MANAGEMENT AND ENTREPRENEURSHIP FOR IT INDUSTRY
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER – V

Subject Code	15CS51	IA Marks	20
Number of Lecture Hours/Week	4	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives: This course will enable students to

- Explain the principles of management, organization and entrepreneur.
- Discuss on planning, staffing, ERP and their importance
- Infer the importance of intellectual property rights and relate the institutional support

Module – 1	**Teaching Hours**
Introduction – Meaning, nature and characteristics of management, scope and functional areas of management, goals of management, levels of management, brief overview of evolution of management. Planning- Nature, importance, types of plans, steps in planning, Organizing- nature and purpose, types of organization.	**10 Hours**
Module – 2	
Staffing- meaning, process of recruitment and selection. Directing and controlling- meaning and nature of directing, leadership styles, motivation theories. Controlling- meaning, steps in controlling, methods of establishing control, Communication- Meaning and importance, Coordination- meaning and importance	**10 Hours**
Module – 3	
Entrepreneur – meaning of entrepreneur, types of entrepreneurship, stages of entrepreneurial process, role of entrepreneurs in economic development, entrepreneurship in India, barriers to entrepreneurship. Identification of business opportunities- market feasibility study, technical feasibility study, financial feasibility study and social feasibility study.	**10 Hours**
Module – 4	
Preparation of project and ERP - meaning of project, project identification, project selection, project report, need and significance of report, contents, formulation, guidelines by planning commission for project report **Enterprise Resource Planning: Meaning and Importance- ERP** and Functional areas of Management – Marketing / Sales- Supply Chain Management – Finance and Accounting – Human Resources – Types of reports and methods of report generation	**10 Hours**
Module – 5	
Micro and Small Enterprises: Definition of micro and small enterprises, characteristics and advantages of micro and small enterprises, steps in establishing micro and small enterprises, Government of India indusial policy 2007 on micro and small enterprises, case study (Microsoft), Case study(Captain G R Gopinath),case study (N R Narayana Murthy & Infosys), **Institutional support:** MSME-DI, NSIC, SIDBI, KIADB, KSSIDC, TECSOK, KSFC, DIC and District level single window agency, **Introduction to IPR.**	**10 Hours**

Course outcomes: The students should be able to:

- Define management, organization, entrepreneur, planning, staffing, ERP and outline

their importance in entrepreneurship
- Utilize the resources available effectively through ERP
- Make us of IPRs and institutional support in entrepreneurship

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. Principles of Management -P. C. Tripathi, P. N. Reddy; Tata McGraw Hill, 4th / 6th Edition, 2010.
2. Dynamics of Entrepreneurial Development & Management -Vasant Desai Himalaya Publishing House.
3. Entrepreneurship Development -Small Business Enterprises -Poornima M Charantimath Pearson Education – 2006.
4. Management and Enterpreneurship- Kanishka Bedi- Oxford University Press-2017

Reference Books:

1. Management Fundamentals -Concepts, Application, Skill Development Robert Lusier – Thomson.
2. Entrepreneurship Development -S S Khanka -S Chand & Co.
3. Management -Stephen Robbins -Pearson Education /PHI -17th Edition, 2003

COMPUTER NETWORKS
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER – V

Subject Code	15CS52	IA Marks	20
Number of Lecture Hours/Week	4	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives: This course will enable students to

- Demonstration of application layer protocols
- Discuss transport layer services and understand UDP and TCP protocols
- Explain routers, IP and Routing Algorithms in network layer
- Disseminate the Wireless and Mobile Networks covering IEEE 802.11 Standard
- Illustrate concepts of Multimedia Networking, Security and Network Management

Module – 1	**Teaching Hours**
Application Layer: Principles of Network Applications: Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the Internet, Application-Layer Protocols. The Web and HTTP: Overview of HTTP, Non-persistent and Persistent Connections, HTTP Message Format, User-Server Interaction: Cookies, Web Caching, The Conditional GET, File Transfer: FTP Commands & Replies, Electronic Mail in the Internet: SMTP, Comparison with HTTP, Mail Message Format, Mail Access Protocols, DNS; The Internet's Directory Service: Services Provided by DNS, Overview of How DNS Works, DNS Records and Messages, Peer-to-Peer Applications: P2P File Distribution, Distributed Hash Tables, Socket Programming: creating Network Applications: Socket Programming with UDP, Socket Programming with TCP. **T1: Chap 2**	**10 Hours**
Module – 2	
Transport Layer : Introduction and Transport-Layer Services: Relationship Between Transport and Network Layers, Overview of the Transport Layer in the Internet, Multiplexing and Demultiplexing: Connectionless Transport: UDP,UDP Segment Structure, UDP Checksum, Principles of Reliable Data Transfer: Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go-Back-N, Selective repeat, Connection-Oriented Transport TCP: The TCP Connection, TCP Segment Structure, Round-Trip Time Estimation and Timeout, Reliable Data Transfer, Flow Control, TCP Connection Management, Principles of Congestion Control: The Causes and the Costs of Congestion, Approaches to Congestion Control, Network-assisted congestion-control example, ATM ABR Congestion control, TCP Congestion Control: Fairness. **T1: Chap 3**	**10 Hours**
Module – 3	
The Network layer: What's Inside a Router?: Input Processing, Switching, Output Processing, Where Does Queuing Occur? Routing control plane, IPv6,A Brief foray into IP Security, Routing Algorithms: The Link-State (LS) Routing Algorithm, The Distance-Vector (DV) Routing Algorithm, Hierarchical Routing,	**10 Hours**

Routing in the Internet, Intra-AS Routing in the Internet: RIP, Intra-AS Routing in the Internet: OSPF, Inter/AS Routing: BGP, Broadcast and Multicast Routing: Broadcast Routing Algorithms and Multicast. **T1: Chap 4:4.3-4.7**	
Module – 4	
Wireless and Mobile Networks: Cellular Internet Access: An Overview of Cellular Network Architecture, 3G Cellular Data Networks: Extending the Internet to Cellular subscribers, On to 4G:LTE,Mobility management: Principles, Addressing, Routing to a mobile node, Mobile IP, Managing mobility in cellular Networks, Routing calls to a Mobile user, Handoffs in GSM, Wireless and Mobility: Impact on Higher-layer protocols. **T1: Chap: 6 : 6.4-6.8**	**10 Hours**
Module – 5	
Multimedia Networking: Properties of video, properties of Audio, Types of multimedia Network Applications, Streaming stored video: UDP Streaming, HTTP Streaming, Adaptive streaming and DASH, content distribution Networks, case studies: Netflix, You Tube and Kankan. **Network Support for Multimedia:** Dimensioning Best-Effort Networks, Providing Multiple Classes of Service, Diffserv, Per-Connection Quality-of-Service (QoS) Guarantees: Resource Reservation and Call Admission **T1: Chap: 7: 7.1,7.2,7.5**	**10 Hours**

Course outcomes: The students should be able to:

- Explain principles of application layer protocols
- Recognize transport layer services and infer UDP and TCP protocols
- Classify routers, IP and Routing Algorithms in network layer
- Understand the Wireless and Mobile Networks covering IEEE 802.11 Standard
- Describe Multimedia Networking and Network Management

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. James F Kurose and Keith W Ross, Computer Networking, A Top-Down Approach, Sixth edition, Pearson,2017 .

Reference Books:

1. Behrouz A Forouzan, Data and Communications and Networking, Fifth Edition, McGraw Hill, Indian Edition
2. Larry L Peterson and Brusce S Davie, Computer Networks, fifth edition, ELSEVIER
3. Andrew S Tanenbaum, Computer Networks, fifth edition, Pearson
4. Mayank Dave, Computer Networks, Second edition, Cengage Learning

DATABASE MANAGEMENT SYSTEM
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER – V

Subject Code	15CS53	IA Marks	20
Number of Lecture Hours/Week	4	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives: This course will enable students to

- Provide a strong foundation in database concepts, technology, and practice.
- Practice SQL programming through a variety of database problems.
- Demonstrate the use of concurrency and transactions in database
- Design and build database applications for real world problems.

Module – 1	**Teaching Hours**
Introduction to Databases: Introduction, Characteristics of database approach, Advantages of using the DBMS approach, History of database applications. **Overview of Database Languages and Architectures:** Data Models, Schemas, and Instances. Three schema architecture and data independence, database languages, and interfaces, The Database System environment. **Conceptual Data Modelling using Entities and Relationships:** Entity types, Entity sets, attributes, roles, and structural constraints, Weak entity types, ER diagrams, examples, Specialization and Generalization. **Textbook 1:Ch 1.1 to 1.8, 2.1 to 2.6, 3.1 to 3.10**	**10 Hours**
Module – 2	
Relational Model: Relational Model Concepts, Relational Model Constraints and relational database schemas, Update operations, transactions, and dealing with constraint violations. **Relational Algebra:** Unary and Binary relational operations, additional relational operations (aggregate, grouping, etc.) Examples of Queries in relational algebra. **Mapping Conceptual Design into a Logical Design:** Relational Database Design using ER-to-Relational mapping. **SQL:** SQL data definition and data types, specifying constraints in SQL, retrieval queries in SQL, INSERT, DELETE, and UPDATE statements in SQL, Additional features of SQL. **Textbook 1: Ch4.1 to 4.5, 5.1 to 5.3, 6.1 to 6.5, 8.1; Textbook 2: 3.5**	**10 Hours**
Module – 3	
SQL : Advances Queries: More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, Views in SQL, Schema change statements in SQL. **Database Application Development:** Accessing databases from applications, An introduction to JDBC, JDBC classes and interfaces, SQLJ, Stored procedures, Case study: The internet Bookshop. **Internet Applications:** The three-Tier application architecture, The presentation layer, The Middle Tier **Textbook 1: Ch7.1 to 7.4; Textbook 2: 6.1 to 6.6, 7.5 to 7.7.**	**10 Hours**
Module – 4	
Normalization: Database Design Theory – Introduction to Normalization using Functional and Multivalued Dependencies: Informal design guidelines for relation schema, Functional Dependencies, Normal Forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal	**10 Hours**

Form. **Normalization Algorithms:** Inference Rules, Equivalence, and Minimal Cover, Properties of Relational Decompositions, Algorithms for Relational Database Schema Design, Nulls, Dangling tuples, and alternate Relational Designs, Further discussion of Multivalued dependencies and 4NF, Other dependencies and Normal Forms **Textbook 1: Ch14.1 to 14.7, 15.1 to 15.6**	
Module – 5	
Transaction Processing: Introduction to Transaction Processing, Transaction and System concepts, Desirable properties of Transactions, Characterizing schedules based on recoverability, Characterizing schedules based on Serializability, Transaction support in SQL. **Concurrency Control in Databases:** Two-phase locking techniques for Concurrency control, Concurrency control based on Timestamp ordering, Multiversion Concurrency control techniques, Validation Concurrency control techniques, Granularity of Data items and Multiple Granularity Locking. **Introduction to Database Recovery Protocols:** Recovery Concepts, NO-UNDO/REDO recovery based on Deferred update, Recovery techniques based on immediate update, Shadow paging, Database backup and recovery from catastrophic failures **Textbook 1: 20.1 to 20.6, 21.1 to 21.7, 22.1 to 22.4, 22.7.**	**10 Hours**
Course outcomes: The students should be able to:	
• Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS. • Use Structured Query Language (SQL) for database manipulation. • Design and build simple database systems • Develop application to interact with databases.	
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. Fundamentals of Database Systems, RamezElmasri and Shamkant B. Navathe, 7th Edition, 2017, Pearson. 2. Database management systems, Ramakrishnan, and Gehrke, 3rd Edition, 2014, McGraw Hill	
Reference Books:	
1. Silberschatz Korth and Sudharshan, Database System Concepts, 6th Edition, Mc-GrawHill, 2013. 2. Coronel, Morris, and Rob, Database Principles Fundamentals of Design, Implementation and Management, Cengage Learning 2012.	

AUTOMATA THEORY AND COMPUTABILITY
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER – V

Subject Code	15CS54	IA Marks	20
Number of Lecture Hours/Week	4	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives: This course will enable students to

- Introduce core concepts in Automata and Theory of Computation
- Identify different Formal language Classes and their Relationships
- Design Grammars and Recognizers for different formal languages
- Prove or disprove theorems in automata theory using their properties
- Determine the decidability and intractability of Computational problems

Module – 1	**Teaching Hours**
Why study the Theory of Computation, Languages and Strings: Strings, Languages. A Language Hierarchy, Computation, **Finite State Machines (FSM)**: Deterministic FSM, Regular languages, Designing FSM, Nondeterministic FSMs, From FSMs to Operational Systems, Simulators for FSMs, Minimizing FSMs, Canonical form of Regular languages, Finite State Transducers, Bidirectional Transducers. **Textbook 1: Ch 1,2, 3,4, 5.1 to 5.10**	**10 Hours**
Module – 2	
Regular Expressions (RE): what is a RE?, Kleene's theorem, Applications of REs, Manipulating and Simplifying REs. Regular Grammars: Definition, Regular Grammars and Regular languages. Regular Languages (RL) and Non-regular Languages: How many RLs, To show that a language is regular, Closure properties of RLs, to show some languages are not RLs. **Textbook 1: Ch 6, 7, 8: 6.1 to 6.4, 7.1, 7.2, 8.1 to 8.4**	**10 Hours**
Module – 3	
Context-Free Grammars(CFG): Introduction to Rewrite Systems and Grammars, CFGs and languages, designing CFGs, simplifying CFGs, proving that a Grammar is correct, Derivation and Parse trees, Ambiguity, Normal Forms. Pushdown Automata (PDA): Definition of non-deterministic PDA, Deterministic and Non-deterministic PDAs, Non-determinism and Halting, alternative equivalent definitions of a PDA, alternatives that are not equivalent to PDA. **Textbook 1: Ch 11, 12: 11.1 to 11.8, 12.1, 12.2, 12,4, 12.5, 12.6**	**10 Hours**
Module – 4	
Context-Free and Non-Context-Free Languages: Where do the Context-Free Languages(CFL) fit, Showing a language is context-free, Pumping theorem for CFL, Important closure properties of CFLs, Deterministic CFLs. Algorithms and Decision Procedures for CFLs: Decidable questions, Un-decidable questions. Turing Machine: Turing machine model, Representation, Language acceptability by TM, design of TM, Techniques for TM construction. **Textbook 1: Ch 13: 13.1 to 13.5, Ch 14: 14.1, 14.2, Textbook 2: Ch 9.1 to 9.6**	**10 Hours**
Module – 5	
Variants of Turing Machines (TM), The model of Linear Bounded automata: Decidability: Definition of an algorithm, decidability, decidable languages,	**10 Hours**

Undecidable languages, halting problem of TM, Post correspondence problem. Complexity: Growth rate of functions, the classes of P and NP, Quantum Computation: quantum computers, Church-Turing thesis. **Textbook 2: Ch 9.7 to 9.8, 10.1 to 10.7, 12.1, 12.2, 12.8, 12.8.1, 12.8.2**	

Course outcomes: The students should be able to:

- Acquire fundamental understanding of the core concepts in automata theory and Theory of Computation
- Learn how to translate between different models of Computation (e.g., Deterministic and Non-deterministic and Software models).
- Design Grammars and Automata (recognizers) for different language classes and become knowledgeable about restricted models of Computation (Regular, Context Free) and their relative powers.
- Develop skills in formal reasoning and reduction of a problem to a formal model, with an emphasis on semantic precision and conciseness.
- Classify a problem with respect to different models of Computation.

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. Elaine Rich, Automata, Computability and Complexity, 1st Edition, Pearson Education,2012/2013
2. K L P Mishra, N Chandrasekaran , 3rd Edition, Theory of Computer Science, PhI, 2012.

Reference Books:

1. John E Hopcroft, Rajeev Motwani, Jeffery D Ullman, Introduction to AutomataTheory, Languages, and Computation, 3rd Edition, Pearson Education, 2013
2. Michael Sipser : Introduction to the Theory of Computation, 3rd edition, Cengage learning,2013
3. John C Martin, Introduction to Languages and The Theory of Computation, 3rd Edition, Tata McGraw –Hill Publishing Company Limited, 2013
4. Peter Linz, “An Introduction to Formal Languages and Automata”, 3rd Edition, Narosa Publishers, 1998
5. Basavaraj S. Anami, Karibasappa K G, Formal Languages and Automata theory, Wiley India, 2012
6. C K Nagpal, Formal Languages and Automata Theory, Oxford University press, 2012.

OBJECT ORIENTED MODELING AND DESIGN
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER – V

Subject Code	15CS551	IA Marks	20
Number of Lecture Hours/Week	3	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives: This course will enable students to

- Describe the concepts involved in Object-Oriented modelling and their benefits.
- Demonstrate concept of use-case model, sequence model and state chart model for a given problem.
- Explain the facets of the unified process approach to design and build a Software system.
- Translate the requirements into implementation for Object Oriented design.
- Choose an appropriate design pattern to facilitate development procedure.

Module – 1	**Teaching Hours**
Introduction, Modelling Concepts and Class Modelling: What is Object orientation? What is OO development? OO Themes; Evidence for usefulness of OO development; OO modelling history. Modelling as Design technique: Modelling; abstraction; The Three models. Class Modelling: Object and Class Concept; Link and associations concepts; Generalization and Inheritance; A sample class model; Navigation of class models; Advanced Class Modelling, Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived Data; Packages. **Text Book-1: Ch 1, 2, 3 and 4**	**8 Hours**
Module – 2	
UseCase Modelling and Detailed Requirements: Overview; Detailed object-oriented Requirements definitions; System Processes-A use case/Scenario view; Identifying Input and outputs-The System sequence diagram; Identifying Object Behaviour-The state chart Diagram; Integrated Object-oriented Models. **Text Book-2:Chapter- 6:Page 210 to 250**	**8 Hours**
Module – 3	
Process Overview, System Conception and Domain Analysis: Process Overview: Development stages; Development life Cycle; System Conception: Devising a system concept; elaborating a concept; preparing a problem statement. Domain Analysis: Overview of analysis; Domain Class model: Domain state model; Domain interaction model; Iterating the analysis. **Text Book-1:Chapter- 10,11,and 12**	**8 Hours**
Module – 4	
Use case Realization :The Design Discipline within up iterations: Object Oriented Design-The Bridge between Requirements and Implementation; Design Classes and Design within Class Diagrams; Interaction Diagrams-Realizing Use Case and defining methods; Designing with Communication Diagrams; Updating the Design Class Diagram; Package Diagrams-Structuring the Major Components; Implementation Issues for Three-Layer Design. **Text Book-2: Chapter 8: page 292 to 346**	**8 Hours**

Module – 5	
Design Patterns: Introduction; what is a design pattern?, Describing design patterns, the catalog of design patterns, Organizing the catalog, How design patterns solve design problems, how to select a design patterns, how to use a design pattern; Creational patterns: prototype and singleton(only);structural patterns adaptor and proxy(only). **Text Book-3:Chapter-1: 1.1, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8,Chapter-3,Chapter-4.**	**8 Hours**
Course outcomes: The students should be able to: • Describe the concepts of object-oriented and basic class modelling. • Draw class diagrams, sequence diagrams and interaction diagrams to solve problems. • Choose and apply a befitting design pattern for the given problem.	
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. Michael Blaha, James Rumbaugh: Object Oriented Modelling and Design with UML,2nd Edition, Pearson Education,2005 2. Satzinger, Jackson and Burd: Object-Oriented Analysis & Design with the Unified Process, Cengage Learning,2005. 3. Erich Gamma, Richard Helm, Ralph Johnson and john Vlissides: Design Patterns – Elements of Reusable Object-Oriented Software, Pearson Education,2007.	
Reference Books:	
1. Grady Booch et.al.: Object-Oriented Analysis and Design with Applications,3rd Edition,Pearson Education,2007. 2. 2.Frank Buschmann, RegineMeunier, Hans Rohnert, Peter Sommerlad, Michel Stal: Pattern –Oriented Software Architecture. A system of Patterns , Volume 1, John Wiley and Sons.2007. 3. 3. Booch, Jacobson, Rambaugh : Object-Oriented Analysis and Design with Applications, 3rd edition, pearson, Reprint 2013	

SOCIAL NETWORK ANALYSIS
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER – V

Subject Code	15IS552	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives: This course will enable students to

- Discuss essential knowledge of network analysis applicable to real world data, with examples from today's most popular social networks.

Module 1	**Teaching Hours**
Introduction to social network analysis and Descriptive network analysis: Introduction to new science of networks. Networks examples. Graph theory basics. Statistical network properties. Degree distribution, clustering coefficient. Frequent patterns. Network motifs. Cliques and k-cores.	**8 Hours**
Module 2	
Network structure, Node centralities and ranking on network: Nodes and edges, network diameter and average path length. Node centrality metrics: degree, closeness and betweenness centrality. Eigenvector centrality and PageRank. Algorithm HITS.	**8 Hours**
Module 3	
Network communities and Affiliation networks: Networks communities. Graph partitioning and cut metrics. Edge betweenness. Modularity clustering. Affiliation network and bipartite graphs. 1-mode projections. Recommendation systems.	**8 Hours**
Module 4	
Information and influence propagation on networks and Network visualization: Social Diffusion. Basic cascade model. Influence maximization. Most influential nodes in network. Network visualization and graph layouts. Graph sampling. Low -dimensional projections	**8 Hours**
Module 5	
Social media mining and SNA in real world: FB/VK and Twitter analysis: Natural language processing and sentiment mining. Properties of large social networks: friends, connections, likes, re-tweets.	**8 Hours**

Course Outcomes: The students should be able to:

- Define notation and terminology used in network science.
- Demonstrate, summarize and compare networks.
- Explain basic principles behind network analysis algorithms.
- Analyzing real world network.

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. David Easley and John Kleinberg. "Networks, Crowds, and Markets: Reasoning About a Highly Connected World." Cambridge University Press 2010.

2. Eric Kolaczyk, Gabor Csardi. “Statistical Analysis of Network Data with R (Use R!)”. Springer, 2014.
3. Stanley Wasserman and Katherine Faust. "Social Network Analysis. Methods and Applications." Cambridge University Press, 1994.

Reference Books:

1. **NIL**

ADVANCED JAVA AND J2EE
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER – V

Subject Code	15CS553	IA Marks	20
Number of Lecture Hours/Week	3	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives: This course will enable students to

- Identify the need for advanced Java concepts like Enumerations and Collections
- Construct client-server applications using Java socket API
- Make use of JDBC to access database through Java Programs
- Adapt servlets to build server side programs
- Demonstrate the use of JavaBeans to develop component-based Java software

Module – 1	**Teaching Hours**
Enumerations, Autoboxing and Annotations(metadata): Enumerations, Enumeration fundamentals, the values() and valueOf() Methods, java enumerations are class types, enumerations Inherits Enum, example, type wrappers, Autoboxing, Autoboxing and Methods, Autoboxing/Unboxing occurs in Expressions, Autoboxing/Unboxing, Boolean and character values, Autoboxing/Unboxing helps prevent errors, A word of Warning. Annotations, Annotation basics, specifying retention policy, Obtaining Annotations at run time by use of reflection, Annotated element Interface, Using Default values, Marker Annotations, Single Member annotations, Built-In annotations.	**8 Hours**
Module – 2	
The collections and Framework: Collections Overview, Recent Changes to Collections, The Collection Interfaces, The Collection Classes, Accessing a collection Via an Iterator, Storing User Defined Classes in Collections, The Random Access Interface, Working With Maps, Comparators, The Collection Algorithms, Why Generic Collections?, The legacy Classes and Interfaces, Parting Thoughts on Collections.	**8 Hours**
Module – 3	
String Handling **:**The String Constructors, String Length, Special String Operations, String Literals, String Concatenation, String Concatenation with Other Data Types, String Conversion and toString( ) Character Extraction, charAt( ), getChars( ), getBytes( ) toCharArray(), String Comparison, equals( ) and equalsIgnoreCase( ), regionMatches( ) startsWith( ) and endsWith( ), equals( ) Versus == , compareTo( ) Searching Strings, Modifying a String, substring( ), concat( ), replace( ), trim( ), Data Conversion Using valueOf( ), Changing the Case of Characters Within a String, Additional String Methods, StringBuffer , StringBuffer Constructors, length( ) and capacity( ), ensureCapacity( ), setLength( ), charAt( ) and setCharAt( ), getChars( ),append( ), insert( ), reverse( ), delete( ) and deleteCharAt( ), replace( ), substring( ), Additional StringBuffer Methods, StringBuilder **Text Book 1: Ch 15**	**8 Hours**
Module – 4	

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. Java Server Pages (JSP): JSP, JSP Tags, Tomcat, Request String, User Sessions, Cookies, Session Objects **Text Book 1: Ch 31 Text Book 2: Ch 11**	**8 Hours**
Module – 5	
The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; ResultSet; Transaction Processing; Metadata, Data types; Exceptions. **Text Book 2: Ch 06**	**8 Hours**

Course outcomes: The students should be able to:

- Interpret the need for advanced Java concepts like enumerations and collections in developing modular and efficient programs
- Build client-server applications and TCP/IP socket programs
- Illustrate database access and details for managing information using the JDBC API
- Describe how servlets fit into Java-based web application architecture
- Develop reusable software components using Java Beans

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. Herbert Schildt: JAVA the Complete Reference, 7th/9th Edition, Tata McGraw Hill, 2007.
2. Jim Keogh: J2EE-TheCompleteReference, McGraw Hill, 2007.

Reference Books:

1. Y. Daniel Liang: Introduction to JAVA Programming, 7thEdition, Pearson Education, 2007.
2. Stephanie Bodoff et al: The J2EE Tutorial, 2nd Edition, Pearson Education,2004.
3. Uttam K Roy, Advanced JAVA programming, Oxford University press, 2015.

PROGRAMMING LANGAUGES
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER – V

Subject Code	15IS554	IA Marks	20
Number of Lecture Hours/Week	3	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives: This course will enable students to

- Acquaint with discipline of programming
- Familiarize with semantics of different constructs of languages
- Introduce different programming paradigms
- Illustrate use of different languages and their applications

Module – 1	**Teaching Hours**
Overview, Names, Types, Type systems	**8 Hours**
Module – 2	
Semantics, semantic interpretation	**8 Hours**
Module – 3	
Functions, function implementation, memory management	**8 Hours**
Module – 4	
Imperative programming, object oriented programming, functional programming	**8 Hours**
Module – 5	
Logic programming, event-driven programming, concurrent programming	**8 Hours**

Course outcomes: The students should be able to:

- Select appropriate languages for given applications
- Demonstrate usage and justification of different languages
- Compare and contrast the strengths and weaknesses of different languages

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. Programming languages by Allen B. Tucker and Robert E. Noonan

Reference Books:

NIL

COMPUTER NETWORK LABORATORY
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER – V

Subject Code	15CSL57	IA Marks	20
Number of Lecture Hours/Week	01I + 02P	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 02

Course objectives: This course will enable students to

- Demonstrate operation of network and its management commands
- Simulate and demonstrate the performance of GSM and CDMA
- Implement data link layer and transport layer protocols.

Description (If any):

For the experiments below modify the topology and parameters set for the experiment and take multiple rounds of reading and analyze the results available in log files. Plot necessary graphs and conclude. Use NS2/NS3.

Lab Experiments:

PART A

1. Implement three nodes point – to – point network with duplex links between them. Set the queue size, vary the bandwidth and find the number of packets dropped.
2. Implement transmission of ping messages/trace route over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.
3. Implement an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination.
4. Implement simple ESS and with transmitting nodes in wire-less LAN by simulation and determine the performance with respect to transmission of packets.
5. Implement and study the performance of GSM on NS2/NS3 (Using MAC layer) or equivalent environment.
6. Implement and study the performance of CDMA on NS2/NS3 (Using stack called Call net) or equivalent environment.

PART B

Implement the following in Java:

7. Write a program for error detecting code using CRC-CCITT (16- bits).
8. Write a program to find the shortest path between vertices using bellman-ford algorithm.
9. 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.
10. Write a program on datagram socket for client/server to display the messages on client side, typed at the server side.
11. Write a program for simple RSA algorithm to encrypt and decrypt the data.
12. Write a program for congestion control using leaky bucket algorithm.

Study Experiment / Project:

NIL

Course outcomes: The students should be able to:

- Analyze and Compare various networking protocols.
- Demonstrate the working of different concepts of networking.

- Implement, analyze and evaluate networking protocols in NS2 / NS3

Conduction of Practical Examination:

1. All laboratory experiments are to be included for practical examination.
2. Students are allowed to pick one experiment from part A and part B with lot.
3. Strictly follow the instructions as printed on the cover page of answer script
4. Marks distribution: Procedure + Conduction + Viva: 80

   Part A: 10+25+5 =40

   Part B: 10+25+5 =40

5. Change of experiment is allowed only once and marks allotted to the procedure part to be made zero.

DBMS LABORATORY WITH MINI PROJECT
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER – V

Subject Code	15CSL58	IA Marks	20
Number of Lecture Hours/Week	01I + 02P	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 02

Course objectives: This course will enable students to

- Foundation knowledge in database concepts, technology and practice to groom students into well-informed database application developers.
- Strong practice in SQL programming through a variety of database problems.
- Develop database applications using front-end tools and back-end DBMS.

Description (If any):

PART-A: SQL Programming (Max. Exam Mks. 50)

- Design, develop, and implement the specified queries for the following problems using Oracle, MySQL, MS SQL Server, or any other DBMS under LINUX/Windows environment.
- Create Schema and insert at least 5 records for each table. Add appropriate database constraints.

PART-B: Mini Project (Max. Exam Mks. 30)

- Use Java, C#, PHP, Python, or any other similar front-end tool. All applications must be demonstrated on desktop/laptop as a stand-alone or web based application (Mobile apps on Android/IOS are not permitted.)

Lab Experiments:

Part A: SQL Programming

1 Consider the following schema for a Library Database:
BOOK(Book_id, Title, Publisher_Name, Pub_Year)
BOOK_AUTHORS(Book_id, Author_Name)
PUBLISHER(Name, Address, Phone)
BOOK_COPIES(Book_id, Branch_id, No-of_Copies)
BOOK_LENDING(Book_id, Branch_id, Card_No, Date_Out, Due_Date)
LIBRARY_BRANCH(Branch_id, Branch_Name, Address)
Write SQL queries to

1. Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each branch, etc.
2. Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2017 to Jun 2017.
3. Delete a book in BOOK table. Update the contents of other tables to reflect this data manipulation operation.
4. Partition the BOOK table based on year of publication. Demonstrate its working with a simple query.
5. Create a view of all books and its number of copies that are currently available in the Library.

2 Consider the following schema for Order Database:
SALESMAN(Salesman_id, Name, City, Commission)
CUSTOMER(Customer_id, Cust_Name, City, Grade, Salesman_id)
ORDERS(Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id)
Write SQL queries to

1. Count the customers with grades above Bangalore's average.

	2. Find the name and numbers of all salesman who had more than one customer. 3. List all the salesman and indicate those who have and don't have customers in their cities (Use UNION operation.) 4. Create a view that finds the salesman who has the customer with the highest order of a day. 5. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted.
3	Consider the schema for Movie Database: ACTOR(Act_id, Act_Name, Act_Gender) DIRECTOR(Dir_id, Dir_Name, Dir_Phone) MOVIES(Mov_id, Mov_Title, Mov_Year, Mov_Lang, Dir_id) MOVIE_CAST(Act_id, Mov_id, Role) RATING(Mov_id, Rev_Stars) Write SQL queries to 1. List the titles of all movies directed by 'Hitchcock'. 2. Find the movie names where one or more actors acted in two or more movies. 3. List all actors who acted in a movie before 2000 and also in a movie after 2015 (use JOIN operation). 4. Find the title of movies and number of stars for each movie that has at least one rating and find the highest number of stars that movie received. Sort the result by movie title. 5. Update rating of all movies directed by 'Steven Spielberg' to 5.
4	Consider the schema for College Database: STUDENT(USN, SName, Address, Phone, Gender) SEMSEC(SSID, Sem, Sec) CLASS(USN, SSID) SUBJECT(Subcode, Title, Sem, Credits) IAMARKS(USN, Subcode, SSID, Test1, Test2, Test3, FinalIA) Write SQL queries to 1. List all the student details studying in fourth semester 'C' section. 2. Compute the total number of male and female students in each semester and in each section. 3. Create a view of Test1 marks of student USN '1BI15CS101' in all subjects. 4. Calculate the FinalIA (average of best two test marks) and update the corresponding table for all students. 5. Categorize students based on the following criterion: If FinalIA = 17 to 20 then CAT = 'Outstanding' If FinalIA = 12 to 16 then CAT = 'Average' If FinalIA< 12 then CAT = 'Weak' Give these details only for 8th semester A, B, and C section students.
5	Consider the schema for Company Database: EMPLOYEE(SSN, Name, Address, Sex, Salary, SuperSSN, DNo) DEPARTMENT(DNo, DName, MgrSSN, MgrStartDate) DLOCATION(DNo,DLoc) PROJECT(PNo, PName, PLocation, DNo) WORKS_ON(SSN, PNo, Hours) Write SQL queries to 1. Make a list of all project numbers for projects that involve an employee whose last name is 'Scott', either as a worker or as a manager of the department that controls the project.

	2. Show the resulting salaries if every employee working on the 'IoT' project is given a 10 percent raise. 3. Find the sum of the salaries of all employees of the 'Accounts' department, as well as the maximum salary, the minimum salary, and the average salary in this department 4. Retrieve the name of each employee who works on all the projects controlledby department number 5 (use NOT EXISTS operator). 5. For each department that has more than five employees, retrieve the department number and the number of its employees who are making more than Rs. 6,00,000.
Part B: Mini project	
• For any problem selected, write the ER Diagram, apply ER-mapping rules, normalize the relations, and follow the application development process. • Make sure that the application should have five or more tables, at least one trigger and one stored procedure, using suitable frontend tool. • Indicative areas include; health care, education, industry, transport, supply chain, etc.	
Course outcomes: The students should be able to:	
• Create, Update and query on the database. • Demonstrate the working of different concepts of DBMS • Implement, analyze and evaluate the project developed for an application.	
Conduction of Practical Examination: 1. All laboratory experiments from part A are to be included for practical examination. 2. Mini project has to be evaluated for 30 Marks. 3. Report should be prepared in a standard format prescribed for project work. 4. Students are allowed to pick one experiment from the lot. 5. Strictly follow the instructions as printed on the cover page of answer script. 6. Marks distribution: a) Part A: Procedure + Conduction + Viva:10 + 35 +5 =50 Marks b) Part B: Demonstration + Report + Viva voce = 15+10+05 = 30 Marks 7. Change of experiment is allowed only once and marks allotted to the procedure part to be made zero.	

CRYPTOGRAPHY, NETWORK SECURITY AND CYBER LAW
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER – VI

Subject Code	15CS61	IA Marks	20
Number of Lecture Hours/Week	4	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives: This course will enable students to

- Explain the concepts of Cyber security
- Illustrate key management issues and solutions.
- Familiarize with Cryptography and very essential algorithms
- Introduce cyber Law and ethics to be followed.

Module – 1	**Teaching Hours**
Introduction - Cyber Attacks, Defence Strategies and Techniques, Guiding Principles, Mathematical Background for Cryptography - Modulo Arithmetic's, The Greatest Comma Divisor, Useful Algebraic Structures, Chinese Remainder Theorem, Basics of Cryptography - Preliminaries, Elementary Substitution Ciphers, Elementary Transport Ciphers, Other Cipher Properties, Secret Key Cryptography – Product Ciphers, DES Construction.	**10 Hours**
Module – 2	
Public Key Cryptography and RSA – RSA Operations, Why Does RSA Work?, Performance, Applications, Practical Issues, Public Key Cryptography Standard (PKCS), Cryptographic Hash - Introduction, Properties, Construction, Applications and Performance, The Birthday Attack, Discrete Logarithm and its Applications - Introduction, Diffie-Hellman Key Exchange, Other Applications.	**10 Hours**
Module – 3	
Key Management - Introduction, Digital Certificates, Public Key Infrastructure, Identity–based Encryption, Authentication–I - One way Authentication, Mutual Authentication, Dictionary Attacks, Authentication – II – Centalised Authentication, The Needham-Schroeder Protocol, Kerberos, Biometrics, IPSec-Security at the Network Layer – Security at Different layers: Pros and Cons, IPSec in Action, Internet Key Exchange (IKE) Protocol, Security Policy and IPSEC, Virtual Private Networks, Security at the Transport Layer - Introduction, SSL Handshake Protocol, SSL Record Layer Protocol, OpenSSL.	**10 Hours**
Module – 4	
IEEE 802.11 Wireless LAN Security - Background, Authentication, Confidentiality and Integrity, Viruses, Worms, and Other Malware, Firewalls – Basics, Practical Issues, Intrusion Prevention and Detection - Introduction, Prevention Versus Detection, Types of Instruction Detection Systems, DDoS Attacks Prevention/Detection, Web Service Security – Motivation, Technologies for Web Services, WS- Security, SAML, Other Standards.	**10 Hours**
Module – 5	
IT act aim and objectives, Scope of the act, Major Concepts, Important provisions, Attribution, acknowledgement, and dispatch of electronic records, Secure electronic records and secure digital signatures, Regulation of certifying authorities: Appointment of Controller and Other officers, Digital Signature certificates, Duties of Subscribers, Penalties and adjudication, The cyber	**10 Hours**

regulations appellate tribunal, Offences, Network service providers not to be liable in certain cases, Miscellaneous Provisions.	

Course outcomes: The students should be able to:

- Discuss cryptography and its need to various applications
- Design and develop simple cryptography algorithms
- Understand cyber security and need cyber Law

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. Cryptography, Network Security and Cyber Laws – Bernard Menezes, Cengage Learning, 2010 edition (Chapters-1,3,4,5,6,7,8,9,10,11,12,13,14,15,19(19.1-19.5),21(21.1-21.2),22(22.1-22.4),25

Reference Books:

1. Cryptography and Network Security- Behrouz A Forouzan, Debdeep Mukhopadhyay, Mc-GrawHill, 3rd Edition, 2015
2. Cryptography and Network Security- William Stallings, Pearson Education, 7th Edition
3. Cyber Law simplified- Vivek Sood, Mc-GrawHill, 11th reprint , 2013
4. Cyber security and Cyber Laws, Alfred Basta, Nadine Basta, Mary brown, ravindra kumar, Cengage learning

FILE STRUCTURES
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER – VI

Subject Code	15IS62	IA Marks	20
Number of Lecture Hours/Week	4	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives: This course will enable students to

- Explain the fundamentals of file structures and their management.
- Measure the performance of different file structures
- Organize different file structures in the memory.
- Demonstrate hashing and indexing techniques.

Module – 1	**Teaching Hours**
Introduction: File Structures: The Heart of the file structure Design, A Short History of File Structure Design, A Conceptual Toolkit; Fundamental File Operations: Physical Files and Logical Files, Opening Files, Closing Files, Reading and Writing, Seeking, Special Characters, The Unix Directory Structure, Physical devices and Logical Files, File-related Header Files, UNIX file System Commands; Secondary Storage and System Software: Disks, Magnetic Tape, Disk versus Tape; CD-ROM: Introduction, Physical Organization, Strengths and Weaknesses; Storage as Hierarchy, A journey of a Byte, Buffer Management, Input /Output in UNIX. **Fundamental File Structure Concepts, Managing Files of Records :** Field and Record Organization, Using Classes to Manipulate Buffers, Using Inheritance for Record Buffer Classes, Managing Fixed Length, Fixed Field Buffers, An Object-Oriented Class for Record Files, Record Access, More about Record Structures, Encapsulating Record Operations in a Single Class, File Access and File Organization.	**10 Hours**
Module – 2	
Organization of Files for Performance, Indexing: Data Compression, Reclaiming Space in files, Internal Sorting and Binary Searching, Keysorting; What is an Index? A Simple Index for Entry-Sequenced File, Using Template Classes in C++ for Object I/O, Object-Oriented support for Indexed, Entry-Sequenced Files of Data Objects, Indexes that are too large to hold in Memory, Indexing to provide access by Multiple keys, Retrieval Using Combinations of Secondary Keys, Improving the Secondary Index structure: Inverted Lists, Selective indexes, Binding.	**10 Hours**
Module – 3	
Consequential Processing and the Sorting of Large Files: A Model for Implementing Cosequential Processes, Application of the Model to a General Ledger Program, Extension of the Model to include Mutiway Merging, A Second Look at Sorting in Memory, Merging as a Way of Sorting Large Files on Disk. **Multi-Level Indexing and B-Trees:** The invention of B-Tree, Statement of the problem, Indexing with Binary Search Trees; Multi-Level Indexing, B-Trees, Example of Creating a B-Tree, An Object-Oriented Representation of B-Trees, B-Tree Methods; Nomenclature, Formal Definition of B-Tree Properties, Worst-case Search Depth, Deletion, Merging and Redistribution, Redistribution during	**10 Hours**

insertion; B* Trees, Buffering of pages; Virtual B-Trees; Variable-length Records and keys.	
Module – 4	
Indexed Sequential File Access and Prefix B + Trees: Indexed Sequential Access, Maintaining a Sequence Set, Adding a Simple Index to the Sequence Set, The Content of the Index: Separators Instead of Keys, The Simple Prefix B+ Tree and its maintenance, Index Set Block Size, Internal Structure of Index Set Blocks: A Variable-order B- Tree, Loading a Simple Prefix B+ Trees, B-Trees, B+ Trees and Simple Prefix B+ Trees in Perspective.	**10 Hours**
Module – 5	
Hashing: Introduction, A Simple Hashing Algorithm, Hashing Functions and Record Distribution, How much Extra Memory should be used?, Collision resolution by progressive overflow, Buckets, Making deletions, Other collision resolution techniques, Patterns of record access. **Extendible Hashing:** How Extendible Hashing Works, Implementation, Deletion, Extendible Hashing Performance, Alternative Approaches.	**10 Hours**
Course outcomes: The students should be able to:	
• Choose appropriate file structure for storage representation. • Identify a suitable sorting technique to arrange the data. • Select suitable indexing and hashing techniques for better performance to a given problem.	
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. Michael J. Folk, Bill Zoellick, Greg Riccardi: File Structures-An Object Oriented Approach with C++, 3rd Edition, Pearson Education, 1998. (Chapters 1 to 12 excluding 1.4, 1.5, 5.5, 5.6, 8.6, 8.7, 8.8)	
Reference Books:	
1. K.R. Venugopal, K.G. Srinivas, P.M. Krishnaraj: File Structures Using C++, Tata McGraw-Hill, 2008. 2. Scot Robert Ladd: C++ Components and Algorithms, BPB Publications, 1993. 3. Raghu Ramakrishan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw Hill, 2003.	

SOFTWARE TESTING
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER – V

Subject Code	15IS63	IA Marks	20
Number of Lecture Hours/Week	4	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives: This course will enable students to

- Differentiate the various testing techniques
- Analyze the problem and derive suitable test cases.
- Apply suitable technique for designing of flow graph
- Explain the need for planning and monitoring a process

Module – 1	**Teaching Hours**
Basics of Software Testing: Basic definitions, Software Quality , Requirements, Behaviour and Correctness, Correctness versus Reliability, Testing and Debugging, Test cases, Insights from a Venn diagram, Identifying test cases, Test-generation Strategies, Test Metrics, Error and fault taxonomies , Levels of testing, Testing and Verification, Static Testing. **Problem Statements:** Generalized pseudocode, the triangle problem, the NextDate function, the commission problem, the SATM (Simple Automatic Teller Machine) problem, the currency converter, Saturn windshield wiper **T1:Chapter1, T3:Chapter1, T1:Chapter2.**	**10 Hours**
Module – 2	
Functional Testing: Boundary value analysis, Robustness testing, Worst-case testing, Robust Worst testing for triangle problem, Nextdate problem and commission problem, Equivalence classes, Equivalence test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations, Decision tables, Test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations. **Fault Based Testing:** Overview, Assumptions in fault based testing, Mutation analysis, Fault-based adequacy criteria, Variations on mutation analysis. **T1: Chapter 5, 6 & 7, T2: Chapter 16**	**10 Hours**
Module – 3	
Structural Testing: Overview, Statement testing, Branch testing, Condition testing , Path testing: DD paths, Test coverage metrics, Basis path testing, guidelines and observations, Data –Flow testing: Definition-Use testing, Slice-based testing, Guidelines and observations**. Test Execution:** Overview of test execution, from test case specification to test cases, Scaffolding, Generic versus specific scaffolding, Test oracles, Self-checks as oracles, Capture and replay **T3:Section 6.2.1, T3:Section 6.2.4, T1:Chapter 9 & 10, T2:Chapter 17**	**10 Hours**
Module – 4	
Process Framework : Basic principles: Sensitivity, redundancy, restriction, partition, visibility, Feedback, the quality process, Planning and monitoring, Quality goals, Dependability properties ,Analysis Testing, Improving the process, Organizational factors. **Planning and Monitoring the Process:** Quality and process, Test and analysis strategies and plans, Risk planning, monitoring the process, Improving the	**10 Hours**

process, the quality team **Documenting Analysis and Test:** Organizing documents, Test strategy document, Analysis and test plan, Test design specifications documents, Test and analysis reports. **T2: Chapter 3 & 4, T2: Chapter 20, T2: Chapter 24.**	
Module – 5	
Integration and Component-Based Software Testing: Overview, Integration testing strategies, Testing components and assemblies. System, Acceptance and Regression Testing: Overview, System testing, Acceptance testing, Usability, Regression testing, Regression test selection techniques, Test case prioritization and selective execution. **Levels of Testing, Integration Testing:** Traditional view of testing levels, Alternative life-cycle models, The SATM system, Separating integration and system testing, A closer look at the SATM system, Decomposition-based, call graph-based, Path-based integrations**.** **T2: Chapter 21 & 22, T1 : Chapter 12 & 13**	**10 Hours**
Course outcomes: The students should be able to:	
• Derive test cases for any given problem • Compare the different testing techniques • Classify the problem into suitable testing model • Apply the appropriate technique for the design of flow graph. • Create appropriate document for the software artefact.	
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. Paul C. Jorgensen: Software Testing, A Craftsman's Approach, 3rd Edition, Auerbach Publications, 2008. (Listed topics only from Chapters 1, 2, 5, 6, 7, 9, 10, 12, 13) 2. Mauro Pezze, Michal Young: Software Testing and Analysis – Process, Principles and Techniques, Wiley India, 2009. (Listed topics only from Chapters 3, 4, 16, 17, 20,21, 22,24) 3. Aditya P Mathur: Foundations of Software Testing, Pearson Education, 2008.(Listed topics only from Section 1.2 , 1.3, 1.4 ,1.5, 1.8,1.12,6. 2.1,6. 2.4)	
Reference Books:	
1. Software testing Principles and Practices – Gopalaswamy Ramesh, Srinivasan Desikan, 2 nd Edition, Pearson, 2007. 2. Software Testing – Ron Patton, 2nd edition, Pearson Education, 2004. 3. The Craft of Software Testing – Brian Marrick, Pearson Education, 1995. 4. Anirban Basu, Software Quality Assurance, Testing and Metrics, PHI, 2015. 5. Naresh Chauhan, Software Testing, Oxford University press.	

OPERATING SYSTEMS
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER – VI

Subject Code	15CS64	IA Marks	20
Number of Lecture Hours/Week	4	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives: This course will enable students to

- Introduce concepts and terminology used in OS
- Explain threading and multithreaded systems
- Illustrate process synchronization and concept of Deadlock
- Introduce Memory and Virtual memory management, File system and storage techniques

Module – 1	**Teaching Hours**
Introduction to operating systems, System structures: What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and Security; Distributed system; Special-purpose systems; Computing environments. 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; Operating System generation; System boot. **Process Management** Process concept; Process scheduling; Operations on processes; Inter process communication	**10 Hours**
Module – 2	
Multi-threaded Programming: Overview; Multithreading models; Thread Libraries; Threading issues. 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.	**10 Hours**
Module – 3	
Deadlocks : Deadlocks; System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock. **Memory Management:** Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation.	**10 Hours**
Module – 4	
Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing. **File System, Implementation of File System:** 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.	**10 Hours**
Module – 5	
Secondary Storage Structures, Protection: Mass storage structures; Disk	**10 Hours**

structure; Disk attachment; Disk scheduling; Disk management; Swap space management. 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 Study: The Linux Operating System:** Linux history; Design principles; Kernel modules; Process management; Scheduling; Memory Management; File systems, Input and output; Inter-process communication.	

Course outcomes: The students should be able to:

- Demonstrate need for OS and different types of OS
- Apply suitable techniques for management of different resources
- Use processor, memory, storage and file system commands
- Realize the different concepts of OS in platform of usage through case studies

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. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles 7th edition, Wiley-India, 2006.

Reference Books

1. Ann McHoes Ida M Fylnn, Understanding Operating System, Cengage Learning, 6th Edition
2. D.M Dhamdhere, Operating Systems: A Concept Based Approach 3rd Ed, McGraw-Hill, 2013.
3. P.C.P. Bhatt, An Introduction to Operating Systems: Concepts and Practice 4th Edition, PHI(EEE), 2014.
4. William Stallings Operating Systems: Internals and Design Principles, 6th Edition, Pearson.

DATA MINING AND DATA WAREHOUSING
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER – VI

Subject Code	15CS651	IA Marks	20
Number of Lecture Hours/Week	3	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives: This course will enable students to

- Define multi-dimensional data models.
- Explain rules related to association, classification and clustering analysis.
- Compare and contrast between different classification and clustering algorithms

Module – 1	**Teaching Hours**
Data Warehousing & modeling: Basic Concepts: Data Warehousing: A multitier Architecture, Data warehouse models: Enterprise warehouse, Data mart and virtual warehouse, Extraction, Transformation and loading, Data Cube: A multidimensional data model, Stars, Snowflakes and Fact constellations: Schemas for multidimensional Data models, Dimensions: The role of concept Hierarchies, Measures: Their Categorization and computation, Typical OLAP Operations.	**8 Hours**
Module – 2	
Data warehouse implementation& Data mining: Efficient Data Cube computation: An overview, Indexing OLAP Data: Bitmap index and join index, Efficient processing of OLAP Queries, OLAP server Architecture ROLAP versus MOLAP Versus HOLAP. **:** Introduction: What is data mining, Challenges, Data Mining Tasks, Data: Types of Data, Data Quality, Data Preprocessing, Measures of Similarity and Dissimilarity,	**8 Hours**
Module – 3	
Association Analysis: Association Analysis: Problem Definition, Frequent Item set Generation, Rule generation. Alternative Methods for Generating Frequent Item sets, FP-Growth Algorithm, Evaluation of Association Patterns.	**8 Hours**
Module – 4	
Classification : Decision Trees Induction, Method for Comparing Classifiers, Rule Based Classifiers, Nearest Neighbor Classifiers, Bayesian Classifiers.	**8 Hours**
Module – 5	
Clustering Analysis: Overview, K-Means, Agglomerative Hierarchical Clustering, DBSCAN, Cluster Evaluation, Density-Based Clustering, Graph-Based Clustering, Scalable Clustering Algorithms.	**8 Hours**

Course outcomes: The students should be able to:

- Identify data mining problems and implement the data warehouse
- Write association rules for a given data pattern.
- Choose between classification and clustering solution.

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. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson, First impression,2014. 2. Jiawei Han, Micheline Kamber, Jian Pei: Data Mining -Concepts and Techniques, 3rd Edition, Morgan Kaufmann Publisher, 2012.
Reference Books:
1. Sam Anahory, Dennis Murray: Data Warehousing in the Real World, Pearson,Tenth Impression,2012. 2. Michael.J.Berry,Gordon.S.Linoff: Mastering Data Mining , Wiley Edition, second edtion,2012.

SYSTEM SOFTWARE
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER – VI

Subject Code	15IS652	IA Marks	20
Number of Lecture Hours/Week	3	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives: This course will enable students to

- Define System Software such as Assemblers, Loaders, Linkers and Macroprocessors
- Familiarize with source file, object file and executable file structures and libraries
- Describe the front-end and back-end phases of compiler and their importance to students

Module – 1	**Teaching Hours**
Introduction to System Software, Machine Architecture of SIC and SIC/XE. **Assemblers:** Basic assembler functions, machine dependent assembler features, machine independent assembler features, assembler design options. **Macroprocessors:** Basic macro processor functions, machine independent macro processor features, Macro processor design options, implementation examples **Text book 1: Chapter 1: (1.1-1.3.2), Chapter2: 2.1- 2.4 ,Chapter4**	**08 Hours**
Module – 2	
Loaders and Linkers: Basic Loader Functions**,** Design of an absolute loader, a simple Bootstrap loader, Machine-dependent loader features-relocation, program linking, algorithm and data structures for a linking loader, Machine –independent loader features-automatic library search, Loader options, loader design options-linkage editor, dynamic linkage, bootstrap loaders, implementation examples-MS DOS linker. **Text book 1 : Chapter 3**	**08 Hours**
Module – 3	
System File and Library Structure: Introduction, Library And File Organization, Design Of A Record Source Program File Structure, Object Code, Object File, Object File Structure, Executable File, Executable File Structure, Libraries, Image File Structure. **Object Code translators:** introduction, binary code translators, object code translators, translation process, hybrid method, applications **Reference 1: chapter 5 and chapter 15**	**08 Hours**
Module – 4	
Lexical Analysis: Introduction, Alphabets And Tokens In Computer Languages, Representation, Token Recognition And Finite Automata, Implementation, Error Recovery. **Text book 2: Chapter 1(1.1-1.5), Chapter 3(3.1-3.5)**	**08 Hours**
Module – 5	
Syntax Analysis: Introduction, Role Of Parsers, Context Free Grammars, Top Down Parsers, Bottom-Up Parsers, Operator-Precedence Parsing **Text book 2: Chapter 4 (4.1 – 4.6)**	**08 Hours**

Course outcomes: The students should be able to:

- Explain system software such as assemblers, loaders, linkers and macroprocessors
- Design and develop lexical analyzers, parsers and code generators
- Utilize lex and yacc tools for implementing different concepts of system software

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. System Software by Leland. L. Beck, D Manjula, 3rd edition, 2012
2. Compilers-Principles, Techniques and Tools by Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman. Pearson, 2nd edition, 2007

Reference Books:

1. Systems programming – Srimanta Pal , Oxford university press, 2016
2. System software and operating system by D. M. Dhamdhere TMG
3. Compiler Design, K Muneeswaran, Oxford University Press 2013.
4. System programming and Compiler Design, K C Louden, Cengage Learning

OPERATIONS RESEARCH
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER – VI

Subject Code	15CS653	IA Marks	20
Number of Lecture Hours/Week	3	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives: This course will enable students to

- Formulate optimization problem as a linear programming problem.
- Solve optimization problems using simplex method.
- Formulate and solve transportation and assignment problems.
- Apply game theory for decision making problems.

Module – 1	**Teaching Hours**
Introduction, Linear Programming: Introduction: The origin, nature and impact of OR; Defining the problem and gathering data; Formulating a mathematical model; Deriving solutions from the model; Testing the model; Preparing to apply the model; Implementation . **Introduction to Linear Programming Problem (LPP):** Prototype example, Assumptions of LPP, Formulation of LPP and Graphical method various examples.	**8 Hours**
Module – 2	
Simplex Method – 1: The essence of the simplex method; Setting up the simplex method; Types of variables, Algebra of the simplex method; the simplex method in tabular form; Tie breaking in the simplex method, Big M method, Two phase method.	**8 Hours**
Module – 3	
Simplex Method – 2: Duality Theory - The essence of duality theory, Primal dual relationship, conversion of primal to dual problem and vice versa. The dual simplex method.	**8 Hours**
Module – 4	
Transportation and Assignment Problems: The transportation problem, Initial Basic Feasible Solution (IBFS) by North West Corner Rule method, Matrix Minima Method, Vogel's Approximation Method. Optimal solution by Modified Distribution Method (MODI). The Assignment problem; A Hungarian algorithm for the assignment problem. Minimization and Maximization varieties in transportation and assignment problems.	**8 Hours**
Module – 5	
Game Theory: Game Theory: The formulation of two persons, zero sum games; saddle point, maximin and minimax principle, Solving simple games- a prototype example; Games with mixed strategies; Graphical solution procedure. **Metaheuristics:** The nature of Metaheuristics, Tabu Search, Simulated Annealing, Genetic Algorithms.	**8 Hours**

Course outcomes: The students should be able to:

- Select and apply optimization techniques for various problems.
- Model the given problem as transportation and assignment problem and solve.
- Apply game theory for decision support system.

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. D.S. Hira and P.K. Gupta, Operations Research, (Revised Edition), Published by S. Chand & Company Ltd, 2014

Reference Books:

1. S Kalavathy, Operation Research, Vikas Publishing House Pvt Limited, 01-Aug-2002
2. S D Sharma, Operation Research, Kedar Nath Ram Nath Publishers.

DISTRIBUTED COMPUTING SYSTEM
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER – VI

Subject Code	15CS654	IA Marks	20
Number of Lecture Hours/Week	3	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 03

Course objectives: This course will enable students to

- Explain distributed system, their characteristics, challenges and system models.
- Describe IPC mechanisms to communicate between distributed objects
- Illustrate the operating system support and File Service architecture in a distributed system
- Analyze the fundamental concepts, algorithms related to synchronization.

Module – 1	**Teaching Hours**
Characterization of Distributed Systems: Introduction, Examples of DS, Resource sharing and the Web, Challenges **System Models:** Architectural Models, Fundamental Models	**8 Hours**
Module – 2	
Inter Process Communication: Introduction, API for Internet Protocols, External Data Representation and Marshalling, Client – Server Communication, Group Communication **Distributed Objects and RMI:** Introduction, Communication between Distributed Objects, RPC, Events and Notifications	**8 Hours**
Module – 3	
Operating System Support: Introduction, The OS layer, Protection, Processes and Threads, Communication and Invocation , Operating system architecture **Distributed File Systems:** Introduction, File Service architecture, Sun Network File System	**8 Hours**
Module – 4	
Time and Global States: Introduction, Clocks, events and process status, Synchronizing physical clocks, Logical time and logical clocks, Global states **Coordination and Agreement:** Introduction, Distributed mutual exclusion, Elections	**8 Hours**
Module – 5	
Distributed Transactions: Introduction, Flat and nested distributed transactions, Atomic commit protocols, Concurrency control in distributed transactions, distributed deadlocks	**8 Hours**

Course outcomes: The students should be able to:

- Explain the characteristics of a distributed system along with its and design challenges
- Illustrate the mechanism of IPC between distributed objects
- Describe the distributed file service architecture and the important characteristics of SUN NFS.
- Discuss concurrency control algorithms applied in distributed transactions

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. George Coulouris, Jean Dollimore and Tim Kindberg: Distributed Systems – Concepts and Design, 5th Edition, Pearson Publications, 2009

Reference Books:

1. Andrew S Tanenbaum: Distributed Operating Systems, 3rd edition, Pearson publication, 2007
2. Ajay D. Kshemkalyani and Mukesh Singhal, Distributed Computing: Principles, Algorithms and Systems, Cambridge University Press, 2008
3. Sunita Mahajan, Seema Shan, " Distributed Computing", Oxford University Press,2015

SOFTWARE TESTING LABORATORY
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER – VI

Subject Code	15ISL67	IA Marks	20
Number of Lecture Hours/Week	01I + 02P	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 02

Course objectives: This course will enable students to

- Analyse the requirements for the given problem statement
- Design and implement various solutions for the given problem
- Employ various design strategies for problem solving.
- Construct control flow graphs for the solution that is implemented
- Create appropriate document for the software artefact

Description (If any):

Design, develop, and implement the specified algorithms for the following problems using any language of your choice under LINUX /Windows environment.

Lab Experiments:

1. Design and develop a program in a language of your choice to solve the triangle problem defined as follows: Accept three integers which are supposed to be the three sides of a triangle and determine if the three values represent an equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all. Assume that the upper limit for the size of any side is 10. Derive test cases for your program based on boundary-value analysis, execute the test cases and discuss the results.

2. Design, develop, code and run the program in any suitable language to solve the commission problem. Analyze it from the perspective of boundary value testing, derive different test cases, execute these test cases and discuss the test results.

3. Design, develop, code and run the program in any suitable language to implement the NextDate function. Analyze it from the perspective of boundary value testing, derive different test cases, execute these test cases and discuss the test results.

4. Design and develop a program in a language of your choice to solve the triangle problem defined as follows: Accept three integers which are supposed to be the three sides of a triangle and determine if the three values represent an equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all. Assume that the upper limit for the size of any side is 10. Derive test cases for your program based on equivalence class partitioning, execute the test cases and discuss the results.

5. Design, develop, code and run the program in any suitable language to solve the commission problem. Analyze it from the perspective of equivalence class testing, derive different test cases, execute these test cases and discuss the test results.

6. Design, develop, code and run the program in any suitable language to implement the NextDate function. Analyze it from the perspective of equivalence class value testing, derive different test cases, execute these test cases and discuss the test results.

7. Design and develop a program in a language of your choice to solve the triangle problem defined as follows: Accept three integers which are supposed to be the three sides of a triangle and determine if the three values represent an equilateral triangle,

isosceles triangle, scalene triangle, or they do not form a triangle at all. Derive test cases for your program based on decision-table approach, execute the test cases and discuss the results.

8. Design, develop, code and run the program in any suitable language to solve the commission problem. Analyze it from the perspective of decision table-based testing, derive different test cases, execute these test cases and discuss the test results.
9. Design, develop, code and run the program in any suitable language to solve the commission problem. Analyze it from the perspective of dataflow testing, derive different test cases, execute these test cases and discuss the test results.
10. Design, develop, code and run the program in any suitable language to implement the binary search algorithm. Determine the basis paths and using them derive different test cases, execute these test cases and discuss the test results.
11. Design, develop, code and run the program in any suitable language to implement the quicksort algorithm. Determine the basis paths and using them derive different test cases, execute these test cases and discuss the test results.
12. Design, develop, code and run the program in any suitable language to implement an absolute letter grading procedure, making suitable assumptions. Determine the basis paths and using them derive different test cases, execute these test cases and discuss the test results

Study Experiment / Project:

1. Design, develop, code and run the program in any suitable language to solve the triangle problem. Analyze it from the perspective of dataflow testing, derive different test cases, execute these test cases and discuss the test results.

2. Design, develop, code and run the program in any suitable language to solve the Nextdate problem. Analyze it from the perspective of decision table-based testing, derive different test cases, execute these test cases and discuss the test results.

Course outcomes: The students should be able to:

- List out the requirements for the given problem
- Design and implement the solution for given problem in any programming language(C,C++,JAVA)
- Derive test cases for any given problem
- Apply the appropriate technique for the design of flow graph.
- Create appropriate document for the software artefact.

Conduction of Practical Examination:

1. All laboratory experiments are to be included for practical examination.
2. Students are allowed to pick one experiment from the lot.
3. Strictly follow the instructions as printed on the cover page of answer script for breakup of marks
4. Procedure + Conduction + Viva: 35 + 35 + 10 (80)
5. Change of experiment is allowed only once and marks allotted to the procedure part to be made zero

FILE STRUCTURES LABORATORY WITH MINI PROJECT
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)
SEMESTER – VI

Subject Code	15ISL68	IA Marks	20
Number of Lecture Hours/Week	01I + 02P	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03

CREDITS – 02

Course objectives: This course will enable students to

- Apply the concepts of Unix IPC to implement a given function.
- Measure the performance of different file structures
- Write a program to manage operations on given file system.
- Demonstrate hashing and indexing techniques

Description (If any):

Design, develop, and implement the following programs

Lab Experiments:

PART A

1. Write a program to read series of names, one per line, from standard input and write these names spelled in reverse order to the standard output using I/O redirection and pipes. Repeat the exercise using an input file specified by the user instead of the standard input and using an output file specified by the user instead of the standard output.
2. Write a program to read and write student objects with fixed-length records and the fields delimited by "|". Implement pack ( ), unpack ( ), modify ( ) and search ( ) methods.
3. Write a program to read and write student objects with Variable - Length records using any suitable record structure. Implement pack ( ), unpack ( ), modify ( ) and search ( ) methods.
4. Write a program to write student objects with Variable - Length records using any suitable record structure and to read from this file a student record using RRN.
5. Write a program to implement simple index on primary key for a file of student objects. Implement add ( ), search ( ), delete ( ) using the index.
6. Write a program to implement index on secondary key, the name, for a file of student objects. Implement add ( ), search ( ), delete ( ) using the secondary index.
7. Write a program to read two lists of names and then match the names in the two lists using Consequential Match based on a single loop. Output the names common to both the lists.
8. Write a program to read k Lists of names and merge them using k-way merge algorithm with k = 8.

Part B --- Mini project:

Student should develop mini project on the topics mentioned below or similar applications **Document processing, transaction management, indexing and hashing, buffer management, configuration management. Not limited to these.**

Course outcomes: The students should be able to:

- Implement operations related to files
- Apply the concepts of file system to produce the given application.
- Evaluate performance of various file systems on given parameters.

Conduction of Practical Examination:

1. All laboratory experiments from part A are to be included for practical examination.
2. Mini project has to be evaluated for 30 Marks as per 6(b).
3. Report should be prepared in a standard format prescribed for project work.
4. Students are allowed to pick one experiment from the lot.
5. Strictly follow the instructions as printed on the cover page of answer script.
6. Marks distribution:
   a) Part A: Procedure + Conduction + Viva:10 + 35 +5 =50 Marks
   b) Part B: Demonstration + Report + Viva voce = 15+10+05 = 30 Marks
7. Change of experiment is allowed only once and marks allotted to the procedure part to be made zero.