brainstorming	What is an interview?	1 hour
Resume Skills Introduction to resume writing skill	Introduction to resume	Brainstorming	What is a resume?	1 hour
			Total	**28**

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
	CO1	Ability to solve the aptitude logical and verbal reasoning problems

	CO2	Ability to use body language properly and use social media
	CO3	Ability to network with people and build personal branding

OPERATING SYSTEM LABORATORY		
Subject Code	**19ISL51**	Credits : 01
CIE: 50	SEE: 50	SEE Hours: 03
Hours/Week : 02 (Practical)		Total Hours:14

Prerequisite Students should have the knowledge of C, Data Structure and Algorithms.

Course Objectives:

To enable the students to obtain the knowledge of Operating System laboratory in the following topics.

- To implement CPU scheduling algorithms
- To develop Bankers algorithm used for deadlock avoidance and prevention.
- To implement page replacement and memory management algorithms.

1. Write a C program to compute average waiting time and average turn around time for First-Come First-Served (FCFS) Scheduling algorithm, the program should accept the arrival time and burst time asinput.
2. Write a C program to compute average waiting time and average turn around time for Shortest-Job-First Scheduling algorithm, the program should accept the arrival time and burst time asinput.
3. Write a C program to compute average waiting time and average turn around time for Priority Scheduling algorithm, the program should accept the arrival time and burst time and priority asinput.
4. Write a C program to compute average waiting time and average turn around time for Round-Robin Scheduling algorithm, the program should accept the arrival time and burst time and assume suitable time quantum as input.
5. Write a C program for Producer-Consumer problem and hence demonstrate multi threading process.
6. Write a C program to detect whether the system is in safe state, the program should accept allocation, max and available matrices. Generate the need matrix.
7. Write a C program that implements FIFO page replacement algorithm.
8. Write a C program that implements optimal page replacement algorithm.
9. Write a C program that implements LRU page replacement algorithm.
10. Write a C program to implement Disk Scheduling
11. Write a C program to implement thread synchronization using mutual exclusive lock
12. Write a C program to implement thread synchronization using condition variable.

Question Paper Pattern:
In SEE, students will be asked to execute the program which may be related to the above list of programs

Reference : Lab Manual

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	**CO #**	**Course Outcome (CO)**
	CO1	Write a c program to implement process Scheduling algorithms
	CO2	Implement process synchronization techniques using C Program
	CO3	Write a c program to implement deadlock handling techniques

	CO4	Implement page replacement algorithms using C program
	CO5	Write a C program to implement disk scheduling techniques, Thread synchronization using mutual exclusion and condition variables.

DATABASE MANAGEMENT SYSTEMS LABORATORY		
Subject Code	**19ISL52**	Credits : 01
CIE: 50	SEE: 50	SEE Hours: 03
Hours/Week : 02 (Practical)		Total Hours:14

Prerequisite : The Students should have the knowledge of Data structure and C++

Course Objectives: To enable the students to obtain the knowledge of Database management systems in the following topics.

- Understand the Data Base Management System Environment
- Understand the techniques to design the data base and populate there cords
- Understand the DML operations.
- Understand the query optimization and error handling techniques.
- Understand the DCL and TCL statements

DATA BASE LABORATORY

PART-A

Consider the following relations :

Student (Stud_number: integer, class: integer, major:char)

Course (Course_name: Char, Course_number: varchar,

Credit_hours:int, Department: char)

Section(Secton_id:varchar, Course_number:varchar,

Semester:char, Year:int, Instructor:char)

Grade_Report (Stud_number:varchar, Section_id:int, Grade:char)

Write the following queries in SQL. No duplicates should be printed in any of the answers.

i) What are the referential integrity constraints that should hold on theschema.

ii) Retrieve the names of all senior students majoring in‘CS’

iii) Retrieve the names of all courses thought by particular professor in year 2017 and2018

iv) For each section taught by particular professor, retrieve the course number,semester, year and number of students who took the section.

v) Retrieve the names and major of all students who do not have a grade of A in anyof

their courses.

vi) Insert a new student in the database

vii) Change the class of particular student.

viii)Insert a new course to the database

ix) Delete the record of the student whose name start with‘S’

x) Delete the record of the students whose name contains ‘a’ and‘e’

xi) Delete the record of the students whose name ends with‘a’

xii) Count the total number of students with Grade and Major wise.

xiii)Remove all the referential integrity constraints on the schema

xiv)Delete all the rows from thetables

xv) Drop all the tables.

PART-B

1. Consider the followingrelations:

Student (snum: integer, sname: string, major: string, level: string, age: integer)

Class (name: string, meets at: string, room: string, d: integer)

Enrolled (snum: integer, cname: string)

Faculty (fid: integer, fname: string, deptid: integer) The meaning of these relations is straightforward; for example, Enrolled has one record per student-class pair such that the student is enrolled in the class. Level is a two character code with 4 different values (example: Junior: JR etc) Write the following queries in SQL. No duplicates should be printed in any of the answers. Find the names of all Juniors (level = JR) who are enrolled in a class taught by Prof. Harshith.

i. Find the names of all classes that either meet in room R128 or have five or more Students enrolled.

ii. Find the names of all students who are enrolled in two classes that meet at the same time.

iii. Find the names of faculty members who teach in every room in which some class is taught.

iv. Find the names of faculty members for whom the combined enrollment of the courses that they teach is less than five

2. The following relations keep track of airline flight information:

Flights (no: integer, from: string, to: string, distance:integer,

Departs: time, arrives: time, price: real) Aircraft (aid: integer, name: string, cruisingrange: integer)

Certified (eid: integer, aid: integer)

Employees (eid: integer, ename: string, salary: integer)

Note that the Employees relation describes pilots and other kinds of employees as well; bbnmbcfEvery pilot is certified for someaircraft, and only pilots are certified to fly.Write each of the following queries in SQL.

i. Find the names of aircraft such that all pilots certified to operate them have salaries more than Rs.80,000.

ii. For each pilot who is certified for more than three aircrafts, find the eid and the maximum cruising range of the aircraft for which she or he iscertified.

iii. Find the names of pilots whose salary is less than the price of the cheapest route from Bengaluru toFrankfurt.

iv. For all aircraft with cruising range over 1000 Kms, .find the name of the aircraft and the average salary of all pilots certified for thisaircraft.

v. Find the names of pilots certified for some Boeingaircraft.

vi. Find the aids of all aircraft that can be used on routes from Bengaluru to NewDelhi.

3. Consider the following database of student enrollment in courses & books adopted for eachcourse.

STUDENT (regno: string, name: string, major: string, bdate:date)

COURSE (course #:int, cname:string, dept:string)

ENROLL (regno:string, course#:int, sem:int, marks:int)

BOOK _ ADOPTION (course# :int, sem:int, book-ISBN:int)

TEXT (book-ISBN:int, book-title:string, publisher:string, author:string)

i. Create the above tables by properly specifying the primary keys and the foreignkeys.

ii. Enter at least five tuples for eachrelation.

iii. Demonstrate how you add a new text book to the database and make this book be adopted by some department.

iv. Produce a list of text books (include Course #, Book-ISBN, Book-title) in the alphabetical order for courses offered by the ‘CS’ department that use more than two books.

v. List any department that has all its adopted books published by a specificpublisher.

vi. Generate suitablereports.

vii. Create suitable front end for querying and displaying the results.

4. The following tables are maintained by a book dealer.

AUTHOR (author-id:int, name:string, city:string,country:string)

PUBLISHER (publisher-id:int, name:string, city:string, country:string)

CATALOG (book-id:int, title:string, author-id:int, publisher-id:int,category-id:int, year:int, price:int)

CATEGORY (category-id:int, description:string)

ORDER-DETAILS (order-no:int, book-id:int, quantity:int)

i. Create the above tables by properly specifying the primary keys and the foreign keys.

ii. Enter at least five tuples for each relation.

iii. Give the details of the authors who have 2 or more books in the catalog and the price of the books is greater than the average price of the books in the catalog and the year of publication is after2000.

iv. Find the author of the book which has maximum sales.

v. Demonstrate how you increase the price of books published by a specific publisher by 10%.

vi. Generate suitable reports.

vii. Create suitable front end for querying and displaying the results.

5. Consider the following database for a banking enterprise

BRANCH(branch-name:string, branch-city:string, assets:real)

ACCOUNT(accno:int, branch-name:string, balance:real)

DEPOSITOR(customer-name:string, accno:int)

CUSTOMER(customer-name:string, customer-street:string,
customer-city:string)

LOAN(loan-number:int, branch-name:string, amount:real)

BORROWER(customer-name:string, loan-number:int)

i. Create the above tables by properly specifying the primary keys and the foreign keys

ii. Enter at least five tuples for eachrelation

iii. Find all the customers who have at least two accounts at the Main branch.

iv. Find all the customers who have an account at all the branches located in a specificcity.

v. Demonstrate how you delete all account tuples at every branch located in a specificcity.

vi. Generate suitable reports.

vii. Create suitable front end for querying and displaying the results.		
Question Paper Pattern: In SEE, students will be asked to execute the program which may be related to the above list of programs		
Reference : Lab Manual		
Course outcomes: On completion of the course, the student will have the ability to:		
Course Code	**CO #**	**Course Outcome (CO)**
	CO1	To demonstrate the understanding and application of the concepts of database management systems
	CO2	To exhibit the skills of writing programs related to database management in order to generate the necessary output
	CO3	To exhibit the skills of writing programs related to Data Mining using Rin order to generate the necessary output
	CO4	To reveal the skill of oral communication to present his /her views on programming aspects
	CO5	To prepare report about the technical details of experimental work related to software application or development

JAVA PROGRAMMING LAB		
Subject Code	19ISL53	Credits:01
CIE:50	SEE:50	SEE: 03hours
Hours/Week:2hours(Practical)		Total Hours:14
Prerequisite: The students should have the thorough knowledge of C, C++ and Data Structure Programming Principles and should have the thorough knowledge of Code Blocks IDE		
Course Objectives: To enable the students to obtain the knowledge of JAVA PROGRAMMING LAB in the following topics. • Familiarize with Eclipse IDE and debugging techniques. • Facilitate with skills required to solve problems using object-oriented concepts. • Impart the knowledge required to write a code with good programming practices. • To apply the event and exceptions handling mechanism in JAVA		
Experiments		
1. The numbers in the sequence1123581321are called Fibonacci numbers.		

Write a program using do-while loop to calculate and print the first m Fibonacci numbers. (Hint: After the first two numbers in the series, each number is the sum of the two preceding numbers).

2. Write a program to print the following outputs using for loops

```
1                    1
2 2                  2  2
3 3 3                3  3  3
4 4 4 4              4  4  4  4
5 5 5 5 5            5  5  5  5  5
```

3. Write a program which will read at extand count all occurrences of a particular word

4. Write a Java program to create class ACC with data members,accno, balance. Create objects ACC1, ACC2 & ACC3. Write a member functiontotransfermoneyfromACC3toACC1,display the balance in all accounts.

5. Write a Java program to implement the concept of multiple inheritance using interfaces.

6. Write a program to create an interface variable and access stacks through it.

7. Write a Java program for handling mouse events.

8. Develop an applet that receives an integer in one text field, and computes its factorial value and returns it in another text field, when button name "compute" is clicked.

9. Write an applet program for menu demonstration, menu bar should contain File, Edit, View and its submenus.

10. Write an applet program for key event sit should recognize enormal as well as special keys and should be displayed on the panel.

11. Write a Java program that creates three threads .First thread displays " Good Morning" every one second, the second thread displays " hello' every two seconds and the third thread displays "Welcome" every three seconds

12. Write a java program that illustrate the suspend, resume and stop operations in thread.

13. Write a java program that illustrates nested try statements.

14. Write a java program to illustrate the use of access control modifiers on two packages.

15. Write a java program to store and retrieve integers using data streams on a single file.

Question paper pattern:

In SEE, students will be asked to execute the programs which may be related to the above list of programs

Reference Books: Lab Manual		
Course outcomes: **On completion of the course, the student will have the ability to:**		
Course Code	**CO #**	**Course Outcome (CO)**
	CO1	To demonstrate the understanding and application of object oriented programming principles
	CO2	To show expertise and proficiency in logical decision making / thinking
	CO3	To exhibit the skills of writing programs related to object-oriented programming concepts in order to generate the necessary output
	CO4	To reveal the skill of oral communication to present his /her views on Programming aspects
	CO5	To prepare report about the technical details of experimental work related to application or development

ENTREPRENEURSHIP, MANAGEMENT AND FINANCE		
Subject Code	**19IS61**	Credits:03
CIE:50	SEE:50	SEE: 03 hrs
Hours/Week: 03 hrs (Theory)		Total Hours:42 hrs
Prerequisite: None		

Course Objectives:

To enable the students to obtain the knowledge of Operating System in the following topics.

- The Meaning, Functions, Characteristics, Types, Role and Barriers of Entrepreneurship,. Government Support for Entrepreneurship
- Management – Meaning, nature, characteristics, scope , functions, role etc and
- Engineers social responsibility and ethics
- Preparation of Project and Source of Finance
- Fundamentals of Financial Accounting
- Personnel and Material Management, Inventory Control

Modules	Teaching Hours
Module-I **ENTREPRENEUR** : Meaning of Entrepreneur; Functions of an Entrepreneur; Characteristics of an entrepreneur , Types of Entrepreneur; Intrapreneurs – an emerging class ; Role of Entrepreneurs in economic development; Barriers to entrepreneurship, Government Support for Innovation and Entrepreneurship in India - Startup-India, Make-in-India, PMMY, AIM , STEP, BIRAC, Stand-up India, TREAD	**8 Hours**
Module-II **MANAGEMENT:** Introduction – Meaning – nature and characteristics of Management, Scope and functional areas of management, Roles of Management, Levels of Management, Henry Fayol - 14 Principles to Management , Engineers Social responsibility and Ethics	**8 Hours**
Module-III **PREPARATION OF PROJECT AND SOURCE OF FINANCE:** **PREPARATION OF PROJECT:** Meaning of project; Project Identification; Project Selection; Project Report; Need and Significance of Report; Contents; **SOURCE OF FINANCE:** Long Term Sources(Equity, Preference, Debt Capital, Debentures, loan from Financial Institutions etc) and Short Term Source(Loan from commercial banks, Trade Credit, Customer Advances etc)	**8 Hours**
Module-IV **FUNDAMENTALS OF FINANCIAL ACCOUNTING:** Definition, Scope and Functions of Accounting , Accounting Concepts and	**9 Hours**

Conventions: Golden rules of Accounting, Final Accounts - Trading and Profit and Loss Account, Balance sheet	
Module-V PERSONNEL MANAGEMENT, MATERIAL MANAGEMENT AND INVENTORY CONTROL: **PERSONNEL MANAGEMENT:** Functions of Personnel Management, Recruitment, Selection and Training, Wages, Salary and Incentives **MATERIAL MANAGEMENT AND INVENTORY CONTROL**: Meaning, Scope and Objects of Material Management. Inventory Control- Meaning and Functions of Inventory control ; Economic Order Quantity(EOQ) and various stock level (Re-order level, Minimum level, Maximum level, Average level and Danger level)	**9 Hours**

Question paper pattern:

1.The question paper will have TEN questions.
2.There will be TWO questions in each module, covering all the topics.
3.The student need to answer FIVE full questions, selecting ONE full question from each module.

Reference Books:

1. Industrial Organization & Engineering Economics-T R Banga & S C Sharma- Khanna Publishers, Dehli.

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
	CO1	Develop Entrepreneurship skills
	CO2	Apply the concepts of management and Engineers Social responsibility & Ethics practice
	CO3	Prepare project report & choose different Source of Finance.
	CO4	Apply Fundamentals of Financial Accounting and interpret the final accounts
	CO5	Apply personnel management skills, Material and inventory control techniques

ARTIFICIAL INTELLIGENCE			
Subject Code		Credits: 04	
CIE: 50	SEE: 50	SEE Hours: 03	
Hours/Week : 04 (Theory)		Total Hours: 52	
Prerequisite The students should be Familiar with the data structures and high-level programming languages.			
Course Objectives : To enable the students to obtain the knowledge of Artificial Intelligence in the following topics.			

- The basic knowledge representation, problem solving, and learning methods of Artificial Intelligence
- Assess the applicability, strengths, and weaknesses of the basic knowledge representation, problem solving, and learning methods in solving particular engineering problems
- Develop intelligent systems by assembling solutions to concrete computational problems
- Understand the role of knowledge representation, problem solving, and learning in intelligent-system engineering

Modules	Teaching Hours
Module I What is artificial intelligence?, Problems, Problem Spaces and search, Heuristic search technique	**10 Hours**
Module II Knowledge Representation Issues, Using Predicate Logic, Representing knowledge using Rules,	**11 Hours**
Module III Symbolic Reasoning under Uncertainty, Statistical reasoning, Weak Slot and Filter Structures.	**10 Hours**
Module IV Strong slot-and-filler structures, Game Playing.	**10 Hours**
Module V Natural Language Processing, Learning, Expert Systems.	**11 Hours**

Question paper pattern:

- The question paper will have TEN questions.
- There will be TWO questions from each module.
- Each question will have questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting ONE full question from each module.

Text books:

1. E. Rich , K. Knight & S. B. Nair - Artificial Intelligence, 3/e, McGraw Hill.

Reference Books:

1. Artificial Intelligence: A Modern Approach, Stuart Rusell, Peter Norving, Pearson Education 2nd Edition.
2. Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems – Prentice Hal of India.

3. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem Solving", Fourth Edition, Pearson Education, 2002.
4. Artificial Intelligence and Expert Systems Development by D W Rolston-Mc Graw hill.
5. N.P. Padhy "Artificial Intelligence and Intelligent Systems" , Oxford University Press-2015

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
	CO1	Analyze the solutions for the AI based problems.
	CO2	Analyze the different techniques to solve the AI problems
	CO3	Demonstrate the learning methods and Implement various learning techniques
	CO4	Analyze the different algorithms for AI problems.
	CO5	Implement the simple real life AI modules.

COMPUTER NETWORKS		
Subject Code	**19IS631**	Credits : 03
CIE: 50	SEE: 50	SEE Hours: 03
Hours/Week : 03 (Theory)		Total Hours : 42

Prerequisite: The students should have Basic knowledge of components, types of information and mode of data transmission, topology of computer networks.

Course Objectives :

To enable the students to obtain the knowledge of computer networking

- To develop an understanding of modern network architectures from a design and performance perspective.
- To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).
- To clarify network terminology. To provide an opportunity to do network programming using TCP/IP.
- To provide a WLAN measurement experience.
- To expose students to emerging technologies and their potential impact.

Modules	**Teaching Hours**
Module I **Packet Switching Networks :** Network services and internal network operations; Packet network topology; Datagrams and virtual circuits;	

Routing in packet networks; Shortest-path routing; ATM networks. **Packet Switching Networks -2** : TCP / IP - 1: Traffic management at the packet level; Traffic management at the flow level; Traffic management at the flow-aggregate level. The TCP / IP architecture; The Internet protocol.	**10 Hours**
Module II **TCP / IP - 2: IPv6:** User datagram protocol; Transmission control protocol; Internet routing protocols; Multicast routing, DHCP, NAT, and Mobile IP. **ATM Networks:** Why ATM? BISDN reference model; ATM layer; ATM adaptation layer; ATM signaling; PNNI routing; classical IP over ATM.	**11 Hours**
Module III **Network Management Security:** Network management overview; SNMP; Structure of Management information; MIB; Remote network monitoring. Security and cryptographic algorithms; Security protocols; Cryptographic algorithms.	**10 Hours**
Module IV **QOS, Resource Allocation, VPNS, Tunneling, Overlay Networks:** Overview of QOS; Integrated services QoS; Differentiated services QoS; Resource allocation. Virtual Private Networks; Multiprotocol Label switching; Overlay networks. **Compression of Digital Voice And Video, VOIP, Multimedia Networking :** Overview of data compression, digital voice and compression, still images and jpeg compression, moving images and MPEG compression, limits of compression methods without loss, case study : FAX compression for transmission.	**11 Hours**
Module V **Mobile AD-HOC Networks , Wireless Sensor Networks :** Overview of wireless adhoc networks; Routing in adhoc networks; Routing protocols for adhoc networks; security of adhoc networks, Sensor networks and protocol structures.	**10 Hours**

Question paper pattern:

1. The question paper will have TEN questions.
2. There will be TWO questions in each module, covering all the topics.
3. The student need to answer FIVE full questions, selecting ONE full question from each module.

Text books:

Communication Networks -Fundamental Concepts and Key Architectures - Alberto Leon-Garcia and Indra Widjaja, 2ndEdition,Tata McGraw-Hill, 2004.
Computer and Communication Networks - Nader F. Mir, Pearson Education, 2007.

Reference Books:

Data Communications and Networking - Behrouz A. Forouzan,4th Edition, Tata McGraw-Hill, 2006.
Data and Computer Communication - William Stallings, 8thEdition, Pearson Education, 2007.
Computer Networks - A Systems Approach - Larry L. Petersonand Bruce S. David, 4th Edition,Elsevier, 2007
Introduction to Data Communications and Networking - Wayne Tomasi, Pearson Education, 2005

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
	CO1	Understand the organization of computer networks, factors influencing computer network development and the reasons for having variety of different types of networks switching networks
	CO2	Analyze the internals of different protocols such as TCP, UDP, IP, TCP/IP and SNMP.
	CO3	Analyze network management Issues
	CO4	Describe the contemporary issues in networking technologies like compression, QOS, Resource allocation.
	CO5	Apply the wireless networking concepts and routing algorithms.

OPEN SOURCE TOOLS AND TECHNIQUES		
Subject Code	**19IS632**	Credits : 03
CIE: 50	SEE: 50	SEE Hours: 03
Hours/Week : 03 (Theory)		Total Hours : 42

Prerequisite: Software Engineering , JAVA and Web Programming,

Course Objectives: To enable the students to

- obtain the knowledge of Open Source Tools and Techniques
- Familiarizing with the working principles of any two open source tools
- Understand the working procedure of the AWS tools to build and deploy the software
- Understand the working procedure of the Selenium Software Testing Tools.

Modules	**Teaching Hours**

Module I Introduction to Open Source Platform, Fundamentals of the Open Source Tools and Application, License Issues, Contrasting and Comparing Open Source V/s. Traditional Development Methodologies. Project Introduction: Hardware and Software Constraints. **Software processes:** Software Processes: Models, Process iteration, Process activities; The Rational Unified Process; Computer-Aided Software Engineering.	**9 Hours**
Module II **Software Development: R**apid Software Development: Agile methods; Extreme programming; Rapid application development. Software Evolution: Program evolution dynamics; Software maintenance; Evolution processes; Legacy system evolution. Managing and Building the Project Source, Distributed Source Code Control, Building the Source using AWS tools.	**8 Hours**
Module III **Verification and Validation:** Verification and Validation: Planning; Software inspections; Automated static analysis; Verification and formal methods. Defining Bugs, Filling bugs with the project, Debugging Techniques, Using Eclipse and Selenium tools	**8 Hours**
Module IV **A Perspective on Testing, Examples:** Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Levels of testing. Examples: Generalized pseudo code, The triangle problem, The Next Date function, The commission problem, The SATM (Simple Automatic Teller Machine) problem, The currency converter, Saturn windshield wiper, **Boundary Value Testing:** Boundary value analysis, Robustness testing, Worst-case testing, Special value testing, Examples, Random testing, Guidelines for Boundary value Testing. using Selenium tools.	**8 Hours**
Module V **Path Testing:** DD paths, Test coverage metrics, Basis path testing, guidelines and observations. Define/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 Integration, call graph-based Integration. Using Selenium Tools.	**9 Hours**

Question paper pattern:

1. The question paper will have TEN questions.
2. There will be TWO questions in each module, covering all the topics.
3. The student need to answer FIVE full questions, selecting ONE full question from each module.

Text books:

Software Engineering – Ian Somerville, 8thEdition, Pearson Education, 2007. (Listed topics only from Chapters 1, 4, 6, 7, 11, 14, 17, 21, 22)

Software Testing, A Craftsman's Approach - Paul C.Jorgensen:, 3rd Edition, Auerbach Publications, 2008.
(Listed topics only from Chapters 1, 2, 5, 6, 7, 9, 12, 13).

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
	CO1	Analyze the importance of Open Source Tools, Applications and its license issues.
	CO2	Illustrate Software Design for Architectural Design decisions, implementation using AWS tools.
	CO3	Apply Verification and Validation, test strategies using Selenium tool
	CO4	Design test cases and analyze different Levels of functional Testing using Selenium tools
	CO5	Design test-cases and analyze different non-functional testing procedures.

SYSTEM SOFTWARE		
Subject Code	**19IS633**	Credits:03
CIE:50	SEE: 50	SEE: 03hrs
Hours/Week: 03hrs (Theory)		Total Hours:42

Prerequisite: The students should be familiar with the implementation and use of data structures, Software engineering concepts and machine level languages.

Course Objectives:

To enable the students to obtain the knowledge of System Software in the following topics.

- Describe the System Software and Machine Architecture of SIC and SIC/XE Computers and apply Concepts to generate SIC Programs.
- Identify the primary functions of Assemblers and Macro Processor for Machine Dependent and Machine Independent Features and Compare Various Phases of Compiler working with Assembler.
- Illustrate how loader and Linker Create an Executable Program from an Object Module created by Assembler and Compiler and describe the "boot" process.
- Analyze Various Editors, Editing Process. User Interface, Editor Structure and Interactive debugging Techniques and Macro processors.
- Apply Lex and Yacc Programming Techniques to develop utility applications or programs.

Modules	Teaching Hours
Module I **Machine Architecture:** Introduction, System Software and Machine Architecture, Simpl Instructional Computer (SIC) – SIC Machine Architecture, SIC Machine Architecture, SIC Programming Examples. **Assemblers**: Basic Assembler Functions- A Simple SIC Assem Assembler Algorithm and Data Structures, Machine Dependent.	**8 Hours**
Module II **Assemblers:** Assembler Features - Instruction Formats & Addressing Modes. Program relocation. Machine independent Assembler Features, Symbol-Definition Statements. Expression, Program Blocks, Sections and Programming linking, Assembler Design Operations One-Pass Assembler, Multi-Pass Assembler, Implementation Examples - MASM Assembler.	**9 Hours**
Module III **Loaders and Linkers:** Basic Loader Functions - Design of Absolute Loader, A Simple Bootstrap Loader, Machine-Dependent Loader Features Relocation, Program Linking, Algorithm and Data Structures for Linking Loader; Machine independent Loader Features - Automatic Library Search, Loader Options.	**8 Hours**
Module IV **Editors and Debugging Systems:** Text Editors – Overview of Editing Process, User Interface, Editor Structure, Interactive Debugging systems – debugging functions and capabilities. **Macro Processor:** Basic Macro Processor Functions - Macro Definitions and Expansion, Macro Processor Algorithm and Data Structures, Machine-independent Macro Processor Features - Concatenation of Macro Parameters, Generation of Unique Labels, Conditional Macro Expansion, Keyword Macro Parameters, Macro Processor Design Options - Recursive Macro Expansion.	**8 Hours**
Module V **LEX and YACC:** Lex and Yacc - The Simplest Lex Program,	

Recognizing Words With LEX, Symbol Tables, Grammars, Communication, The Parts of Speech Lexer, A YACC Parser. The Rules Section. Running LEX and YACC, LEX and Handwritten Lexers, Using Lex - Regular Expression, Examples of Regular Expressions. Using YACC – Grammars, Recursive Rules, shift / reduce Parsing, What YACC Cannot Parse, A YACC Parser- The definition Section, The Rules Section, Symbol Values and Actions, The LEXER, Compiling and Running a Simple Parser.	**9 Hours**

Question paper pattern:

1.The question paper will have TEN questions.
2.There will be TWO questions in each module, covering all the topics.
3.The student need to answer FIVE full questions, selecting ONE full question from each module.

Text books:

1. **System Software** – Leland L. Beck 3rd Edition, Addison-Wesley
2. **Lex and Yacc** – John R. Levine, Mason and Doug Brown, O'Reilly SPD

Reference Books:

System Programming and Operating Systems – D.M.Dhamdhere, 7th Edition, Tata McGraw – Hill.

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
	CO1	Illustrate the architecture of SIC/XE Machines and write SIC/XE programs
	CO2	Identify the features and types of assemblers and implementation of MASM assembler
	CO3	Demonstrate the working principles of machine dependent and independent loaders and linkers
	CO4	Illustrate the process and functions of Editors, Debugging Systems and Macro Processors
	CO5	Implement Lex and Yaac programs to develop simple application programs

SYSTEM SIMULATION AND MODELLING		
Subject Code	**19IS641**	Credits:03
CIE:50	SEE:50	SEE: 03hours
Hours/Week: 3hours(Theory)		Total Hours:42

Prerequisite: The students should have the basic knowledge of numerical mathematics, probability and Programming skills in one or more of the following programming languages: C or C++

Course Objectives:

To enable the students to obtain the knowledge of System Simulation and Modelling in the following topics.

- To introduce various system modeling and simulation techniques and highlight their applications in different areas.
- To Analysis of different Simulation models.
- To explain Verification and Validation of simulation model.
- To interpret the model and apply the results to resolve critical issues in a real world environment.

Modules	Teaching Hours
Module I **Introduction:** When simulation is the appropriate tool and when it is not appropriate; Advantages and disadvantages of Simulation; Areas of application; Systems and system environment; Components of a system; Discrete and continuous systems; Model of a system; Types of Models; Discrete-EventSystemSimulation;StepsinaSimulationStudy.Simulation examples:Simulationofqueuingsystems,simulationofinventorysystems, other examplesofsimulation.**GeneralPrinciples,SimulationSoftware:**ConceptsinDiscrete-EventSimulation:TheEvent-Scheduling/Time-AdvanceAlgorithm,Manual simulation Using Event Scheduling.	**8 Hours**
Module II **Statistical Models In Simulation:** Review of terminology and concepts; Useful statistical models; discrete distributions; Continuous distributions; Poisson process, empirical distributions. **Queuing Models:** Characteristics of queuing systems, Queuing notation, Long-run measures of performance of queuing systems, Long-run measures of performance of queuing systems cont…Steady-state behavior of M/G/1 queue, Networks of queues	**9 Hours**
Module III **Random-Number Generation:** Properties of random numbers; Generation of pseudo-random numbers; Technique for generating random numbers. Test for random numbers. **Random-Variate Generation :** Random-Variate Generation: Inverse transform technique; Acceptance Rejection Technique.	**8 Hours**
Module IV **Input Modeling**: Data Collection; Identifying the distribution with data, Parameter estimation, Goodness of Fit Tests, Fitting a non-stationary Poisson process, Selecting input models without data, Multivariate and Time-Series input models. **Estimation of Absolute Performance:** Types of simulations with respect to output Analysis, Stochastic nature of output data, Measures of performance and their estimation.	**8 Hours**
Module V **Output Analysis For A Single Model:** Output analysis for terminating simulations; output analysis for steady state simulations. **Verification And Validation Of Simulation Models, Optimization**: Model building, verification and validation; Verification of simulation models; Calibration and validation of models; optimization via simulation.	**9 Hours**

Question paper pattern:

1. The question paper will have TEN questions.
2. There will be TWO questions in each module, covering all the topics.
3. The student need to answer FIVE full questions, selecting ONE full question from each module.

Text books:

1. Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol: Discrete-Event System Simulation, 5 th Edition, Pearson Education, 2010.

Reference Books:

1. Lawrence M. Leemis , Stephen K. Park: Discrete– Event Simulation: A First Course, Pearson Education, 2006.
2. Averill M. Law: Simulation Modeling and Analysis, 4th Edition, Tata McGraw-Hill, 2007

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
	CO1	Identify the system modeling and types of simulation tools.
	CO2	Demonstrate the concepts of scheduling and queuing systems.
	CO3	Test and Analyze random function generation through various transform techniques.
	CO4	Analyze the data collection process
	CO5	Interpret the stochastic nature of output

NETWORK MANAGEMENT SYSTEM		
Subject Code	**19IS642**	Credits:03
CIE:50	SEE:50	SEE: 03hours
Hours/Week: 3hours(Theory)		Total Hours:42
Prerequisite: The students should have the basic knowledge of Computer Networks, Wireless networks and protocols required for it.		
Course Objectives: To enable the students to obtain the knowledge of Network Management Systems in the		

following topics.

- To have an understanding of network management architectures and protocols.
- To become comfortable with using the different TCP/IP Protocols.
- To be comfortable using a variety of network management tools.
- To be familiar with a variety of computer network security issues.

Modules	Teaching Hours
Module I **Introduction:** Communications Protocols and Standards- Communication Architectures, Protocol Layers and Services; Case Histories of Networking and Management–The Importance of topology, Filtering Does Not Reduce Load on Node, Some Common Network Problems; Challenges of Information Technology Managers, Network Management: Goals, Organization, and Functions- Goal of Network Management. Basic Foundations: Standards, Models, And Language: Network Management Standards, Network Management Model, Organization Model, Information Model – Management Information Trees, Managed Object Perspectives, Communication Model;ASN.1-Terminology,Symbols, and Conventions, Objects and Data Types, Object Names.	**9 Hours**
Module II **SnmpvlNetworkManagement:** Managed Network: The History of SNMP Management, Internet Organizations and standards, Internet Documents, The SNMP Model, Snmpv1 Network Management –Contd., The Information Model – Introduction, The Structure of Management Information, Managed Objects, Management Information Base. The SNMP Communication Model–The SNMP Architecture, Administrative Model	**8 Hours**
Module III SNMP Management – RMON: Remote Monitoring, RMON SMI and MIB, RMONI1- RMON1 Textual Conventions, RMON1 Groups and Functions, Relationship Between Control and Data Tables, RMON1 Common and Ethernet Groups, RMON Token Ring Extension Groups, RMON2 – The RMON2 Management Information Base, Broadband Network Management: ATM Network: Broadband Networks and Services, ATM Technology – Virtual Path-Virtual Circuit, ATM Packet Size, Integrated Service, SONET	**8 Hours**
Module IV Broadband Network Management: Broadband Access Networks and Technologies – Broadband Access Networks, Broadband Access Technology; HFCT Technology–The Broadband LAN, The Cable Modem, The Cable Modem Termination System, The HFC Plant, The RF Spectrum for Cable Modem; Data Over Cable Reference Architecture; HFC Management – Cable Modem and CMTS Management, HFC Link Management, RF Spectrum Management, DSL Technology; Asymmetric Digital Subscriber Line Technology–Role of the ADSL Access Networking an Overall Network, ADSL Architecture.	**8 Hours**
Module V	

Network Management Applications: Configuration Management-Network Provisioning, Inventory Management, Network Topology, Fault Management- Fault Detection, Fault Location and Isolation Techniques, Performance Management – Performance Metrics, Data Monitoring, ProblemIsolation,PerformanceStatistics;EventCorrelationTechniques,Rule-BasedReasoning,Model-BasedReasoning,Case-BasedReasoning, Codebook correlation Model, State Transition Graph Model, Finite State Machine Model, Security Management–Policies and Procedures.	**9 Hours**

Question paper pattern:

1. The question paper will have TEN questions.
2. There will be TWO questions in each module, covering all the topics.
3. The student need to answer FIVE full questions, selecting ONE full question from each module.

Text books:

1. Network Management-Principles and Practice-Mani Subramanian ,Pearson Education,2003.

Reference Books:

Network Management Concepts and Practices A Hands-On Approach - J.Richard Burke, PHI,2008.

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
	CO1	Analyze the basic concepts of communication protocols, standards and architecture
	CO2	Identify the network management standards and models.
	CO3	Describe the remote network management and ATM network concepts.
	CO4	Identify the broadband access networks and technologies,
	CO5	Propose the applications of network management.

DATA MINING AND WAREHOUSING		
Subject Code	**19IS643**	Credits: 3
CIE:50	SEE:50	SEE: 03 hrs
Hours/Week: 3 hrs (Theory)		Total Hours: 42 hrs
Prerequisite: DBMS, Programming languages		

Course Objectives: To enable the students to obtain the knowledge of data mining and warehousing in the following topics.

- Learn Multidimensional schemas suitable for data warehousing
- Understand various data mining functionalities

- Inculcate knowledge on data mining query languages.
- Know in detail about data mining algorithms

Modules	Teaching Hours
Module I **Introduction** : What is Data Warehouse? Need of Data Warehouse, Data Preprocessing, Why preprocess the data, Data Cleaning, Missing Values, Noisy Data, Data Integration and Transformation, Data Reduction Data Warehouse and OLAP Technology : Difference between operational data base and data warehouse, Multi-dimensional Data Model, Stars, Snowflake and Fact **Constellations**: Schemas for Multidimensional Data bases, Defining Star, Snowflake and Fact constellation schemas, Concept Hierarchies, OLAP operations in Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, From Data Warehouse to Data Mining	**10 Hours**
Module II Mining Frequent Patterns, Association and Correlations : Frequent Item sets, Closed Item sets and Association Rules, The Apriority Algorithm finding frequent item sets using Candidate Generation, Generating Association Rules from Frequent Item Sets, Improving the efficiency of Apriority, Mining Frequent Item set Without Candidate Generation, FP-Growth Algorithm, Mining Frequent Itemset using Vertical Data Format, Mining Closed Frequent Itemset.	**10 Hours**
Module III **Classification:** Preliminaries; general Approach to solving a classification problem; Decision tree induction; Rule Based classifier; Nearest –neighbor classifier **Introduction to R :** Introduction, variable declaration, data sets, data frames, R programming principles	**11 Hours**
Module IV Cluster Analysis: Overview; K-means Agglomerative hierarchical clustering, DBSCAN, Overview of Cluster Evaluation. R Analysis : Perform data cleaning, data integration, data section, data reduction and apply the different data mining algorithms to perform analysis.	**11 Hours**
Module V **Further Topics in Data Mining:** Multidimensional analysis and descriptive mining of complex data objects; Spatial data mining; Multimedia data mining; Text mining; Mining the www.Outlier Analysis. Applications: Data **Mining Applications:** Data Mining System Products and Research Prototypes; Additional Themes on Data Mining; Social Impact of Data Mining; Trends in Data Mining.	**10 Hours**
Question paper pattern:	

1.The question paper will have TEN questions.
2. There will be TWO questions in each module, covering all the topics.
3. The student need to answer FIVE full questions, selecting ONE full question from each module.

Text books:

1. Introduction to Data Mining-Pang –Ning-Tan,MichaelSteinbach,Vipin Kumar Pearson Education,2007
2 .Data Mining-Concepts and Techniques-Jiawei Han and Micheline Kamber, 2nd Edition,Morgan Kaufmann ,2006

Reference Books:

1. Insight into Data Mining-Theory and practice- K.P.Soman,ShyamDiwakar,V.Ajay,PHI, 2006

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
	CO1	Demonstrate the data preprocessing techniques and data ware house models
	CO2	Analyze the different approaches for mining frequent patterns, associations and Correlations.
	CO3	Apply various algorithms for classification techniques using R programming principles
	CO4	Apply different algorithmic approach for cluster analysis using R data frames
	CO5	Implement data mining application using R

CRYPTOGRAPHY AND BLOCK CHAIN TECHNOLOGY		
Subject Code	**19IS651**	Credits : 03
CIE: 50	SEE: 50	SEE Hours: 03
Hours/Week : 03 (Theory)		Total Hours: 42
Prerequisite: The students should have the basic knowledge of Big Data Analytics and Cryptography.		

Course Objectives:

To enable the students to obtain the knowledge of Block chain technology:

- Understand the Block Chain environment and the distributed data base aspects.
- Understand the importance of cryptography and Block chain networking
- Understand the Bit coin Protocols, Mining Strategy and rewards
- Understand Navie Block chain construction and Digital Transactions

Modules	Teaching Hours
Module I Block chain overview, working procedure of the Block chain technology, Brief-view of Distributed Data Base, Hadoop Distributed File System, Distributed Hash Table, Advantages of Block Chain over conventional distributed database	**8 Hours**
Module II **Cryptography:** Hash function, Digital Signature – ECDSA, Memory Hard Algorithm. Block chain network, Mining Mechanism, Distributed Consensus.	**9 Hours**
Module III **Cryptocurrency** : History, Distributed Ledger, Bitcoin protocols – Mining strategy and rewards, Ethereum – Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin	**8 Hours**
Module IV Naive Block chain construction, Memory Hard algorithm - Hashcash implementation,	**9 Hours**
Module V Blockchain in a Nutshell, Block chain use cases, applications, advantages, disadvantages, cyber laws in India, Modes of Digital Transactions, Advantages of Digital Transactions.	**8 Hours**

Question paper pattern:

1. The question paper will have TEN questions.
2. There will be TWO questions in each module, covering all the topics.
3. The student need to answer FIVE full questions, selecting ONE full question from each module.

Text books:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Crypto currency Technologies: A Comprehensive Introduction, Princeton University Press (July 19,2016).

Reference Books:

1. Antonopoulos, Mastering Bitcoin: Unlocking Digital Crypto currencies
2. Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System
3. DR. Gavin Wood, "ETHEREUM: A Secure Decentralized Transaction Ledger,"Yellow paper.2014.
4. Nicola Atzei, Massimo Bartoletti, and Tiziana Cimoli, A survey of attacks on Ethereum smart contracts

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	**CO #**	**Course Outcome (CO)**
	CO1	Demonstrate the Block Chain environment and the distributed data base aspects.
	CO2	Analyze the importance of cryptography and Block chain networking
	CO3	Implement the Bitcoin Protocols, Mining Strategy and rewards
	CO4	Analyze the Navie Block chain construction
	CO5	Analyze Block chain applications and Digital Transactions

Web Technology & J2EE		
Subject Code	**19IS652**	Credits:03
CIE: 50	SEE: 50	SEE Hours: 03
Hours/Week : 03 (Theory)		Total Hours: 42

Prerequisite: The students must have knowledge of network Protocols, Basic HTML Programming and Database concepts.

Course Objectives:

To enable the students to obtain the knowledge of Web Technology & J2EE in the following topics.

- Understand the fundamentals of internet protocols and develop static web pages.
- Create interactive WebPages using style sheets.
- Learn the basics about Client side scripts and Server side scripts. and Understand database transactions on the server side machines.
- Create enterprise applications using session bean, Entity bean and message driven beans.

Modules	Teaching Hours
Module I **Fundamentals of Web, XHTML:** Internet, WWW, Web Browsers, and Web Servers; URLs; MIME; HTTP; Security; The Web Programmers Toolbox. XHTML: Origins and evolution of HTML and XHTML; Basic syntax; Standard XHTML document structure. Basic text markup. Images; Hypertext Links; Lists; Tables; Forms; Frames; Syntactic differences between HTML and XHTML.	**8 Hours**
Module II **CSS:** Introduction; Levels of style sheets; Style specification formats; Selector forms; Property value forms; Font properties; List properties; Color; Alignment of text; The Box model; Background images, The <Span> and tags; conflict resolution . **JAVASCRIPT:** Overview of JavaScript; Object orientation and JavaScript; General syntactic characteristics; Primitives, operations, and expressions; Screen output and keyboard input; Control statements; Object creation and modification; Arrays; Functions; Constructor; pattern matching using regular expressions ;errors in scripts, examples	**9 Hours**
Module III **Java 2 Enterprise Edition Overview, Database Access:** Overview of J2EE and J2SE.The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database	**8 Hours**

Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; Result Set; Transaction Processing; Metadata types; Exceptions.	
Module IV **Servlets:** Background; The Life Cycle of a Servlet; Using Tomcat for Servlet Development; A simple Servlet; The Servlet API; The Javax.servlet Package; Reading Servlet Parameter; The Javax.servlet.http package; Handling HTTP Requests and Responses; Using Cookies; Session tracking.	**8 Hours**
Module V **JSP, EJB:** Java Server Pages (JSP): JSP, JSP Tags, Tomcat, Request String, User Sessions, Cookies, Session Objects. Types of Enterprise Java beans, Session Bean & Entity Bean, Features of Session Bean, Life-cycle of Stateful Session Bean, Features of Entity Bean, Life-cycle of Entity Bean, Container-managed Transactions & Bean-managed Transactions, Implementing a container-managed Entity Bean	**9 Hours**

Question paper pattern:

1. The question paper will have TEN questions.
2. There will be TWO questions in each module, covering all the topics.
3. The student need to answer FIVE full questions, selecting ONE full question from each module.

Text books:

1. **Java The Complete Reference -** Herbert Schildt, 7th Edition, Tata McGraw Hill, 2007.
2. **J2EE The Complete Reference -** Jim Keogh, Tata McGraw Hill, 2007
3. **Programming the World Wide Web –** Robert Sebesta 4th Edition Pearson

Reference Books:

1. **Introduction to JAVA Programming -** Y. Daniel Liang, 6th Edition, Pearson Education, 2007
2. **The J2EE Tutorial -** Stephanie Bodoff et al, 2nd Edition, Pearson Education, 2004

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
	CO1	Discuss the fundamentals of internet, web and identify the differences between XHTML and HTML.
	CO2	Apply the concepts of Cascading style sheets for web development and XHTML documents.
	CO3	Apply JDBC skills necessary to create database driven enterprise applications to access and manipulate

		information.
	CO4	Implement Servlets, JSP and EJB concepts to control the request and responses from server side.
	CO5	Develop enterprise applications using the knowledge of EJB container features.

CLOUD COMPUTING		
Subject Code	**19IS653**	Credits:03
CIE:50	SEE:50	SEE: 03hours
Hours/Week:3hours(Theory)		Total Hours:42
Prerequisite: The Students should have knowledge of distributed computing, network protocols, IP addressing and cloud storage systems		
Course Objectives: **To enable the students to obtain the knowledge of Cloud Computing in the following topics.** • To understand the basics of cloud computing and different cloud computing services. • To understand cloud implementation, programming and mobile cloud computing. • To understand different phases of cloud migration. • To understand the best practices and Future of cloud computing.		
Modules		**Teaching Hours**
Module I **Cloud Computing Basics** Cloud Computing Overview, Applications, Intranets and the cloud, First Movers in the Cloud **Organization and Cloud Computing**-Scenarios to use and shouldn't use Cloud Computing Benefits, Limitations, Security Concerns and Regulations Issues		**8 Hours**
Module II **Cloud Computing with the Titans** Google App Engine, Web Toolkit EMC Technologies, VMware Acquisition, Netapp offerings, Microsoft ,Amazon,Salesforce.com, IBM, Partnerships. **The Business Case for Going To the Cloud** Cloud Computing Services, How those applications help your Business, Deleting Your Datacenter,salesforce.com, Thomson Reuters.		**9 Hours**
Module III **Cloud Computing Technology** Hardware and Infrastructure- Client, Security, Network and Services **Accessing the Cloud**		**8 Hours**

Platforms, Web Applications ,Web APIs, Web Browsers. Cloud Storage overview, Cloud storage providers, standards	
Module IV **Cloud computing at work** **Software as a service**-overview, Driving forces, Company Offerings, industries. **Software Plus Services** -Overview, Mobile Device Integration, Providers, Microsoft online **Migrating to the Cloud-**Cloud Services for the individuals ,Cloud Services aimed at Mid-Market, Enterprise -Class Cloud Offerings, Migration.	**8 Hours**
Module V **Developing applications** Google, Microsoft, Intuit Quick base, Cast Iron Cloud, Bungee Connect ,Development-Google App Engine, Salesforce.com, Microsoft Windows Azure, Troubleshooting, Application Management. Best Practices and the future of Cloud computing Analyze Your Service, Best Practices , How Cloud Computing Might Evolve.	**9 Hours**

Question paper pattern:

1. The question paper will have TEN questions.
2. There will be TWO questions in each module, covering all the topics.
3. The student need to answer FIVE full questions, selecting ONE full question from each module.

Text books:

1. Cloud Computing: The Practical Approach, Mc Graw Hill, 2012. Anthony T. Volte, Toby J Volte, Robert Elsenpeter:

Reference Books:

1 Kai Hwang, Jack Dungaree, and Geoffrey Fox: Distributed and Cloud Computing, From Parallel Processing to the Internet of Things, M K Publishers, 2012.

2. Cloud Computing, A Practical Approach, McGraw Fill, 2010.

3. Cloud Computing for Dummies: J. Hurwitz, ISBN 978-0-470-484-8 4. Dr. Kumar Sourabh, Cloud Computing, 2nd Edition, Wiley India

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)

	CO1	Identify fundamental concepts of Cloud Computing and also analyze the importance of organizational concerns
	CO2	Illustrate cloud platform architecture over data centers and develop the business models that underlie the cloud computing technology
	CO3	Design the systems hardware, infrastructure and services in accessing the cloud computing environment
	CO4	Illustrate various cloud services and cloud offerings to manage development of cloud computing services.
	CO5	Analyze applications over commercial cloud computing infrastructures and develop the best practices in the cloud computing

SOFTWARE TESTING TOOLS & TECHNIQUES		
Subject Code	**19IS6OE**	Credits:3
CIE:50	SEE:50	SEE: 03 hrs
Hours/Week: 3 hrs (Theory)		Total Hours:42 Hrs

Prerequisite: The students should have the knowledge of Software Engineering Fundamentals and Object Oriented programming languages

Course Objectives:

To enable the students to obtain the knowledge of Software Testing Tools and Techniques

- To understand the Software Engineering processes and Models for Various test processes and continuous quality improvement.
- To understand the Verification and Validation techniques, Project planning and Cost Estimations techniques.
- To understand the Architectural Design decisions and Object Oriented Design Processes.

To make use of various test tools and Application of software testing techniques in commercial environments.

Modules	**Teaching Hours**
Module I **Overview:** Introduction: FAQ's about software engineering, Professional and ethical responsibility. **Software processes:** Software Processes: Models, Process iteration, Process activities; The Rational Unified Process; Computer-Aided Software Engineering. **Requirements:** Software Requirements: Functional and Non-functional requirements; User requirements; System requirements; Interface specification; The software requirements document. Requirements Engineering Processes: Feasibility studies;	**9 Hours**

Requirements elicitation and analysis; Requirements validation; Requirements management.	
Module II **Software design:** Architectural Design: Architectural design decisions; System organization; Modular decomposition styles; Control styles. Object-Oriented design: Objects and Object Classes; An Object-Oriented design process; Design evolution. **Development: R**apid Software Development: Agile methods; Extreme programming; Rapid application development. Software Evolution: Program evolution dynamics; Software maintenance; Evolution processes; Legacy system evolution.	**9 Hours**
Module III **Verification and Validation:** Verification and Validation: Planning; Software inspections; Automated static analysis; Verification and formal methods. **Management**: managing People: Selecting staff; Motivating people; Managing people; The People Capability Maturity Model. **Software Cost Estimation:** Productivity; Estimation techniques.	**8 Hours**
Module IV **A Perspective on Testing, Examples:** Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Levels of testing. Examples: Generalized pseudo code, The triangle problem, The NextDate function, The commission problem, The SATM (Simple Automatic Teller Machine) problem, The currency converter, Saturn windshield wiper. **Boundary Value Testing:** Boundary value analysis, Robustness testing, Worst-case testing, Special value testing, Examples, Random testing, Guidelines for Boundary value Testing.	**8 Hours**
Module V **Path Testing:** DD paths, Test coverage metrics, Basis path testing, guidelines and observations. Define/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.	**9 Hours**

Integration Testing: A closer look at the SATM system, Decomposition-based Integration, call graph-based Integration.	

Question paper pattern:

1. The question paper will have TEN questions.
2. There will be TWO questions in each module, covering all the topics.
3. The student need to answer FIVE full questions, selecting ONE full question from each module.

Text books:

Software Engineering – Ian Somerville, 8th Edition, Pearson Education, 2007.
(Listed topics only from Chapters 1, 4, 6, 7, 11, 14, 17, 21, 22)
Software Testing, A Craftsman's Approach - Paul C. Jorgensen:, 3rd Edition, Auerbach Publications, 2008.
(Listed topics only from Chapters 1, 2, 5, 6, 7, 9, 12, 13).

Reference Books:

1.

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
	CO1	Demonstrate Software Engineering processes models, Requirement collection and analysis process.
	CO2	Illustrate Software Design for Architectural Design decisions and Object Oriented Design Processes,
	CO3	Apply Verification and Validation,, Project Planning and Cost Estimation Techniques.
	CO4	Design test cases and analyze different Levels of functional Testing.
	CO5	Design test-cases and analyze different non-functional testing procedures

RECRUITMENT PROCESS TRAINING - II		
Subject Code	**19HU02**	Credits: 01
CIE: 50	SEE: 50	SEE Hours: 03
Hours/Week : 02 (Theory)		Total Hours: 28

TOPICS	TAKE AWAY	METHODOLOGY	APPLICATION	DURATION (HOURS)
Quantitative aptitude Percentage & Profit and	Focus on the Mentioned topics and Solving	Problem Solving, Blended Learning	Understanding the concepts and short cuts related to the	

loss Time, speed and distance Algebra Time and work Average, mixtures and alligations	Problems related to the Same		topics	**12 Hours**
Logical ability Clocks and calendars Syllogisms Abductive and inductive logic analogies	Focus on the Mentioned topics and Solving Problems related to the Same	Problem Solving, Blended Learning	Understanding the concepts and logic related to the topics	**5 Hours**
Verbal ability Sentence completion, sentence correction Idioms and phrases Active and passive voice of speech	Understanding the application of articles, preposition, pronoun and tenses through Examples	Blended Learning and NLP	Understanding the application of the verbal topics	**3 Hours**
Interview Skills Structured and	Understanding the skill involved for	Blended Learning and NLP	What is an interview? What are the skills	**2 Hours**
TOPICS	**TAKE AWAY**	**METHODOLOGY**	**APPLICATION**	**DURATION (HOURS)**
Unstructured Interview, Face-Face interview, Techniques to face Video interviews, Grooming, Body Language, tips to customize preparation for personal interview, Mock	facing an Interview		required to face an interview	

Interview				
Resume Skills Resume Template, Color, Font, Structure of the resume, Usage of power Verbs, Formatting, Customizing resume, Introduction to Curriculum Vitae	Understanding the skill involved for writing a Resume	Blended Learning and NLP	What is a resume? How to prepare an industry specific resume?	**3 Hours**
Group Discussion	Do's and Don't of GD, Etiquette, Expectations from Industry experts	Blended Learning and NLP	Tips and tricks to crack GD	**3 Hours**

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	**CO #**	**Course Outcome (CO)**
	CO1	Improve ability of Aptitude, Logical and verbal reasoning skill to solve related problems
	CO2	Improved problem solving and decision making
	CO3	Ability to apply questioning techniques and aware of ethics in various situations
	CO4	Awareness of assertiveness and its importance and ability to face risk and managing different personalities

NETWORK PROGRAMMING LAB		
Subject Code	19ISL61	Credits :01
CIE: 50	SEE: 50	SEE Hours: 03
Hours/Week : 02(Practical)		Total Hours: 14

Prerequisite: The students should have the basic knowledge of components, types of information and mode of data transmission, topology of computer networks.

Course Objectives :

To enable the students to obtain the knowledge of Computer Network Programming Lab in the following topics.

- To understand the different network protocols and algorithms by writing and executing a program.
- To introduce the student to the major concepts like client/server involved computer networks
- To clarify network terminology. To provide an opportunity to do network programming using TCP/IP.
- To provide a WLAN measurement experience.
- To expose students to emerging technologies and their potential impact.

Experiments	Teaching Hours
The following experiments shall be conducted using either NS / OPNET/ NCTUNES or any other suitable simulator.	
PART – A	
1. Simulate a three nodes point – to – point network with duplex links between them. Set the queue size and vary the bandwidth and find the number of packets dropped.	
2. Simulate a four node point-to-point network with the links connected as follows:	
3. n0 – n2, n1 – n2 and n2 – n3. Apply TCP agent between n0-n3 and UDP between n1-n3. Apply relevant applications over TCP and UDP agents changing the parameter and determine the number of packets sent by TCP / UDP.	
4. Simulate the different types of Internet traffic such as FTP and TELNET over a network and analyze the throughput.	
5. Simulate the transmission of ping messages over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.	
6. Simulate an Ethernet LAN using n nodes and set multiple traffic nodes and determine collision across different nodes.	
7. Simulate an Ethernet LAN using n nodes and set multiple traffic nodes	

and plot congestion window for different source / destination.

8. Simulate simple ESS and with transmitting nodes in wire-less LAN by simulation and determine the performance with respect to transmission of packets .

PART – B

Implement the following in C/C++:

1. Write a program for error detecting code using CRC-CCITT (16-bits).
2. Write a program for frame sorting technique used in buffers.
3. Write a program for distance vector algorithm to find suitable path for transmission.
4. Using TCP/IP sockets, write a client – server program to make the client send the file name and to make the server send back the contents of the requested file if present.
5. Implement the above program using as message queues or FIFOs as IPC channels.
6. Write a program for simple RSA algorithm to encrypt and decrypt the data.
7. Write a program for Hamming code generation for error diction and correction.
8. Write a program for congestion control using leaky bucket algorithm.

Question paper pattern:
Note: In SEE, one program from PART – A and PART – B will be asked.

Reference Books: Lab Manual

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	**CO #**	**Course Outcome (CO)**
	CO1	Construct wired and wireless network
	CO2	Set network traffic at nodes
	CO3	Implement various network problems using C/C++
	CO4	Create a client-server environment to exchange information
	CO5	Simulate the protocols of wired and wireless networks.

ARTIFICIAL INTELLIGENCE LABORATORY		
Subject Code	**19ISL62**	Credits:1
CIE:50	SEE:50	SEE: 03 hrs
Hours/Week: 2 hrs (LABORATORY)		Total Hours:42 Hrs

Experiments

1. Implement breath first search algorithm.
2. Implement depth first search algorithm.
3. Implement travel salesman problem.
4. Implement water jag problem.
5. Implement A * search algorithm.
6. Implement AO* Search algorithm.
7. For a given set of training data examples stored in a CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
8. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

Course outcomes:
On completion of the course, the student will have the ability to:

	CO1	Understand artificial intelligence, its characteristics and its application areas.
	CO2	Formulate real-world problems as state space problems, optimization problems or constraint Satisfaction problems.
	CO3	Select and apply appropriate algorithms and AI techniques to solve complex problems.
	CO4	Design and implement using various search algorithms.
	CO5	Design and develop an expert system by using appropriate tools and techniques.

MINI-PROJECT		
Subject Code	**19ISMP63**	Credits:02
CIE:50	SEE:50	SEE: 03hours
Hours/Week : --		Total hrs: 14
Prerequisite: The students should have Thorough knowledge of Software Engineering and Mastering any one programming language.		
Course Objectives: • To understand the current requirement of the Industries. • To understand the different software development and testing methodologies. • To understand and apply architectural model, data flow and control flow diagrams. • To acquire good documentation, demonstration skills and impact of application on society.		
		Teaching Hours
Project comprises of: 1. Literature Survey 2. Requirement Analysis - S/w Requirement - H/w Requirements 3. Design Module presentation 4. Application 5. System Requirement Specification document SRS document contains synopsis, problem formulation and requirement analysis based on above factors. Document should be submitted by the end of Semester		

Course outcomes: **On completion of the course, the student will have the ability to:**		
	CO1	Demonstrate the skills of performing surveys on current industrial requirements.
	CO2	Analyze the requirements and apply appropriate software development methodology.
	CO3	Implement and Validate the architectural model, data flow and control flow structures.
	CO4	Demonstrate the documentation and presentation skills
	CO5	Implement the Societal and Ethical systems.