



**M.Sc. INFORMATION TECHNOLOGY: CHOICE BASED CREDIT SYSTEM -
LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (CBCS - LOCF)**

(Applicable to the candidates admitted from the academic year 2022-23 onwards)

Sem.	Course	Course Title	Ins. Hrs.	Credit	Exam Hrs.	Marks		Total
						Int.	Ext.	
I	Core Course – I (CC)	Object Oriented Systems Development	6	5	3	25	75	100
	Core Course – II (CC)	Advanced Database Management Systems	6	5	3	25	75	100
	Core Choice Course I (CCC)	Any One from the list	6	4	3	25	75	100
	Core Practical I (CP)	Advanced Database Management Systems	3	2	3	40	60	100
	Core Choice Practical I (CP)	Any One from the list	3	2	3	40	60	100
	Core Elective – I (CE)	Any One from the list	6	4	3	25	75	100
	Value Added Course I (VAC)	Multimedia and Animation	-	2*	3	25	75	100*
Total			30	22	-	-	-	600
II	Core Course III (CC)	Advanced Operating Systems	6	5	3	25	75	100
	Core Course IV (CC)	Foundations of Information Security	5	5	3	25	75	100
	Core Choice Course II (CCC)	Any One from the list	5	4	3	25	75	100
	Core Practical II (CP)	Advanced Operating Systems	3	2	3	40	60	100
	Core Choice Practical II (CP)	Any One from the list	3	2	3	40	60	100
	Elective Course II (EC)	Any One from the list	5	4	3	25	75	100
	Non Major Elective I	Fundamentals of Information Technology	3	2	3	25	75	100
Total			30	24	-	-	-	700
III	Core Course V (CC)	Principles of Compiler Design	6	5	3	25	75	100
	Core Course VI (CC)	Problem Solving using R	5	5	3	25	75	100
	Core Choice Course III (CCC)	Any One from the list	5	4	3	25	75	100
	Core Practical III (CP)	Problem Solving using R Lab	3	2	3	40	60	100
	Core Choice Practical III (CP)	Any One from the list	3	2	3	40	60	100
	Elective Course III (EC)	Any One from the list	5	4	3	25	75	100
	Non Major Elective II	Fundamentals of Internet	3	2	3	25	75	100
Total			30	24	-	-	-	700
IV	Core Course – VII (CC)	Software Project Management	6	5	3	25	75	100
	Core Course – VIII(CC)	Cloud Computing	6	5	3	25	75	100
	Entrepreneurship / Industry Based Course	Technology Innovation and Sustainable Enterprise	6	5	3	25	75	100
	Project Work	Project	12	5	-	20	80	100
	Value Added Course II (VAC)	Cyber Security Fundamentals	-	2*	3	25	75	100*
Total			30	20	-	-	-	400
Grand Total				90				2400

***The value added courses credit will not be included in the total CGPA.
These courses are extra-credit courses.
Instruction hours for these courses is 30 hours.**

LIST OF CORE CHOICE COURSES

Core Choice Course I		Core Choice Course I Practical	
1.	Web Programming	1.	Web Programming
2.	Advanced Data Structures	2.	Advanced Data Structures
Core Choice Course II		Core Choice Course II Practical	
1.	J2EE Technologies	1.	J2EE Technologies
2.	Data Mining Techniques and Tools	2.	Data Mining Techniques and Tools
Core Choice Course III		Core Choice Course III Practical	
1.	Distributed Technologies	1.	Distributed Technologies
2.	Machine Learning Techniques	2.	Machine Learning Techniques

LIST OF ELECTIVE COURSES

Core Elective I	
1.	E- Commerce
2.	Open Source Technologies
3.	Green Computing
Core Elective II	
1.	Wireless Networks
2.	Big Data Frameworks
3.	Internet of Things
Core Elective III	
1.	Web Services
2.	Software Metrics
3.	Parallel Computing

SUMMARY OF CURRICULUM STRUCTURE OF PG PROGRAMMES

Sl. No.	Types of the Course	No. of Courses	No. of Credits	Marks
1.	Core Course	8	40	800
2.	Core Choice Courses	3	12	300
3.	Core Practical	6	12	600
4.	Elective Courses	3	12	300
5.	Entrepreneurship/ Industry Based Course	1	5	100
6.	Project	1	5	100
7.	Non-Major Elective Courses	2	4	200
Total		24	90	2400
Value Added Courses *		2*	4*	200*

PROGRAM SPECIFIC OUTCOMES:

After the successful completion of M.Sc. (Information Technology) programme, the Graduates will be able to:

- Understand how technical developments can be achieved.
- Enhance the development of critical thinking, code writing skills and configuring the technical tools.
- Prepares students for a wide variety of careers in IT related all industries with research bent of mind.
- Able to develop strong analytical skills, critical thinking and experimental skills.
- Understand how technological advances impact society and the social, legal, ethical and cultural ramifications of computer technology and their usage.

First Year

**CORE COURSE I
OBJECT ORIENTED SYSTEMS
DEVELOPMENT**

Semester I

Code:

(Theory)

Credit: 5

COURSE OBJECTIVES:

- Introduce the concept of Object-oriented design and understand the fundamentals of OOSD life cycle.
- Familiar with evolution of object-oriented model, classes and its notations
- Practice UML in order to express the design of software projects.

UNIT – I FUNDAMENTALS OF OOSD:

Overview of Object Oriented Systems Development: Two orthogonal views of the software - OOSD methodology - Object basics: Object Oriented Philosophy- Objects – Attributes – Object response to messages – Encapsulation and information hiding – class hierarchy – Polymorphism – Object relationship and associations. OOSD life cycle: Software development process – OOSD Use case Driven Approach – Reusability.

UNIT – II METHODOLOGY, MODELLING AND UML:

Object Oriented Methodologies: Rumbaugh et al.'s object modelling technique – The Booch methodology – The Jacobson et al. methodology – Patterns – Frameworks - The Unified approach. Unified Modelling Language : Static and dynamic models – UML diagrams – UML class diagram – Use case diagram - UML dynamic modelling – packages and model organization.

UNIT – III OBJECT ORIENTED ANALYSIS:

Object Oriented Analysis process: Business Object Analysis - Use case driven - object oriented analysis – Business process modelling – Use-Case model – Developing effective documentation. Classification: Classifications theory – Approaches for identifying classes – Noun phrase approach – Common class patterns approach – Use-Case Driven approach – Classes, Responsibilities, and Collaborators - Naming classes. Identifying object relationships, attributes, and methods: Association – Super-Sub class relationship – Aggregation – Class responsibility – Object responsibility.

UNIT – IV OBJECT ORIENTED DESIGN:

Object Oriented Design Process and Design Axioms - OOD process- OOD axioms – Corollaries – Design patterns. Designing classes: Designing classes – Class visibility – Refining attributes – Designing methods and protocols – Packages and managing classes. Access layer: Object Store and persistence – DBMS – Logical and physical Database Organization and access control – Distributed Databases and Client Server Computing — Multi database Systems – Designing Access layer classes. View Layer: Designing view layer classes – Macro level process – Micro level process – The purpose of view layer interface – Prototyping the user interface.

UNIT – V SOFTWARE QUALITY:

Software Quality Assurance: Quality assurance tests – Testing strategies – Impact of Object Orientation on Testing - Test Cases- Test Plan – Continuous testing. System Usability and Measuring User satisfaction: Usability Testing – User satisfaction test – A tool for analyzing user satisfaction. System Usability and Measuring User satisfaction: Introduction – Usability Testing.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Ali Bahrami, “Object Oriented Systems Development using UML”, McGraw-Hill, 2008
2. Booch Grady, Rumbaugh James, Jacobson Ivar, “The Unified modeling Language – User Guide, Pearson Education, 2006
3. Brahma Dathan, Sarnath Ramnath, “Object Oriented Analysis, Design and Implementation”, Universities Press, 2010.
4. Mahesh P.Matha, “Object-Oriented Analysis and Design Using UML”, PHI Learning Private Limited, 2012.
5. Rachita Misra, Chhabi Rani Panigrahi, Bijayalaxmi Panda, “Principles of Software Engineering and System Design”, Yesdee Publishing 2019.
6. https://www.tutorialspoint.com/object_oriented_analysis_design/ooad_object_oriented_system.htm
7. <https://www.w3computing.com/systemsanalysis/object-oriented-systems-analysis-design/>
8. <https://www.geeksforgeeks.org/steps-to-analyze-and-design-object-oriented-system/>

COURSE OUTCOMES:

At the end of the course, the students will be able to:

1. Show how the object-oriented approach differs from the traditional approach to systems analysis and design.
2. Analyze, design, document the requirements through use case driven approach
3. Explain the importance of modelling and how the Unified Modelling Language (UML) represents an object-oriented system using a number of modelling views.
4. Recognize the difference between various object relationships: inheritance, association and aggregation.
5. Show the role and function of test cases, testing strategies and test plans in developing object-oriented software.

First Year

**CORE COURSE II
ADVANCED DATABASE MANAGEMENT
SYSTEMS
(Theory)**

Semester I

Code:

Credit: 5

COURSE OBJECTIVES:

- Acquire Knowledge of Database Models, Applications of Database
- Understand the design of Distributed Databases.
- Understand the emerging Database Models, Technologies and Applications

UNIT – I RELATIONAL AND PARALLEL DATABASE DESIGN:

Basics, Entity Types, Relationship Types, ER Model, ER-to-Relational Mapping algorithm. Normalization: Functional Dependency, 1NF, 2NF, 3NF, BCNF, 4NF and 5NF. Architecture, I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Intraoperation Parallelism, Interoperation Parallelism.

UNIT – II DISTRIBUTED AND OBJECT BASED DATABASES:

Architecture, Distributed data storage, Distributed transactions, Commit protocols, Concurrency control, Query Processing. Complex Data Types, Structured Types and Inheritance, Table Inheritance, array and Multiset, Object Identity and Reference Types, Object Oriented versus Object Relational.

UNIT – III SPATIAL DATABASE:

Spatial Database Characteristics, Spatial Data Model, Spatial Database Queries, Techniques of Spatial Database Query, Logic based Databases: Introduction, Overview, Propositional Calculus, Predicate Calculus, Deductive Database Systems, Recursive Query Processing

UNIT – IV XML DATABASES:

XML Hierarchical data model, XML Documents, DTD, XML Schema, XML Querying, XHTML, Illustrative Experiments

UNIT – V TEMPORAL DATABASES:

Introduction, Intervals, Packing and Unpacking Relations, Generalizing the relational Operators, Database Design, Integrity Constraints, Multimedia Databases: Multimedia Sources, Multimedia Database Queries, Multimedia Database Applications.

UNIT – VI: CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Abraham Silberschatz, Henry F Korth , S Sudarshan, “Database System Concepts”, 6th edition , McGraw-Hill International Edition , 2011
2. C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, 8th Edition, Pearson Education Reprint 2016
3. Ramez Elmasri, Shamkant B Navathe, “Fundamental of Database Systems”, Pearson, 7th edition 2016.
4. Thomas Connolly, Carolyn Begg., “Database Systems a practical approach to Design , Implementation and Management “, Pearson Education, 2014.
5. <https://www.geeksforgeeks.org/normal-forms-in-dbms/>
6. <https://www.simplilearn.com/tutorials/sql-tutorial/what-is-normalization-in-sql>
7. <https://www.tutorialspoint.com/Spatial-Databases>
8. <https://www.oracle.com/database/spatial/>
9. <https://nptel.ac.in/courses/106/106/106106093/>

COURSE OUTCOMES:

At the end of the course, the students will be able to:

- Acquired knowledge for developing holistic solutions based on database systems/database techniques.
- Normalize relational database design of an application
- Critically assess new developments in database technology
- Know about the Various Data models and Works on Database Architecture
- Interpret and explain the impact of emerging database standards

First Year

CORE CHOICE COURSE I

Semester I

Code:

**1) WEB PROGRAMMING
(Theory)**

Credit: 4

COURSE OBJECTIVES:]

- To introduces the concepts of PHP, MySQL, HTML 5, CSS,
- To introduces the concepts JavaScript, jQuery and Angular.
- It provides concepts of creating dynamic web application using client and server-side scripting languages

UNIT – I INTRODUCTION TO CSS:

Importing style sheet- CSS Rules – Style Types – CSS Selectors –Fonts and Typography – Managing Text styles – color- positioning elements – Box model and Layout – Advanced CSS and CSS3: Attribute Selectors – Box -sizing Property – CSS3 Backgrounds – Borders- Multicolumn Layout – Text effects

UNIT – II ACCESSING CSS FROM JAVASCRIPT:

Revisiting the getElement By Id function – Accessing CSS properties from JavaScript – Inline Javascript – Adding NEW elements – Using Interrupts – Introduction to jQuery: selectors- Handling events – Event functions and Properties -Special effects – Manipulating the DOM – Dynamically Applying classes – Modifying Dimensions – DOM Traversal - Using jQuery without selectors

UNIT – III INTRODUCTION TO DYNAMIC WEB CONTENT:

HTTP and HTML- The Request /Response Procedure – Benefits of PHP. My SQL, Javascript, CSS and HTML5- Introduction to PHP- Expressions and Control Flow in PHP – PHP Functions and Objects- Arrays – File Handling

UNIT – IV ACCESSING MYSQL USING PHP:

Form Handling – Cookies, Sessions, and Authentication – Exploring JavaScript - Functions – Objects – Arrays-JavaScript and PHP validation and Error Handling: Validating User Input with JavaScript–Using Ajax

UNIT – V LEARNING ANGULAR:

Jumping into typescript – Angular components - Expressions – Data binding – Advanced Angular: Events and Change detection – Implementing Angular services in Web applications.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Robin Nixon (2017). Learning PHP, MySQL & JavaScript with jQuery, CSS & HTML5, (4/e) with jQuery, Thomson Press (India) Ltd., Delhi.
2. K.Meena, R.Slvakumar, A .B.Karthick Anand Babu, Web Programming with PHP and MySQL, Himalaya Publications. Mumbai, 2012. (ISBN: 978- 93 - 5051 - 581• 5).
3. Brad Dayley, Brendan Dayley, Caleb Dayley (2018), Node.js, MongoDB and Angular Web Development: The definitive guide to using the MEAN stack to build web applications (Developer's Library), (2/e), Pearson education
4. Ralph Moseley, M.T.Savaliya, (2013). Developing Web Applications, (2/e), Wiley India Pvt. Ltd., New Delhi.
5. Nicholas C.Zakas(2012). Professional JavaScript for Web Developers(3/e), Wiley India Pvt. Ltd., New Delhi.
6. https://www.tutorialspoint.com/php/php_and_mysql.htm
7. <https://www.w3schools.com/angular/default.asp>
8. <https://angular.io/start>
9. <https://www.greengeeks.in/tutorials/make-dynamic-website/>

COURSE OUTCOMES:

At the end of the course, the students will be able to:

- Understand the concepts of dynamic web design
- Apply the concepts of data driven web design using PHP with MySQL
- Analyze the usage of SQL language, JavaScript, jQuery, PHP and CSS for real time applications
- Design dynamic web application using server and client side
- Create Web application using Angular framework

First Year

CORE CHOICE COURSE I
2) ADVANCED DATA STRUCTURES
(Theory)

Semester I

Code:

Credit: 4

COURSE OBJECTIVES:

- To provide the knowledge of advanced data structures and their implementations.
- To understand importance of data structures in context of writing efficient programs.
- To develop skills to apply appropriate data structures in problem solving.

UNIT – I INTRODUCTION:

Arrays – Singly Linked List – Circularly Linked List – Stack – Queues – List Abstract Data Type (ADT) – Iterators – Graphs and Sorting 1- Graphs: Graph ADT – Data Structures for Graphs – Graph Traversals – Directed Acyclic Graphs – Shortest Paths – Minimum Spanning Tree - Sorting: Merge Sort – Quick Sort – Selection Sort.

UNIT – II HASHING:

General Idea, Hash Function, Separate Chaining, Hash Tables without linked lists: Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Hash Tables in the Standard Library, Universal Hashing, Extendible Hashing.

UNIT – III PRIORITY QUEUES (HEAPS):

Model, Simple implementations, Binary Heap: Structure Property, Heap Order Property, Basic Heap Operations: insert, delete, Percolate down, Other Heap Operations.

UNIT – IV TREES:

AVL: Single Rotation, Double Rotation, B-Trees. **Multi-way Search Trees**– Trees: Searching for an Element in a Tree, Inserting a New Element in a Tree, Deleting an Element from a Tree. **Red-Black Trees** – Properties of red-black trees, Rotations, Insertion, Deletion.

UNIT – V GRAPHS ALGORITHMS:

Elementary Graph Algorithms: Topological sort, Single Source Shortest Path Algorithms: Dijkstra's, Bellman-Ford, All-Pairs Shortest Paths: Floyd-Warshall's Algorithm.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, 4th Edition, 2014, Pearson.
2. Thomas H Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Introduction to Algorithms, 3rd Edition, 2009, The MIT Press.
3. Ellis Horowitz, Satraj Sahani and Rajasekharam, Fundamentals of Computer Algorithms, 2nd Edition, 2009, University Press Pvt. Ltd.
4. ReemaThareja, S. Rama Sree,Advanced Data Structures, Oxford University Press, 2018.
5. <http://www.coursera.org/learn/advanced-data-structures>
6. <http://ocw.mit.edu/6-851S12> (MITOPENCOURSEWARE, Massachusetts Institute of Technology)
7. <https://nptel.ac.in/courses/106/106/106106133/>
8. <https://www.mooc-list.com/search/node?keys=Advanced+Data+Structures>
9. <http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms>

COURSE OUTCOME:

After learning the course, the students are able to:

1. Understand the implementation of symbol table using hashing techniques
2. Develop and analyse algorithms for red-black trees, B-trees and Splay trees
3. Develop algorithms for text processing applications
4. Students would be able to work on disjoint sets of data structures.
5. Identify suitable data structures and develop algorithms for computational problems

First Year

**CORE PRACTICAL I
ADVANCED DATABASE MANAGEMENT
SYSTEMS
(Practical)**

Semester I

Code:

Credit: 2

IMPLEMENT THE FOLLOWINGS:

1. Usage of Data Definition Language commands
2. Usage of Data Manipulation Language
3. Data communication using SQL functions
4. Database Design and Normalization
5. Join command
6. Sub queries
7. Creating Views
8. Triggers
9. Procedures
10. Apply PL/SQL for processing databases.

First Year

CORE CHOICE PRACTICAL I

Semester I

1) WEB PROGRAMMING

Code:

(Practical)

Credit: 2

1. Develop a Program to pass information between web pages using GET and POST methods.
2. Develop a Program string functions to manipulate strings.
3. Develop a Program to implement file operations.
4. Develop a Program to create menus, styles, Animation using CSS.
5. Develop a Program to validate the HTML form fields using Javascript.
6. Develop a Program to using jQuery and CSS.
7. Develop a Program to handle events and special effects using jQuery
8. Develop a Program to implement explode and implode functions
9. Develop a Program to create data base connectivity using PHP and MySQL
10. Using PHP, Create Admin Login, Logout form using session variables.

First Year

CORE CHOICE PRACTICAL I
2) ADVANCED DATA STRUCTURES
(Practical)

Semester I

Code:

Credit: 2

Implement the following using C/C++/Java

1. Develop a program to perform the following operations on doubly linked list.
i) Creation ii) Insertion iii) Deletion iv) Traversal in both ways
2. Develop a program that implements stack and its operations using i) Arrays
ii) linked list.
3. Develop a programs that implements Queue and its operations using i)
Arrays ii) linked list.
4. Develop a program that implements the Quick sort method to sort a given
list of integers in ascending order.
5. Develop a program that implement the Merge sort method to sort a given list
of integers in ascending order.
6. Develop a program to perform the following: i) Creating a Binary Tree of
integers ii) Traversing the above binary tree in preorder, inorder and
postorder.
7. Develop a program to perform the following: i) Creating a AVL Tree of
integers ii) Traversing the above binary tree in preorder, inorder and
postorder.
8. Develop a program that uses functions to perform the following: i) Creating a
SplayTree of integers ii) Traversing the above binary tree in preorder, inorder
and postorder.
9. Develop program to perform the following: i) Creating a B-Tree of integers ii)
Traversing the above binary tree in preorder, inorder and postorder.
10. Develop a program that implements Kruskals algorithm using a disjoint set
data structure. The program takes as input a file (data.txt), in which each
line either represents a vertex or an edge. For the edge lines, the first integer
on that line representing the starting vertex, the second the ending vertex,
and the third the weigh of the edge. Use this file to construct, line by line,
the graph upon which Kruskal's algorithm will be run (do NOT hardcode this
graph!).

First Year

CORE ELECTIVE I

Semester I

Code:

**1) E-COMMERCE
(Theory)**

Credit: 4

COURSE OBJECTIVES:

- To acquire the basic concept of E-Commerce
- To impart knowledge on electronic payment systems
- To know and apply various digital payment methods

UNIT – I E-COMMERCE:

Framework-Classification of electronic commerce -Anatomy of E-Commerce Applications- Components of the I way-Network Access Equipment-Internet Terminology.

UNIT – II ELECTRONIC DATA INTERCHANGE:

Benefits-EDI Legal, Security & privacy issues- EDI software implementation- Value added networks-Internal Information Systems-Work flow automization and Coordination-Customization and Internal Commerce.

UNIT – III NETWORK SECURITY AND FIREWALLS:

Client Server Network Security- Emerging client server security threats- Firewalls and network security- Data and message security- Encrypted documents and electronic mail- Hypertext publishing- Technology behind the web- Security and the web.

UNIT – IV CONSUMER ORIENTED ELECTRONIC COMMERCE:

Consumer Oriented Applications-Mercantile Process Models-Mercantile Models From the Consumers Perspective- Mercantile Models from the Merchants Perspective.

UNIT – V ELECTRONIC PAYMENT SYSTEMS:

Types-Digital Token Based Electronic Payment System-Smart Cards & Credit Card Electronic Payment Systems -Risk -Designing electronic payment system.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Ravi Kalakota &Andrew b.Whinston , “Frontiers of Electronic Commerce”, Dorling Kindersley (India) Pvt.Ltd-2006

2. Bharat Bhasker, "Electronic Commerce", Tata Mc Graw Hill Publishing Co Ltd, New Delhi 2006.
3. Daniel Minoli, Emma Minoli "Web Commerce Technology Handbook", Tata McGraw Hill Publishing, New Delhi.
4. Dr. C. S. Rayudu, "E-Commerce & E-Business", Himalaya Publishing House, New Delhi, 2004.

COURSE OUTCOMES:

At the end of the course, the students will be able to:

- Understand the basic concept of E- Commerce and its applications.
- Understand the concept of network Security.
- To gain the knowledge on EDI.
- To gain knowledge on consumer aspects in E-Commerce
- To know and apply various digital payment methods

First Year

CORE ELECTIVE I
2) OPEN SOURCE TECHNOLOGIES
(Theory)

Semester I

Code:

Credit: 4

COURSE OBJECTIVES:

- Understand the difference between open-source software and commercial software.
- Understand the policies, licensing procedures and ethics of FOSS.
- Understand open-source philosophy, methodology and ecosystem.

Unit – I INTRODUCTION:

Introduction to Open-Source: Open Source, Need and Principles of OSS, Open-Source Standards, Requirements for Software, OSS success, Free Software, Examples, Licensing, Free Vs. Proprietary Software, Free Software Vs. Open-Source Software, Public Domain. History of free software, Proprietary Vs Open-Source Licensing Model, use of Open- Source Software, FOSS does not mean no cost. History: BSD, The Free Software Foundation and the GNU Project.

UNIT – II OPEN-SOURCE PRINCIPLES AND METHODOLOGY:

Open-Source History, Open Source Initiatives, Open Standards Principles, Methodologies, Philosophy, Software freedom, Open-Source Software Development, Licenses, Copyright vs. Copy left, Patents, Zero marginal cost, Income-generation Opportunities, Internationalization. Licensing: What Is A License, How to create your own Licenses, Important FOSS Licenses (Apache, BSD, PL, LGPL), copyrights and copy lefts, Patent.

UNIT – III OPEN-SOURCE PROJECTS:

Starting and maintaining own Open-Source Project, Open-Source Hardware, Open-Source Design, Open-source Teaching, Opensource media. **Collaboration:** Community and Communication, Contributing to OpenSource Projects Introduction to GitHub, interacting with the community on GitHub, Communication and etiquette, testing open-source code, reporting issues, contributing code. Introduction to Wikipedia, contributing to Wikipedia or contributing to any prominent open-source project of student's choice

UNIT – IV OPEN-SOURCE ETHICS AND SOCIAL IMPACT:

Open source vs. closed source, Open-source Government, Ethics of Open-source, Social and Financial impacts of open-source technology, Shared software, Shared source, Open Source as a Business Strategy

UNIT – V UNDERSTANDING OPEN-SOURCE ECOSYSTEM:

Open-Source Operating Systems: GNU/Linux, Android, Free BSD, Open Solaris. Open-Source Hardware, Virtualization Technologies, Containerization Technologies: Docker, Development tools, IDEs, Debuggers, Programming languages, LAMP, Open-Source Database technologies

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. “Open-Source Technology”, Kailash Vadera&Bhavyesh Gandhi, University Science Press, Laxmi Publications, 2009
2. “Open-Source Technology and Policy”, Fadi P. Deek and James A. M. McHugh, Cambridge University Press, 2008.
“Perspectives on Free and Open-Source Software”, Clay Shirky and Michael Cusumano, MIT press.
3. “Understanding Open Source and Free Software Licensing”, Andrew M. St. Laurent, O’Reilly Media.
4. “Open Source for the Enterprise”, Dan Woods, GautamGuliani, O’Reilly Media
5. https://www.tutorialspoint.com/basics_of_computers/basics_of_computers_open_source_software.htm
6. Linux kernel Home: <http://kernel.org>
7. Open-Source Initiative: <https://opensource.org/>
8. The Linux Foundation: <http://www.linuxfoundation.org/>
9. The Linux Documentation Project: <http://www.tldp.org/>
10. Docker Project Home: <http://www.docker.com3>.
11. Linux Documentation Project: <http://www.tldp.org/>
12. Wikipedia:<https://en.wikipedia.org/7>.https://en.wikipedia.org/wiki/Wikipedia:Contributing_to_Wikipedia
13. GitHub: <https://help.github.com/>
14. The Linux Foundation: <http://www.linuxfoundation.org/>

COURSE OUTCOMES:

At the end of the course, the students will be able to:

1. Can identify the licensing of open source systems and make decisions on their use, based on an understanding of the legal, economical and technical issues.
2. Can find open source projects related to a given development problem
3. Differentiate between Open Source and Proprietary software and Licensing.
4. Recognize the applications, benefits and features of Open-Source Technologies
5. Gain knowledge to start, manage open-source projects.

First Year

**CORE ELECTIVE I
3) GREEN COMPUTING
(Theory)**

Semester I

Code:

Credit: 4

COURSE OBJECTIVES:

- Study the concepts related to Green IT
- Identify Green devices and hardware along with software methods
- Understand green enterprise activities, managing the green IT and various laws, standards, protocols.

UNIT – I GREEN IT: AN OVERVIEWS:

Introduction, Environmental Concerns and Sustainable Development, Environmental Impacts of IT, Green IT, Holistic Approach to Greening IT, Greening IT, Applying IT for enhancing Environmental sustainability, Green IT Standards and Eco-Labeling of IT, Enterprise Green IT strategy, Green IT: Burden or Opportunity

UNIT – II GREEN DEVICES AND HARDWARE WITH GREEN SOFTWARE:

Green Devices and Hardware: Introduction, Life Cycle of a device or hardware, Reuse, Recycle and Dispose. Green Software: Introduction, Energy-saving software techniques, Evaluating and Measuring software Impact to platform power.

UNIT – III GREEN ENTERPRISES AND THE ROLE OF IT:

Introduction, Organization and Enterprise Greening, Information systems in Greening Enterprises, Greening Enterprise: IT Usage and Hardware, Inter-Organizational Enterprise activities and Green Issues, Enablers and making the case for IT and Green Enterprise.

UNIT – IV MANAGING GREEN IT:

Introduction, Strategizing Green Initiatives, Implementation of Green IT, Information Assurance, Communication and Social media.

UNIT – V REGULATING THE GREEN IT:

Laws, Standards and Protocols Introduction, The regulatory environment and IT manufacturers, Non regulatory government initiatives, Industry associations and standards bodies, Green building standards, Green data centers, Social movements and Greenpeace.

REFERENCES:

1. Harnessing Green IT Principles and Practices , San Murugesan, G.R. Gangadharan Wiley Publication, ISBN:9788126539680

2. The Green Computing Book - Tackling Energy Efficiency at Large Scale, Wuchun Feng, CRC Press, 2014
3. <https://www.javatpoint.com/green-computing>
4. <https://dl.acm.org/doi/fullHtml/10.1145/3493700.3493772>

COURSE OUTCOMES:

- Understand Green IT with its different dimensions and Strategies.
- Gain the Knowledge about Green devices and hardware along with its green software methodologies.
- Understand the concepts of how to manage the green IT with necessary components.
- Know the various laws, standards and protocols for regulating green IT.
- Identify the various key sustainability and green IT trends.

First Year

**VALUE ADDED COURSE I
MULTIMEDIA AND ANIMATION
(Theory)**

Semester I

Code:

Credit: *2

COURSE OBJECTIVES:

- It introduces how multimedia can be used in various application areas.
- It provides a solid foundation to the students so that they can identify the proper applications of multimedia.
- Evaluate the appropriate multimedia systems and develop effective multimedia applications.

UNIT – I INTRODUCTION:

Branch Overlapping Aspects of Multimedia Content – Global Structure – Multimedia Literature. Multimedia – Media and Data Streams – Medium.

UNIT – II SOUND/AUDIO:

Basic Sound Concepts – Music – Speech, Images and Graphics : Basic Concepts – Computer Image Processing – Video and Animation : Basic Concepts – Television – Computer Based Animation.

UNIT – III DATA COMPRESSION:

Storage Space – Coding Requirements – JPEG – MPEG – DVI, Optical Storage Media , Computer Technology – Multimedia Operating System.

UNIT – IV NETWORKING SYSTEM:

Layers, Protocols and Services, Networks, Metropolitan Area Networks, WAN, Multimedia Communication System.

UNIT – V USER INTERFACES:

Synchronization, Abstraction for Programming: Abstraction Levels – Libraries – System Software – Toolkit – Higher Programming Languages. Multimedia Application : Introduction – Media Population – Media Composition – Media Communication – Trends

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Ralf Steinmetz & Klara Nahrstedt – “Multimedia Computing, Communication

& Applications“Pearson Education.

2. Fred T, Hofstetter – “ Multimedia Literacy “ – 3rd edition TMH.

COURSE OUTCOMES:

At the end of the course, the students will be able to:

- Create a well-designed, interactive Web site with respect to current standards and Practices
- Demonstrate in-depth knowledge in an industry-standard multimedia development tool and its associated scripting language
- Determine the appropriate use of interactive verses standalone Web applications
- Create time-based and interactive multimedia components
- Identify issues and obstacles encountered by Web authors in deploying Web-based applications.

First Year

**CORE COURSE III
ADVANCED OPERATING SYSTEMS
(Theory)**

Semester II

Code:

Credit: 5

COURSE OBJECTIVES:

- To study the characteristics of Multiprocessor and Multi computer
- To understand the advance concepts of distributed operating systems
- To gain knowledge on the design concepts of data base operating systems and mobile operating systems

UNIT – I MULTIPROCESSOR OPERATING SYSTEMS:

System Architectures- Structures of OS – OS design issues –Process synchronization – Process Scheduling and Allocation- memory management.

UNIT – II DISTRIBUTED OPERATING SYSTEMS:

System Architectures- Design issues – Communication models –clock synchronization – mutual exclusion – election algorithms- Distributed Deadlock detection.

UNIT – III DISTRIBUTED SCHEDULING:

Distributed shared memory - Distributed File system – Multimedia file systems - File placement – Caching

UNIT – IV DATABASE OPERATING SYSTEMS:

Requirements of Database OS – Transaction process model – Synchronization primitives - Concurrency control algorithms

UNIT – V MOBILE OPERATING SYSTEMS:

ARM and Intel architectures - Power Management - Mobile OS Architectures - Underlying OS - Kernel structure and native level programming – Runtime issues- Approaches to power management

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Mukesh Singhal and Niranjana G. Shivaratri, “Advanced Concepts in Operating Systems Distributed, Database, and Multiprocessor Operating Systems”, Tata McGraw-Hill, 2001.
2. A S Tanenbaum, Distributed Operating Systems, Pearson Education Asia, 2001.

3. Source Wikipedia, Mobile Operating Systems, General Books LLC, 2010.
4. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, "Operating System Concepts", Wiley, Eighth Edition, 2008.
5. <https://www.javatpoint.com/distributed-operating-system>
6. <https://www.w3schools.in/operating-system/distributed-system>
7. <https://www.blogsaaays.com/tutorial-part1-introduction-android-mobile-operating-system/>
8. <https://www.geeksforgeeks.org/scheduling-and-load-balancing-in-distributed-system/>

COURSE OUTCOMES

At the end of the course, the students will be able to:

- Enrich the Knowledge about advance concepts in OS.
- Demonstrate the various issues in distributed operating systems.
- Identify the different features of data base operating systems.
- Able to develop modules for Mobile devices.
- Able to develop OS for distributed operating system.

First Year

**CORE COURSE IV
FOUNDATIONS OF INFORMATION
SECURITY
(Theory)**

Semester II

Code:

Credit: 5

COURSE OBJECTIVES:

- Understand the conceptual foundation of information security awareness..
- Analysis the risk events, treatment plans, assessment Understanding.
- Study the physical and logical perimeters of information assets and its security.

UNIT-I THE NEED FOR INFORMATION SECURITY:

The Internet of Things Is Changing How We Live-Evolution of the Internet of Things - Converting to a TCP/IP World - IoT's Impact on Human and Business Life - Evolution from Bricks and Mortar to E-Commerce - Why Businesses Must Have an Internet and IoT Marketing Strategy - IP Mobility - Mobile Applications - New Challenges-Created by the IoT.

UNIT - II ATTACKS:

Malicious Attacks, Threats, and Vulnerabilities-Malicious Activity on the Rise - Attack Tools - Security Breach - Risks, Threats, and Vulnerabilities - Malicious Attack - Malicious Software - Common Types of Attacks – Countermeasure.

UNIT - III SECURITY OPERATIONS AND ADMINISTRATION:

Security Administration – Compliance – Professional Ethics - The Infrastructure for an IT Security Policy - Data Classification Standards - Configuration Management - The Change Management Process - Application Software Security - Software Development and Security.

UNIT - IV NETWORKS AND TELECOMMUNICATIONS:

-The Open Systems Interconnection Reference Model – The Main Types of Networks - TCP/IP and How It Works - Network Security Risks - Basic Network Security Defense Tools - Wireless Networks

UNIT - V MALICIOUS CODE AND ACTIVITY:

Characteristics, Architecture, and Operations of Malicious Software - The Main Types of Malware - A Brief History of Malicious Code Threats - Threats to Business Organizations - Anatomy of an Attack - Attack Prevention Tools and Techniques - Intrusion Detection Tools and Techniques.

UNIT - VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Fundamentals of Information Systems Security, 3rd Edition by David Kim, Michael G. Solomon Released October 2016 Publisher(s): Jones & Bartlett Learning Edition
2. Fundamentals of Information Security by Nadkarni, Sanil , BPB Publications, 2020
3. Principles Of Information Security 5Th Edition by Whitman M E, Cengage Learning, Whitman M E, Cengage Learning, 2014
4. <https://www.tutorialspoint.com/principles-of-information-system-security>
5. <https://www.geeksforgeeks.org/principle-or-information-system-secutiry/>

COURSE OUTCOMES:

At the end of the course, the students will be able to:

- Detail evaluation of information classification, roles and responsibilities
- Examining the access controls, monitoring, management and review process
- Understand several foundational areas in information security
- Acquire the knowledge about attacks
- Understand Malicious Code and Activity.

First Year

CORE CHOICE COURSE II

Semester II

1) J2EE TECHNOLOGIES

Code:

(Theory)

Credit: 4

COURSE OBJECTIVES:

- To design and develop web based and enterprise applications using J2EE.
- Understand the concepts such as JDBC, JSP
- To develop a concept of JNDI and Struts framework.

UNIT – I JAVA 2 ENTERPRISE EDITION OVERVIEW:

J2EE and J2SE – J2EE Multi-Tier Architecture: The Tier – J2EE Multi-Tier Architecture – Client Tier Implementation – Web Tier Implementation – Enterprise JavaBeans Tier Implementation – Enterprise Information Systems Tier Implementation. Java Servlets : Java Servlets and Common Gateway Interface Programming – A Simple Java Servlet – Anatomy of a Java Servlet – Reading data from a Client – Reading HTTP Request Headers – Sending Data to a Client and Writing the HTTP Response Header – Working with Cookies – Tracking Sessions.

UNIT – II JSP:

Introduction to JSP – Working with JSP Basic and Implicit Objects: Exploring Scripting Tags – Exploring Implicit Objects – Exploring Directive Tags – Enhancing the JSP tags Support: Custom Tags – Empty Tags – Simple Tags – Understanding JSP Expression Language: Basic Syntax of using EL: Types of EL Expressions – Tag Attribute Types – Resolving EL Expressions – Expression Language Operators.

UNIT – III JDBC:

Introducing JDBC – Exploring the JDBC Architecture – Working with JDBC APIs: Communicating with Databases by using JDBC APIs – Implementing JDBC statements and Result sets: Working with the Statement Interface – Working with the Prepared Statement Interface – Working with the Callable Statement Interface: Describing stored Procedures – Listing the benefits of working with a Stored Procedure – Using Callable Statement – Using Callable Statement with Parameters – Describing Advanced JDBC Concepts: SQL 99 Data Types.

UNIT – IV JAVA NAMING AND DIRECTORY INTERFACE API:

Naming and Directories – Java Naming and Directory Interface – Naming Operations – Web Services: SOAP – SOAP Basics – Java API for XML Messaging – Create, Send and Receive a Point to Point SOAP Message – Create and Send a SOAP Message Using a Messaging Provider – Creating a SOAP Attachment.

UNIT – V STRUTS FRAMEWORK:

Introduction to Struts – Two Development Models – Model View Architecture – Enter struts – Basic Components of Struts – Building Simple Struts Application –

Model Layer: Struts and the model - View Layer: Struts and view layer -The Controller Layer: Struts and controller layer.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Jim Keogh (2014), The Complete Reference J2EE, McGraw Hill Education (India) Private Limited, New Delhi, 36th reprint
2. Santosh Kumar (2014), JDBC Servlets and JSP, 1/e, Dream tech Press.
3. James Holmes (2007), Struts – The Complete Reference, Tata Mc-Graw Hill Publications.
4. James McGovern, Rahim Adaitia et.al, J2EE 1.4 Bible, Wiley India Publications, New Delhi.
5. Kogent Learning Solutions Inc (2014), Java Server Programming, Dreamtech Press.
6. Beginning J2EE 1.4: From Novice to Professional, Jim Crume, Kevin Mukhar, James Weaver, James Crume,2004
7. <https://www.javatpoint.com/java-ee>
8. <https://beginnersbook.com/jsp-tutorial-for-beginners/>
9. <https://docs.oracle.com/javase/tutorial/jdbc/basics/index.html>
10. <https://www.javatpoint.com/struts-2-tutorial>

COURSE OUTCOMES:

At the end of the course, the students will be able to:

- Understand the concepts of web designing using J2EE.
- Understand the communication between application and database using JDBC API
- Apply JNDI concept to set up database connection pool.
- Determine the importance of scripting language in making a web page Interactive
- Analyze effective techniques to be followed to create as Struts applications

First Year

CORE CHOICE COURSE II
2) DATA MINING TECHNIQUES AND
TOOLS
(Theory)

Semester II

Code:

Credit: 4

COURSE OBJECTIVES:

- Introduce the basic concepts of data mining and various data mining techniques like classification, clustering, and association rule mining.
- Acquire the knowledge about various applications of data mining such as Text mining, Web mining, Multimedia mining, Image mining, Spatial mining
- To gain the concept of data visualization

UNIT – I INTRODUCTION TO DATA MINING:

Mining from database - Data mining functionalities – Mining patterns - Classification of data mining systems - Major issues in Data mining.

UNIT – II DATA PREPROCESSING:

Need for preprocessing – Data summarization – Data cleaning – Data integration - Data transformation – Data reduction – Data discretization. Association Rule Mining: Apriori algorithm.

UNIT – III CLASSIFICATION:

Decision trees - Naïve Bayes - K Nearest Neighbour - Support Vector Machine - Neural Networks- Deep Neural Networks- Evaluation of classification algorithms. Prediction – Regression, Evaluation of Prediction methods.

UNIT – IV CLUSTERING:

Cluster Analysis - Partitioning Methods: K-Means, K-Medoids - Hierarchical Methods – BIRCH, ROCK - Density based methods: DBSCAN, OPTICS - Evaluation of clustering algorithms. Data Visualization: Foundations for building visualizations - Visualizing data -Working with Data in Tableau - Moving from Foundational to Advanced Visualizations.

UNIT – V ADVANCED DATA MINING TECHNIQUES:

Mining Data Streams - Mining Time Series Data - Mining Sequence Patterns in Biological Data - Graph Mining - Social Network Analysis – Spatial Data Mining - Multimedia Data Mining - Text Mining - Mining the World Wide Web - Data Mining Applications and Tools.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Jaiwei Han, Micheline Kamber (2006). Data Mining-concepts and techniques, 2/e, Morgan Kaufmann Publishers, San Francisco.
2. Joshua N.Milligan (2015). Learning Tableau, PACKT publishing
3. Mark A. Hall, Ian H. Witten, Eibe Frank (2011),Data Mining: Practical Machine Learning Tools and Techniques, 4/e, Morgan Kaufmann Publishers, San Francisco .
4. David Hand, Heikki Mannila and Padhraic Smyth (2001). Principles of Data Mining, Prentice Hall of India, New Delhi
5. Arun K. Pujari (2001). Data Mining Techniques; Universities Press, Hyderabad
6. Soman KP (2005). Data mining from theory to practice, 2/e, PHI Learning Pvt. Ltd., New Delhi.
7. Dr. K. Meena & N. Vjyalakshml, Introduction to Data Mining, P.R. Publishers and Distributors, Tiruchirappalli, 2014 (ISBN:978-81-927413-1-4)
8. <https://www.javatpoint.com/data-mining-techniques>
9. <https://www.tutorialride.com/data-mining/data-mining-tutorial.htm>
10. <https://www.javatpoint.com/classification-algorithm-in-machine-learning>
11. <https://developers.google.com/machine-learning/clustering>

COURSE OUTCOMES:

At the end of the course, the students will be able to:

- Understand basic concepts of data mining like classifications, clustering, association rule mining, prediction and related algorithms
- Apply data mining techniques to carry out simple data mining tasks
- Analyze data using data visualization with Tableau
- Design different data mining models for real world problems
- Develop predictive models using advanced Data Mining Techniques

First Year

**CORE PRACTICAL II
ADVANCED OPERATING SYSTEMS
(USING C/C++)
(Practical)**

Semester II

Code:

Credit: 2

1. Develop a program to perform CPU Scheduling Algorithm
2. Develop a program to perform Producer-Consumer Problem using Semaphores.
3. Develop a program to perform Dining-Philosopher Problem
4. Develop a program to perform Memory Management Techniques(Paging)
5. Develop a program to perform Contiguous Memory Allocation
6. Develop a program to perform Page Replacement Algorithms
7. Develop a program to perform File allocation Strategies.
8. Develop a program to perform Dead Lock Prevention
9. Develop a program to perform Dead Lock Avoidance
10. Develop a program to perform Disk Scheduling Algorithms

First Year

CORE CHOICE PRACTICAL II

Semester II

1) J2EE TECHNOLOGIES

Code:

(Practical)

Credit: 2

1. Develop webpage to pass information between pages.
2. Develop webpage to implement HTTP Request and Response
3. Develop webpage to implement JDBC API to connect the application with the database.
4. Develop webpage to design a website using forms validation techniques.
5. Develop webpage to implement arithmetic operations.
6. Develop webpage to implement exception handling.
7. Develop webpage to create and send a SOAP Message using a Messaging provider
8. Develop webpage to create an application using basic JSP tags.
9. Develop webpage to develop a Servlet application.
10. Develop webpage to design a web application using struts.

First Year

CORE CHOICE PRACTICAL II
2) DATA MINING TECHNIQUES AND
TOOLS
(Practical)

Semester II

Code:

Credit: 2

Implement the following Data mining techniques in C/C++.

1. Preprocessing Activities
2. Exercise on Filters
3. Feature Selection
4. Apriori algorithm
5. Bayes classification.
6. Nearest Neighbor classification
7. k-means clustering technique.
8. Exercise on Association Rule Mining
9. Exercise on Knowledge Flow
10. Exercise on Text Mining

First Year

ELECTIVE COURSE II
1) WIRELESS NETWORKS
(Theory)

Semester II

Code:

Credit: 4

COURSE OBJECTIVES:

- Understand the basic WSN technology and supporting protocol
- Understand the Cellular systems functionality
- Learn key routing protocols for sensor networks.

UNIT – I INTRODUCTION TO WIRELESS NETWORKS:

Evolution of Wireless Networks – Challenges. Wireless Communications Principles and Fundamentals: The Electromagnetic Spectrum - Wireless Propagation Characteristics and Modelling - Analog and Digital Data transmission - Modulation Techniques for Wireless Systems - The Cellular Concept – Routers- Wireless Services. Principles of AIR-Interface Design - Characteristics of the Wireless Medium.

UNIT – II GENERATION OF CELLULAR SYSTEMS:

First Generation (1G) Cellular Systems - Second Generation (2G Cellular Systems: Introduction – D-AMPS – CDMAone - GSM – IS-41 - Third Generation (3G) Cellular Systems: Introduction – 3G Spectrum Allocation – Service Classes and Application – Fourth Generation (4G) Systems. 5G Fundamentals and Architecture: Evolution of 5G, Need for 5G-5G RAN(Radio Access Networks)-Key features of 5G- Architecture: Key elements of 5G- 3GPP standards for 5G radio and core.

UNIT – III PRINCIPLES OF WIRELESS NETWORK OPERATION:

Network Planning – Wireless Network Operation - Satellite Networks: Introduction - Satellite Systems - VSAT Systems - Examples of Satellite based Mobile Telephony Systems - Satellite-based Internet Access.

UNIT – IV FIXED WIRELESS ACCESS SYSTEMS:

Wireless Local Loop versus Wired Access - Wireless Local Loop - Wireless Local Loop Subscriber Terminals (WLL) - Wireless Local Loop Interfaces to the PSTN, IEEE 802.16 Standards. Wireless Local Area Networks: Introduction - Wireless LAN Topologies - Wireless LAN Requirements - The Physical Layer - The Medium Access Control (MAC) Layer - Latest Developments. Wireless ATM: Introduction - Wireless ATM Architecture – HIPERLAN 2: An ATM Compatible WLAN.

UNIT – V PERSONAL AREA NETWORKS:

Introduction to PAN Technology and Applications, Commercial Alternatives: Bluetooth - Commercial Alternatives: HomeRF. Security Issues in Wireless Systems: The Need for Wireless Network Security - Attacks on Wireless Networks - Security Services - Wired Equivalent Privacy (WEP) Protocol - Mobile IP -

Weaknesses in the WEP Scheme - Virtual Private Network (VPN). Simulation of Wireless Network Systems.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. P.Nicopolitidis, M.S. Obaidat, G.I Papadimitriou, A.S. Pomportsis (2003). Wireless Networks, New Delhi: John Wiley & Sons (ASIA)
2. William Stallings (2002). Wireless Communication and Networks, Pearson Education, Delhi,
3. KavehPahlavan, Prashant Krishnamurthy (2002), Principles of Wireless Networks - A Unified Approach; 2/e; New Delhi: Pearson Education.
4. Anwer AI-Dulaimi, Xianbin Wang and Chih-Lin I, “5G Networks: Fundamental Requirements,Enabling Technologies, and Operations Management”, Wiley- IEEE Press, USA, (2018).
5. <https://www.rfwireless-world.com/Tutorials/wireless-LAN-tutorial.html>
6. <https://www.tutorialspoint.com/Wireless-Networks>

COURSE OUTCOMES:

At the end of the course, the students will be able to:

- Understand the enabling technologies for wireless sensor networks.
- Understand the principles behind the networking operation.
- Understand the Advantages of sensor networks and applications.
- Classification of different technologies followed in various generation of cellular networks.
- Understand the operating systems and execution environments, network architecture.

First Year

ELECTIVE COURSE II
2) BIG DATA FRAMEWORKS
(Theory)

Semester II

Code:

Credit: 4

COURSE OBJECTIVES:

- To understand the basic concepts of Big data.
- To learn Hadoop, MapReduce, Hive.
- To Learn HBase and Pig.

UNIT – I:

Fundamentals of Big Data Understanding Big Data: Concepts and Terminology – Big Data Characteristics – Types of Data – Case Study Background – Drivers for Big Data Adoption: Information and Communication Technology – Big Data Analytics Lifecycle

Unit – II:

Fundamentals of Hadoop Core components of Hadoop- Apache Hadoop – HDFS Daemons – MapReduce Daemons – HDFS High Availability Daemons – Benefits and Challenges of HDFS – File Sizes, Block Sizes and Block Abstraction in HDFS – Data Replication – How does HDFS Store, Read, and Write Files – Data Serialization Options – File System Shell Commands for HDFS

Unit – III:

HDFS and MapReduce Choosing Key and Value Types for MapReduce Jobs – The Relationship of Input Keys to Output Keys – Sorting Keys and Values – Sort and Shuffle Process – MapReduce Job Configuration and Submission Hadoop Distributed File System – MapReduce Framework – Setting the Environment – Hadoop Cluster Modes – Running a MapReduce Job with the MR1Framework – Running a MapReduce Job with the Yarn Framework – Running Hadoop Streaming.

Unit – IV:

Hive and HBase Apache Hive: Setting the Environment – Configuring Hadoop, Hive – Starting HDFS, Hive Server, CLI – Creating and Using a Database – Creating a Managed Table – Loading data into a Table – Creating a Table using LIKE – Adding Data into a Table from Queries – Adding Data using INSERT INTO TABLE – Adding Data using INSERT OVERWRITE – Creating a table using CREATE TABLE AS SELECT – Altering, Truncating and Dropping a Table – Creating an External Table – Apache HBase: Setting the Environment – Configuring Hadoop, Hive and HBase – Starting the HBase and HBase Shell – Creating HBase Table – Adding Data to a Table – Listing all Tables – Getting a Row of Data – Scanning a Table – Counting the Number of Rows in a Table – Altering a Table – Deleting a Table Row, Column – Disabling and Enabling a Table – Truncating and Dropping a Table – Determining If Table Exists – Creating a Hive External Table stored by HBase

Unit – V:

Pig Introduction – Installing and Running Pig – Grunt – Pig’s Data Model – Introduction to Pig Latin – Advanced Pig Latin – Developing and Testing Pig Latin Scripts – Making Pig Fly – Writing Evaluation and Filter Functions – Writing and Loading Store Function

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Alan Gates, “Programming Pig”, Oreilly Publication, 2011.
2. Deepak Vohra, “Practical Hadoop Ecosystem: A Definitive Guide to Hadoop-Related Frameworks and Tools”, Apress, 2016.
3. Thomas Erl, Wajid Khattak, Paul Buhler, –Big Data Fundamentals Concepts, Drivers & Techniques| , Service Tech Press, 2015.
4. Noreen Burlingame, “The little book on BigData”, New Street publishers, 2012.
5. 2.Anil Maheshwari, “Data Analytics”, Mc Graw Hill Education,2017
6. <https://data-flair.training/blogs/hadoop-ecosystem-components/>
7. <https://hadoop.apache.org/docs/stable/hadoop-mapreduce-client/hadoop-mapreduce-client-core/MapReduceTutorial.html>
8. <https://www.javatpoint.com/hive>
9. https://www.tutorialspoint.com/apache_pig/index.htm

COURSE OUTCOMES:

At the end of the course, the students will be able to:

- To understand the Data Science, Overview of Big Data Analytics, Big Data Evolution,
- To Understand the Data Analytics Life Cycle
- To understand Map Reduce concept
- To apply parallel and distributed computing for big data in Hadoop
- To implement data science and big data analytics projects using Map Reduce, Pig, HBase, Hive.

First Year

ELECTIVE COURSE II
3) INTERNET OF THINGS
(Theory)

Semester II

Code:

Credit: 4

COURSE OBJECTIVES:

- Understand the basic concepts of IoT, IoT Protocols and design methodology.
- Introduces building IoT with Arduino for various real time applications.
- Acquire the knowledge about data acquisition using Arduino

UNIT – I INTRODUCTION TO IoT:

Internet of Things – Physical Design of IoT– Logical Design of IoT: Blocks, Models - IoT Enabling Technologies: Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems. IoT Levels and Deployment Templates– Domain Specific IoTs.

UNIT – II INTRODUCTION TO ARDUINO:

Installing the Integrated Development Environment (IDE)- Setting up the Arduino Board- Structuring an Arduino Program- Simple Primitive Types- Floating-Point Numbers – Working with groups of values- Arduino String Functionality – C character Strings- Converting Number to String – Structuring the Code into Function Block.

UNIT – III SERIAL COMMUNICATION:

Sending Debug Information From Arduino to your computer – Sending Formatted Text and Numeric data from arduino- Receiving Serial Data in Arduino – Sending and Receiving multiple text fields from arduino in a single message. Digital and Analog Input : Using Switch-Without external resistors-detecting the closing of switch- How long a switch is pressed- reading a Keypad, Analog values- Changing range of values- Displaying Voltage up to 5V.

UNIT – IV INPUTS FROM SENSORS:

Detecting Movements, Light, Motion – Measuring Distance, Temperature- Detecting Vibration, Sound – Reading RFID tags. Visual Output: Connecting and Using LEDs- Adjusting the Brightness of an LED- Driving High-power LEDs- Adjusting the colour of an LED. Physical Output: Controlling the position of a servo- Controlling one or Two Servo with a Potentiometer or sensor-Controlling the speed of continuous Rotation Seros.

UNIT – V AUDIO OUTPUTS:

Playing Tones, Simple Melody- Generating more than one simultaneously Tone- Generating Audio Tones and Fading LED's, Playing WAV File, Controlling MIDI. Using Display: Connecting and Using a Text LCD Display- Formatting Text – Turning the cursor and display On or Off- Scrolling Text- Displaying Special Symbols- Creating Custom Characters- Displaying Symbols Larger than a single character- Displaying Text on TV. Using Time and Dates : Creating Delays- Using

mills to determine duration- Measuring duration Pulse-Using Arduino as Clock-
Creating an alarm to periodically call a function –Using a Real time clock

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Arshdeep Bahaga, Vijay Madiseti (2014). “Internet of Things – A hands on approach”, Universities Press
2. Michael Margolis(2011), “Arduino Cookbook” 2nd Edition, O'Reilly Media
3. Honbo Zhou (2012). The Internet of Things in the Cloud: A Middleware Perspective, New York: CRC Press.
4. Dieter Uckelmann, Mark Harrison, Florian Michahelles (2011). Architecting the Internet of Things, Germany, Springer.
5. Olivier Hersent, Omar Elloumi and David Boswarthick (2012). The Internet of Things: Applications to the Smart Grid and Building Automation, UnitedStates: Wiley Publishing Inc
6. <https://data-flair.training/blogs/iot-tutorial/>
7. <https://www.arduino.cc/en/Tutorial/HomePage/>
8. <https://fiware-tutorials.readthedocs.io/en/1.0.0/iot-sensors/>

COURSE OUTCOMES:

At the end of the course, the students will be able to:

- Understand basic concepts of IoT.
- Apply various sensors and protocols in real time applications.
- Implement data acquisition using Arduino.
- Create real time applications
- Create web application for handling data communication using IOT devices.

First Year

**NON-MAJOR ELECTIVE COURSE I
FUNDAMENTALS OF INFORMATION
TECHNOLOGY
(Theory)**

Semester II

Code:

Credit: 2

COURSE OBJECTIVES:

- To understand the revolution in computers and communications
- To know about various application software
- To understand the information systems and software development

UNIT – I INFORMATION TECHNOLOGY:

Introduction – Information systems – Definition of computer and system – Software and Data - IT in business and Industry – IT in the Home and at Play – It in Education and Training – IT in Entertainment and the Arts – IT in Science, Engineering, and Mathematics – Global Positioning System.

UNIT – II INTRODUCTION TO COMPUTERS:

History of computers, Types of computers, Characteristics of computers, Basic Anatomy of a computer, Applications of computer – Memory – Memory types.

UNIT – III SOFTWARE:

Kinds of Software - The five types of Applications software - Word processing – Spreadsheets - Database software, Presentation graphics software - Communications software System Software – Operating system - functions

UNIT – IV COMPUTER NETWORKS:

Introduction – Definition Computer Networks - Types of Networks – Local Area Network – Metropolitan Area Network - Wide Area Network – Personal Area Network - internet – Intranet – firewalls - Network Topology – Bus – Ring – Hybrid – Star

UNIT – V BASIC INTERNET CONCEPTS:

Analog and Digital Signals - modems and communication Software, ISDN lines, and Cable Modems - Definition of Internet - The World Wide Web - Connecting to the Internet – Browsing the web – Web browser – Uniform Resource Locator (URL) – E-mail communication.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Dennis P. Curtin, Kim dolwy, KunL AWN, Xrhleen morin, Information Technology, the breaking wave, TMH 2000.
2. Stacey C Sawyer, Brain K Williams, Sarah E Hutchinson Using Information Technology –Brief Version
3. A Practical Introduction to Computer and Communications Third Edition,

McGraw Hill Companies 2011

4. James O'Brien – Introduction to Information systems. 16th edition, 2005.
5. The Internet Book: Everything You Need to Know About Computer Networking and How the Internet Works, Douglas E. Comer, Pearson, 2000
6. <https://www.javatpoint.com/internet>
7. <http://www.steves-internet-guide.com/networking/>

COURSE OUTCOMES:

At the end of the course, the students will be able to:

- To know the latest trends in information technology
- To understand the fundamentals of computers
- To gain knowledge about networks
- To acquire knowledge about different software
- To understand Internet basics

COURSE OBJECTIVES:

- To get familiar with the structure of the compilation process
- To Learn the basic concepts of NFAs and DFAs
- To Know the Functionality of Abstract Syntax Tree, Intermediate Representations and Code Optimization .

UNIT – I INTRODUCTION:

Basics of Compiler - The Importance of Compilers - A Quick Tour : The Compiler Toolchain – Stages Within a Compiler - Example Compilation - Scanning : Kinds of Tokens - A Hand-Made Scanner - Regular Expressions - Finite Automata - Deterministic Finite Automata - Nondeterministic Finite Automata - Conversion Algorithms - Converting REs to NFAs - Converting NFAs to DFAs - Minimizing DFAs - Limits of Finite Automata - Using a Scanner Generator - Practical Considerations.

UNIT - II PARSING:

Overview - Context Free Grammars - Deriving Sentences - Ambiguous Grammars - LL Grammars - Eliminating Left Recursion - Eliminating Common Left Prefixes - First and Follow Sets - Recursive Descent Parsing - Table Driven Parsing - LR Grammars - Shift-Reduce Parsing - The LR(0) Automaton - SLR Parsing - LR(1) Parsing - LALR Parsing - Grammar Classes Revisited - The Chomsky Hierarchy

UNIT - III THE ABSTRACT SYNTAX TREE:

Overview - Declarations - Statements - Expressions - Types - Putting it All Together - Building the AST Semantic Analysis : Overview of Type Systems - Designing a Type System - The B-Minor Type System - The Symbol Table - Name Resolution - Implementing Type Checking - Error Messages

UNIT - IV INTERMEDIATE REPRESENTATIONS:

Introduction - Abstract Syntax Tree - Directed Acyclic Graph-Control Flow Graph - Static Single Assignment Form - Linear IR - Stack Machine IR - Examples - GIMPLE - GNU Simple Representation - LLVM - Low Level Virtual Machine - JVM - Java Virtual Machine - Memory Organization : Introduction - Logical Segmentation - Heap Management - Stack Management - Stack Calling Convention - Register Calling Convention - Locating Data - Program Loading

UNIT - V CODE GENERATION:

Introduction - Supporting Functions - Generating Expressions - Generating Statements - Conditional Expressions - Generating Declarations - Optimization: Overview - Optimization in Perspective - High Level Optimizations - Constant Folding - Strength Reduction Loop Unrolling - Code Hoisting - Function Inlining -

Dead Code Detection and Elimination - Low-Level Optimizations - Peephole Optimizations - Instruction Selection - Register Allocation - Safety of Register Allocation - Priority of Register Allocation - Conflicts Between Variables - Global Register Allocation - Optimization Pitfalls - Optimization Interactions.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Introduction to Compilers and Language Design, Douglas Thain, Lulu Publications, 2020.
2. Compiler Design, Karthi M, Sudha Rani S, Rajkumar Y, Wiley Publication, 2019.
3. A.V. Aho, Ravi Sethi, J.D. Ullman, Compilers- Principles, Techniques and Tools, Addison-Wesley, 2003.
4. Fischer Leblanc, Crafting Compiler, Benjamin Cummings, Menlo Park, 1988. . Kenneth C. Loudon, Compiler Construction Principles and Practice, Vikas publishing House, 2004.
5. AllenI. Holub, Compiler Design in C, Prentice Hall of India, 2001.
6. S. Godfrey Winster, S.Aruna Devi, R. Sujatha, “Compiler Design”, yesdee publishers, Third Reprint 2019.
7. <https://riptutorial.com/parsing>
8. <https://www.javatpoint.com/automata-tutorial>
9. https://www.tutorialspoint.com/compiler_design/compiler_design_intermediate_code_generations.htm
10. <https://www.methodsandtools.com/archive/archive.php?id=86>
11. <https://www.i2tutorials.com/compiler-design-tutorial/>

COURSE OUTCOMES:

At the end of the course, the students will be able to:

1. Understand the structure of the compilation Process and should be distinguish, what happens at each and every phase of a compiler.
2. Acquire knowledge about parsing techniques.
3. Evaluate the Context-free grammars and parsing methods for removing useless productions symbols and removing epsilon productions.
4. Understand the concepts of Abstract Syntax tree and Intermediate Representations.
5. Apply code optimization techniques to reduce number of instructions in a program.

COURSE OBJECTIVES:

- Introduce the basic features of R Programming.
- Understand the concept of List and Data
- Get knowledge about R built in Functions

UNIT - I OVERVIEW OF R:

History and Overview of R- Basic Features of R-Design of the R System- Installation of R- Console and Editor Panes- Comments- Installing and Loading R Packages- Help Files and Function Documentation- Saving Work and Exiting R- Conventions- R for Basic Math- Arithmetic- Logarithms and Exponentials- E-Notation- Assigning Objects- Vectors- Creating a Vector- Sequences, Repetition, Sorting, and Lengths- Subsetting and Element Extraction- Vector-Oriented Behaviour Practical

UNIT - II MATRICES AND ARRAYS:

Defining a Matrix – Defining a Matrix- Filling Direction- Row and Column Bindings- Matrix Dimensions- Subsetting- Row, Column, and Diagonal Extractions- Omitting and Overwriting- Matrix Operations and Algebra- Matrix Transpose- Identity Matrix- Matrix Addition and Subtraction- Matrix Multiplication- Matrix Inversion-Multidimensional Arrays- Subsets, Extractions, and Replacements

UNIT - III NON-NUMERIC VALUES:

Logical Values- Relational Operators- Characters- Creating a String- Concatenation- Escape Sequences- Substrings and Matching- Factors- Identifying Categories- Defining and Ordering Levels- Combining and Cutting

UNIT - IV LISTS AND DATA FRAMES:

Lists of Objects-Component Access-Naming-Nesting-Data Frames-Adding Data Columns and Combining Data Frames-Logical Record Subsets-Some Special Values-Infinity-NaN-NA-NULL Attributes-Object-Class-Is-Dot Object-Checking Functions-As-Dot Coercion Functions-

UNIT – V BASIC PLOTTING:

Using plot with Coordinate Vectors-Graphical Parameters-Automatic Plot Types- Title and Axis Labels Color-Line and Point Appearances-Plotting Region Limits- Adding Points, Lines, and Text to an Existing Plot-ggplot2 Package-Quick Plot with qplot-Setting Appearance Constants with Geoms-- READING AND WRITING FILES- R-Ready Data Sets- Contributed Data Sets- Reading in External Data Files- Writing Out Data Files and Plots- Ad Hoc Object Read/Write Operations

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Tilman M. Davies, “**The Book of R - A First Programming and Statistics**” Library of Congress Cataloging-in-Publication Data,2016.
2. Roger D. Peng,”R Programming for Data Science”Lean Publishing, 2016.
3. Hadley Wickham, Garrett Golemund,” R for Data Science”,OREILLY Publication,2017
4. Steven Keller, “R Programming for Beginners”, CreateSpace Independent Publishing Platform 2016.
5. Kun Ren ,”Learning R Programming”, Packt Publishing,2016
6. <https://www.geeksforgeeks.org/r-programming-exercises-practice-questions-and-solutions/>
7. https://www.w3schools.com/r/r_graph_plot.asp
8. <https://www.geeksforgeeks.org/list-of-dataframes-in-r/>

COURSE OUTCOMES:

At the end of the course, the students will be able to:

- Identify and execute basic syntax and programs in R.
- Perform the Matrix operations using R built in functions
- Apply non numeric values in vectors
- Create the list and data frames
- Exploit the graph using ggplot2.

COURSE OBJECTIVES:

- To introduce the technologies behind the distributed computing environment
- To provide the programming expertise to develop applications for distributed environment.
- To build concepts regarding the fundamental principles of distributed systems.

UNIT – I INTRODUCTION TO DISTRIBUTED COMPUTING:

Challenges involved in establishing remote connection – Strategies involved in remote computation – Current Distributed computing practices through Dot Net and Java technologies.

UNIT – II ADVANCED ADO.NET:

Disconnected Data Access – Gridview, Details View, Form View controls – Crystal Reports – Role of ADO, NET in Distributed Applications.

UNIT – III ADVANCED ASP.NET:

AdRotator, Multiview, Wizard and Image Map Controls – Master Pages – Site Navigation – Web Parts – Uses of these controls and features in Website development.

UNIT – IV ADVANCED FEATURES OF ASP.NET:

Security in ASP, NET – State Management in ASP, NET – Mobile Application development in ASP, NET – Critical usage of these features in Website development.

UNIT – V WEB SERVICES:

Role of Web services in Distributed Computing – WSDL, UDDI, SOAP concepts involved in Web Services – Connected a Web Service to a Data Base – Accessing a Web Service through n ASP, NET application.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Walther, ASP, NET 3.5, SAMS Publication, 2005.
2. Mathew Mac Donald, “ASP.NET Complete Reference”, TMH 2005.

3. Crouch Matt J, “ASP.NET and VB.NET Web Programming”, Addison Wesley 2002.
4. J.Liberty, D.Hurwitz, “Programming ASP.NET”, Third Edition, O’REILLY, 2006.
5. K.Meena, R.Sivakumar, A.B.Karthlck Anand Babu, Dot Net Technologies, Himalaya Publishing House Pvt., Ltd., Bangalore, 2016, (ISBN:978 -93-5037-938-9)
6. <https://www.geeksforgeeks.org/types-of-distributed-system/>
7. <https://www.dotnetcurry.com/tutorials/aspnet>
8. <https://www.javatpoint.com/ado-net-tutorial>

COURSE OUTCOMES:

At the end of the course, the students will be able to:

- Design a web page with Web form fundamentals and web control classes
- Knowledge on Various Controls in ASP .NET
- Enrich the knowledge of ASP.NET object, ADO.NET data access
- Analyze and Design the Mobile Application Development in ASP .NET
- Clear Understanding on WSDL, UDI and SOAP Concepts.

COURSE OBJECTIVES:

- To Learn about Machine Intelligence and Machine Learning applications
- To understand the theoretical and practical aspects of Probabilistic Graphical Models
- To understand how to perform evaluation of learning algorithms and model selection

UNIT – I INTRODUCTION:

Machine Learning - Machine Learning Foundations –Overview – Design of a Learning system - Types of machine learning –Applications Mathematical foundations of machine learning - random variables and probabilities - Probability Theory – Probability distributions -Decision Theory- Bayes Decision Theory - Information Theory

UNIT – II SUPERVISED LEARNING:

Linear Models for Regression - Linear Models for Classification – Naïve Bayes - Discriminant Functions -Probabilistic Generative Models -Probabilistic Discriminative Models - Bayesian Logistic Regression. Decision Trees - Classification Trees- egression Trees - Pruning. Neural Networks -Feed-forward Network Functions - Back- propagation. Support vector machines - Ensemble methods- Bagging- Boosting

UNIT – III UNSUPERVISED LEARNING:

Clustering- K-means - EM Algorithm- Mixtures of Gaussians. The Curse of Dimensionality Reduction - Factor analysis - Principal Component Analysis - Probabilistic PCA- Independent components analysis

UNIT – IV PROBABILISTIC GRAPHICAL MODELS:

Graphical Models - Undirected graphical models - Markov Random Fields - Directed Graphical Models -Bayesian Networks - Conditional independence properties - Inference – Learning- Generalization - Hidden Markov Models - Conditional random fields(CRFs)

UNIT – V ADVANCED LEARNING:

Sampling –Basic sampling methods – Monte Carlo. Reinforcement Learning- K-Armed Bandit-Elements - Model-Based Learning- Value Iteration- Policy Iteration. Temporal Difference Learning- Exploration Strategies- Deterministic and Non-deterministic Rewards and Actions Computational Learning Theory - Mistake bound analysis, sample complexity analysis, VC dimension. Occam learning, accuracy and confidence boosting

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned

REFERENCES:

1. Christopher Bishop, “Pattern Recognition and Machine Learning” Springer, 2007.
2. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.
3. Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press, Third Edition, 2014.
4. Tom Mitchell, "Machine Learning", McGraw-Hill, 1997.
5. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer, Second Edition, 2011.
6. Stephen Marsland, “Machine Learning - An Algorithmic Perspective”, Chapman and Hall/CRC Press, Second Edition, 2014.
7. Demystifying Machine Learning, Neural Networks and Deep Learning By Suresh Samudrala · 2019, [Notion Press](#)
8. Machine Learning, By Rajiv Chopra KHANNA PUBLISHING HOUSE, 2020
9. <https://data-flair.training/blogs/machine-learning-tutorial/>
10. <https://www.cs.ubc.ca/~murphyk/Bayes/bnintro.html>
11. <https://www.geeksforgeeks.org/machine-learning/>

COURSE OUTCOMES:

At the end of the course, the students will be able to:

- Have a good understanding of the fundamental issues and challenges of machine learning:
- Have an understanding of the strengths and weaknesses of many popular machine learning approaches.
- Be able to design and implement various machine learning algorithms in a range of real-world applications.
- Use a tool to implement typical clustering algorithms for different types of applications
- Design and implement an HMM for a sequence model type of application

1. Develop program for Basic Mathematical computation –Square, Square root, exponential etc.
2. Develop program to extract the first and last elements of already created vector from, storing them as a new object.
3. Develop program Overwrite the existing object using the same sequence with the order reversed.
4. Develop program Confirm that the length of the vector created is 20.
5. Create and store a three-dimensional array with six layers of a 4 X 2 matrix, filled with a decreasing sequence of values between 4.8 and 0.1 of the appropriate length.
6. Extract and store as a new object the fourth- and first-row elements, in that order, of the second column only of all layers of (1).
7. Confirm the specific locations of elements equal to 0 in the 10 X 10 identity matrix I10
8. Create and store this data frame as dframe with the fields of person, sex, funny in your R workspace. Append the two new records.
9. Use your knowledge of handling character strings in R to extract all records from mydataframe that correspond to people whose names start with S.
10. Create a database with the fields of weight, height and sex then create a plot of weight on the x-axis and height on the y-axis. Use different point characters or colors to distinguish between males and females and provide a matching legend. Label the axes and give the plot a title.

Second Year

**CORE CHOICE PRACTICAL III
1. DISTRIBUTED TECHNOLOGIES**

Semester III

Code:

(Practical)

Credit: 2

1. Create a table and insert a few records using Disconnected Access.
2. Develop a project to update and delete few records using Disconnected Access.
3. Develop a project to view the records using Grid View, Details View, Form View Controls.
4. Develop a project to generate a crystal report from an existing database.
5. Design a web page that makes uses of Ad Rotator Control.
6. Design a web page involving Multi View or Wizard Control.
7. Design a simple web site that makes use of Master Pages.
8. Establish the security features in a simple web site with five pages.
9. Develop a web service that has an ASP.NET client.
10. Develop a web service to fetch a data from a table and send it across to the client.

1. Extract the data from database using python
2. Implement k-nearest neighbours classification using python
3. Implement linear regression using python.
4. Implement Naïve Bayes theorem to classify the English text
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program.
7. Calculate the accuracy, precision, and recall for your data set.
8. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.

Second Year

ELECTIVE COURSE III

Semester III

1. WEB SERVICES

Code:

(Theory)

Credit: 4

COURSE OBJECTIVES:

To Know the Basics of Web Services:

1. To Understand the Basic Virtual Machines Concepts
2. To Know the Programming Constructs Used in Web Services
3. To Get Introduced to Deployment in Web Services

UNIT – I AMAZON WEB SERVICES:

Cloud Computing - AWS - Benefit from using AWS - Cost - Comparing Alternatives - Exploring AWS Services - Interacting with AWS - Creating an AWS account - Creating a billing alarm to keep track of AWS bill

UNIT – II USING VIRTUAL MACHINES - EC2:

Exploring a virtual machine - Monitoring and debugging a virtual machine - Shutting down a virtual machine - Changing the size of a virtual machine - Starting a virtual machine in another data center - Allocating a public IP address - Adding an additional network interface to a virtual machine - Optimizing costs for virtual machines

UNIT – III PROGRAMMING THE INFRASTRUCTURE:

The command-line, SDKs, and Cloud Formation: Infrastructure as Code - Using the command-line interface - Programming with the SDK - Using a blueprint to start a virtual machine

UNIT – IV AUTOMATING DEPLOYMENT:

Cloud Formation, Elastic Beanstalk, and OpsWorks : Deploying applications in a flexible cloud environment - Comparing deployment tools - Creating a virtual machine and run a deployment script on startup with AWS Cloud Formation - Deploying a simple web application with AWS Elastic Beanstalk - Deploying a multilayer application with AWS OpsWorks Stacks

UNIT – V SECURING YOUR SYSTEM:

IAM, security groups, and VPC : Responsible for security - Keeping the software up to date - Securing the AWS account - Controlling network traffic to and from your virtual machine - Creating a private network in the cloud: Amazon Virtual Private Cloud (VPC)

UNIT – VI CURRENT CONTOURS (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Amazon Web Services in Action, Michael Wittig, Andreas Wittig, Second Edition, Manning Publications, 2019.
2. Amazon web services for mobile developers: building apps with AWS, Mishra, Abhishek, Sybex Publications, 2018.

COURSE OUTCOMES:

At the end of the course, the students will be able to:

- Know the Basics of Web Services
- Acquire the knowledge about Virtual Machine concept
- Know about the Programming Constructs Used in Web Services
- Understand and Get Introduced to automating Deployment
- Learn the Concepts related to Security in Web Services.

Second Year

**ELECTIVE COURSE III
2. SOFTWARE METRICS**

Semester III

Code:

(Theory)

Credit: 4

COURSE OBJECTIVES:

- To gain basic knowledge about metrics, measurement theory and related terminologies
- To learn measure the quality level of internal and external attributes of the software product
- To explore various metrics and models of software reliability

UNIT - I SOFTWARE QUALITY:

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

UNIT – II Applying The Seven Basic Quality Tools In Software Development:

Ishikawa's Seven Basic Tools, Checklist, Pareo Diagram, Histogram, Run Charts, Scatter Diagram, Control Chart, Cause, and Effect Diagram. The Rayleigh Model: Reliability Models, the Rayleigh Model Basic Assumptions, Implementation, Reliability and Predictive Validity.

UNIT – III Complexity Metrics and Models:

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

UNIT – IV Availability Metrics:

Definition and Measurement of System Availability, Reliability Availability and Defect Rate, Collecting Customer Outage Data For Quality Improvement, In Process Metrics For Outage And Availability. Conducting Software Project Assessment: Audit Ad Assessment, Software Process Maturity Assessment And Software Project Assessment, Software Process Assessment A Proponed Software Project Assessment Method.

UNIT - V DOS AND DON'TS OF SOFTWARE PROCESS IMPROVEMENT:

Measuring Process Maturity, Measuring Process Capability, Staged Versus Continuous Debating Religion, Measuring Levels Is Not Enough, Establishing The Alignment Principle, Take Time Getting Faster, Keep it Simple Or Face Decomplexification, Measuring The Value Of Process Improvement, Measuring Process Compliance, Celebrate The Journey Not Just The Destination. Using Function Point Metrics to Measure Software Process Improvement: Software Process Improvement Sequences, Process Improvement Economies, Measuring Process Improvement at Activity Levels.

UNIT – VI CURRENT CONTOURS (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Norman E-Fentor and Share Lawrence Pflieger.” Software Metrics”. International Thomson Computer Press, 1997.
2. Stephen H Khan: Metrics and Models in Software Quality Engineering, Pearson 2nd edition 2013.
3. S.A. Kelkar, “Software quality and Testing, PHI Learning, Pvt., Ltd., New Delhi 2012.
4. Watts S Humphrey, “Managing the Software Process”, Pearson Education Inc, 2008.
5. Mary Beth Chrissis, Mike Konrad and Sandy Shrum, “CMMI”, Pearson Education (Singapore) Pvt. Ltd., 2003
6. Philip B Crosby ”Quality is Free: The Art of Making Quality Certain“, Mass Market, 1992.

COURSE OUTCOMES:

At the end of the course, the students will be able to:

- Learn to apply software testing knowledge and engineering methods.
- Learn to design SQA activities, SQA strategy, formal technical review report for software quality control and assurance.
- Analyze and understand the use of software testing methods and modern software testing tools for their testing projects.
- Identify defects and manage those defects for improvement in quality for given Software.
- Acquire knowledge about S/W process improvements

Second Year

**ELECTIVE COURSE III
3. PARALLEL COMPUTING**

Semester III

Code:

(Theory)

Credit: 4

COURSE OBJECTIVES:

- To understand the technologies enabling parallel computing.
- To study the different types of interconnection networks.
- To study the different parallel programming models.

UNIT - I SCALABILITY AND CLUSTERING:

Evolution of Computer Architecture – Dimensions of Scalability – Parallel Computer Models – Basic Concepts Of Clustering – Scalable Design Principles – Parallel Programming Overview – Processes, Tasks and Threads – Parallelism Issues – Interaction / Communication Issues – Semantic Issues In Parallel Programs

UNIT – II ENABLING TECHNOLOGIES:

System Development Trends – Principles of Processor Design – Microprocessor Architecture Families – Hierarchical Memory Technology – Cache Coherence Protocols – Shared Memory Consistency – Distributed Cache Memory Architecture – Latency Tolerance Techniques – Multithreaded Latency Hiding.

UNIT – III SYSTEM INTERCONNECTS:

Basics of Interconnection Networks – Network Topologies and Properties – Buses, Crossbar and Multistage Switches, Software Multithreading – Synchronization Mechanisms.

UNIT – IV PARALLEL PROGRAMMING:

Paradigms And Programmability – Parallel Programming Models – Shared Memory Programming.

UNIT – V MESSAGE PASSING PROGRAMMING:

Message Passing Paradigm – Message Passing Interface – Parallel Virtual Machine.

UNIT – VI CURRENT CONTOURS (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Kai Hwang and Zhi. Wei Xu, “Scalable Parallel Computing”, Tata McGraw-Hill, New Delhi, 2003.
2. David E. Culler & Jaswinder Pal Singh, “Parallel Computing Architecture: A

- Hardware/Software Approach”, Morgan Kaufman Publishers, 1999.
3. Michael J. Quinn, “Parallel Programming in C with MPI & Open MP”, Tata McGraw-Hill, New Delhi, 2003.
 4. Kai Hwang, “Advanced Computer Architecture” Tata McGraw-Hill, New Delhi, 2003.
 5. https://www.tutorialspoint.com/parallel_computer_architecture/index.htm

COURSE OUTCOMES:

At the end of the course, the students will be able to:

1. Optimize sequential code for fastest possible execution.
2. Understand processor design.
3. Analyze sequential programs and determine if they are worthwhile to parallelize.
4. Understand the multi programming concepts.
5. Know the different forms of multiprocessor.

Second Year

**NON MAJOR ELECTIVE II
FUNDAMENTALS OF INTERNET
(Theory)**

Semester III

Code:

Credit: 2

COURSE OBJECTIVES:

- To understand the revolution in Internet Technology
- To know about various applications of Internet
- To learn the basic HTML tags

UNIT - I :

Fundamentals of Internet : Networking Concepts, Data Communication – Types of Networking, Internet and its Services, Internet Addressing – Internet Applications – Computer Viruses and its types – Browser –Types of Browsers.

UNIT - II:

Internet applications: Using Internet Explorer, Standard Internet Explorer Buttons, Entering a Web Site Address, Searching the Internet – Introduction to Social Networking: twitter, tumblr, LinkedIn, face book, flicker, Skype, yahoo, Google+, YouTube, WhatsApp, etc.

UNIT - III :

E-mail :Definition of E-mail - Advantages and Disadvantages – User-Ids, Passwords, Email Addresses, Domain Names, Mailers, Message Components, Message Composition, Mail Management.

UNIT - IV:

WWW- Web Applications, Web Terminologies, Web Browsers, URL – Components of URL, Searching WWW – Search Engines

UNIT - V:

Basic HTML: Basic HTML – Web Terminology – Structure of a HTML Document – HTML, Head and Body tags –Heading, Font, Image and Anchor Tags –Different types of Lists using tags – Table Tags, Image formats – Creation of simple HTML Documents.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCE BOOKS:

1. Fundamentals of the Internet and the World Wide Web, 2/e – by Raymond Greenlaw and Ellen Hepp, Publishers : TMH

2. Learning Internet & Email, 4th Revised Edition, Ramesh Bangia, Khanna Book Publishing Co Pvt Ltd.
3. Internet & Ecommerce, C. Nellai Kannan, NELS Publications.
4. <https://www.tutorialspoint.com/email>
5. <https://www.javatpoint.com/blog>

COURSE OUTCOMES:

At the end of the course, the students will be able:

- To acquire knowledge about Domain name system
- To understand Internet Applications
- To know the E-mail usages
- To know the different types of browsers
- To Gain the knowledge about basic HTML

COURSE OBJECTIVES:

- To understand the Software Project Planning and Evaluation techniques.
- To learn about the activity planning and risk management principles.
- To manage software projects and control software deliverables.

UNIT – I PROJECT EVALUATION AND PROJECT PLANNING:

Importance of Software Project Management – Activities – Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.

UNIT – II PROJECT LIFE CYCLE AND EFFORT ESTIMATION:

Software process and Process Models – Choice of Process models – Rapid Application development – Agile methods – Dynamic System Development Method – Extreme Programming– Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points – COCOMO II – a Parametric Productivity Model.

UNIT – III ACTIVITY PLANNING AND RISK MANAGEMENT:

Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Formulating Network Model – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Risk Planning –Risk Management – – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical paths – Cost schedules.

UNIT – IV PROJECT MANAGEMENT AND CONTROL:

Framework for Management and control – Collection of data – Visualizing progress – Cost monitoring – Earned Value Analysis – Prioritizing Monitoring – Project tracking – Change control – Software Configuration Management – Managing contracts – Contract Management.

UNIT – V STAFFING IN SOFTWARE PROJECTS:

Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham – Hackman job characteristic model – Stress – Health and Safety – Ethical and Professional concerns – Working in teams – Decision making – Organizational structures – Dispersed and Virtual teams – Communications genres – Communication plans – Leadership.

REFERENCES:

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.
2. Robert K. Wysocki –Effective Software Project Management – Wiley Publication, 2011.
3. Walker Royce: –Software Project Management- Addison-Wesley, 1998.
4. Gopalaswamy Ramesh, –Managing Global Software Projects – McGraw Hill Education (India), Fourteenth Reprint 2013.
5. https://www.tutorialspoint.com/management_concepts/project_management_processes.html
6. https://www.tutorialspoint.com/estimation_techniques/estimation_techniques_overview.htm
7. <https://www.javatpoint.com/software-engineering-personnel-planning>

COURSE OUTCOMES:

At the end of the course, the students should be able to:

- Understand Project Management principles while developing software.
- Gain extensive knowledge about the basic project management concepts, framework and the process models.
- Obtain adequate knowledge about software process models and software effort estimation techniques.
- Estimate the risks involved in various project activities.
- Define the checkpoints, project reporting structure, project progress and tracking mechanisms using project management principles.

Second Year

**CORE COURSE VIII
CLOUD COMPUTING
(Theory)**

Semester IV

Code:

Credit: 5

COURSE OBJECTIVES:

- To understand the broad perspective of cloud architecture and model.
- To be familiar with the lead players in cloud.
- To understand the concept of Virtualization and CRM

UNIT – I COMPUTING PARADIGMS:

High-performance computing, parallel computing, distributed computing, cluster computing, grid computing, cloud computing, bio-computing, mobile computing quantum computing, optical computing. Nano-computing.

UNIT – II CLOUD COMPUTING FUNDAMENTALS:

Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models.

UNIT – III CLOUD COMPUTING ARCHITECTURE AND MANAGEMENT:

Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications on the Cloud, Managing the Cloud, Managing the Cloud Infrastructure, Managing the Cloud application, Migrating, Application to Cloud, Phases of Cloud Migration Approaches for Cloud Migration

UNIT – IV CLOUD SERVICE MODELS:

Infrastructure as a Service, Characteristics of IaaS, Suitability of IaaS, Pros and Cons of IaaS, Summary of IaaS Providers, Platform as a Service, Characteristics of PaaS, Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers, Software as a Service, Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers. Other Cloud Service Models

UNIT – V CLOUD SERVICE PROVIDERS:

EMC, EMC IT, Captiva Cloud Toolkit, Google Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue ,Service, Microsoft Windows Azure, Microsoft Assessment and Planning Toolkit, SharePoint, IBM Cloud Models, IBM Smart Cloud, SAP Labs, SAP HANA Cloud Platform, Virtualization Services Provided by SAP, Sales force, Sales Cloud, Service Cloud: Knowledge as a Service, Rack space, VMware, Manjra soft Aneka Platform

UNIT – VI CURRENT CONTOURS (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Essentials of Cloud Computing: K. Chandrasekhran, CRC Press, 2015.
2. Cloud Computing: Principles and Paradigms by RajkumarBuyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
3. Rittinghouse and Ransome, Cloud Computing: Implementation, Management, and Security, CRC Press, 2016.
4. Michael Miller “Cloud Computing Web based application that change the way you work and collaborate online”. Pearson edition, 2002
5. Kris Jamsa, Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile, Security and More, Jones & Bartlett Learning, 2012.
6. Cloud Computing: Principles and Paradigms by RajkumarBuyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
7. <https://developer.ibm.com/articles/cl-cloudintro/>
8. <https://www.tutorialride.com/cloud-computing/service-models-in-cloud-computing.htm>
9. <https://www.geeksforgeeks.org/architecture-of-cloud-computing/>

COURSE OUTCOMES:

At the end of the course, the students will be able to:

- Compare the strengths and limitations of cloud computing.
- Identify the architecture, infrastructure and delivery models of cloud computing.
- Understanding the project management in the cloud environment.
- Understanding the cloud services.
- Analyze various cloud service models and apply them to solve problems on the cloud.

Second Year

**ENTREPRENEURSHIP /
INDUSTRY BASED COURSE
TECHNOLOGY INNOVATION AND
SUSTAINABLE ENTERPRISE**

Semester IV

Code:

(Theory)

Credit: 5

COURSE OBJECTIVES:

- Provide information, frameworks, and tools for identifying and pursuing sustainable business opportunities
- Inform students of the changing dynamics of nature-human interdependencies globally
- Examine examples of innovators implementing successful green strategies.

UNIT – I INNOVATION:

Need - Objectives of innovation - Technology innovation - its importance - Knowledge Management- need - Business strategies related to knowledge management - Knowledge Management Approaches-Transformation of an enterprise through Knowledge Management - Creating Knowledge Management System in Organization Establishing Knowledge Management through IT-Organizational culture for Knowledge Management - Future of Knowledge Management

UNIT – II TECHNOLOGY TRANSFER AND JOINT VENTURES:

Policy, Procedure & Practices-India's Technology base and Capabilities-Preference of Indian Technology-major Constraints and problems- Operational constraints-Problems in Indian Business Environment Problems in Finalization of Agreement-Major Problems in Technology transfer Collaboration Agreements, R& D, Import Substitution, Scaling, Diagrams- Patterns and Intellectual Property rights.

UNIT – III WEB MARKETING:

Meaning- Benefits of Web Marketing-Myths and Facts in Web Marketing Web Psychology: Understanding the Internet mind- The Internet and the Law: Copyright, Censorship, Privacy, Jurisdiction- Do's and Don'ts on Web

UNIT – IV WEB MARKETING STRATEGIES:

Choosing the strategy- Online store fronts -Target Marketing Attracting Customers- Web Advertising - E-Mail Marketing-Instant market research - Securities Issues

UNIT – V ENTERPRISE RESOURCE PLANNING:

The E- Business backbone -Meaning- ERP decision Enterprise Architecture Planning- ERP Implementation- The Future of ERP Applications- Procurement-Business Blueprint Planning.

UNIT – VI CURRENT CONTOURS (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Knowledge Management for Competitive advantage-Harish chandra Chaudharaty, Excel Books Publications, New Delhi
2. Technology Transfer and Joint Ventures Abroad-R.R.Azad, Deep& deep Publications, New Delhi
3. Web Advertising and marketing thomas J Kuegler,Jr. #rd Edition-Prentice-Hall of India, New Delhi
4. e-Business Roadmap for Success- Dr.ravi Kalakota- Perason Education
5. "Frontiers of Electronic Commerce", Ravi Kalakota, Andrew B. Whinston, Addition -Wesley, 2000
6. The Lean Startup by Eric Ries,Publisher : Eric Ries, 2017
Start Up India :
7. <http://www.startupindia.gov.in/pdf/file.php?id=117&title=Startup%20India%20Action%20Planandtype=Actionandq=Action%20Plan.pdfandcontenttype=Actionandsubmenupoint=action>
About – Entrepreneurship Development Institute of India (EDII) :
8. <http://www.ediindia.org/institute.html>
EDII – Centres :
9. <http://www.ediindia.org/centres.html>
The National Institute for Entrepreneurship and Small Business Development
Publications:
10. <http://niesbud.nic.in/Publication.html>

COURSE OUTCOMES:

At the end of the course, the students will be able to:

- Identify entrepreneurial traits.
- Develop comprehensive business plans.
- Prepare plans to manage the enterprise effectively.
- Acquire knowledge about Web Marketing
- Understand ERP techniques

Code:

Credit: 5

Each candidate shall be required to take up a Project Work and submit it at the end of the final year. The Head of the Department shall assign the Guide who, in turn, will suggest the Project Work to the student in the beginning of the final year. A copy of the Project Report will be submitted to the University through the Head of the Department on or before the date fixed by the University.

The Project will be evaluated by an internal and an external examiner nominated by the University. The candidate concerned will have to defend his/her Project through a Viva-voce.

ASSESSMENT / EVALUATION / VIVA-VOCE:**1. PROJECT REPORT EVALUATION (Both Internal & External):**

- | | |
|--|------------|
| I. Plan of the Project | - 20 marks |
| II. Execution of the Plan/collection of Data / Organisation of Materials / Hypothesis, Testing etc and presentation of the report. | - 45 marks |
| III. Individual initiative | - 15 marks |

2. VIVA-VOCE / INTERNAL& EXTERNAL - 20 marks**TOTAL** - 100 marks**PASSING MINIMUM:**

Project	Vivo-Voce 20 Marks 40% out of 20 Marks (i.e. 8 Marks)	Dissertation 80 Marks 40% out of 80 marks (i.e. 32 marks)
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A candidate shall be declared to have passed in the Project work if he/she gets not less than 40% in each of the Project Report and Viva-voce but not less than 50% in the aggregate of both the marks for Project Report and Viva-voce.

A candidate who gets less than 40% in the Project must resubmit the Project Report. Such candidates need to defend the resubmitted Project at the Viva-voce within a month. A maximum of 2 chances will be given to the candidate.

Second Year

**VALUE ADDED COURSE II
CYBER SECURITY FUNDAMENTALS**

Semester IV

Code:

(Theory)

Credit: 5

COURSE OBJECTIVES:

- To understand the Basic Concepts in Cyber Security
- To know about Classification of Cyber Security
- To understand the Present and Future Cyber Security

UNIT – I INTRODUCTION TO CYBER CRIME:

Types of Cyber Crime – Classification of Cyber Criminals – Tools used in Cyber Crime – Challenges – Strategies – Cryptocurrency – Bitcoin – Blockchain - Ransomware.

UNIT – II CYBER FORENSICS DEFINITION:

Disk Forensics – Network Forensics – Wireless Forensics – Database Forensics – Malware Forensics – Mobile Forensics – Email Forensics.

UNIT – III ETHICAL HACKING:

Essential Terminology, Hacking windows – Network hacking – Web hacking – Password hacking, Malware, Scanning, Cracking.

UNIT – IV DIGITAL EVIDENCE IN CRIMINAL INVESTIGATIONS:

The Analog and Digital World, Training and Education in digital evidence, Evidence Collection and Data Seizure: Why Collect Evidence, Collection Options Obstacles, Types of Evidence, The Rules of Evidence, Volatile Evidence

UNIT – V INTRUSION:

Physical Theft, Abuse of Privileges, Unauthorized Access by Outsider, Malware infection, Intrusion detection and Prevention Techniques, Anti-Malware software, Network based Intrusion detection Systems, Network based Intrusion Prevention Systems, Host based Intrusion prevention Systems

UNIT – VI CURRENT CONTOURS (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCES:

1. Deje, Dr. Murugan, “Cyber Forensics”, Oxford University Press, India, 2018.
2. William Stallings and Lawrie Brown, “Computer Security: Principles and Practice”, Prentice Hall.
3. Swiderski, Frank and Syndex, “Threat Modeling”, Microsoft Press.
4. John W. Rittinghouse, William M. Hancock, “Cyber Security Operations Handbook”, Elsevier Pub.

5. Deborah G Johnson, "Computer Ethics", 4th Edition, Pearson Education Publication.
6. Earnest A. Kallman, J.P Grillo, "Ethical Decision making and IT: An Introduction with Cases", McGraw Hill Publication.
7. <https://www.w3schools.com/cybersecurity/index.php>
8. <https://intellipaat.com/blog/tutorial/ethical-hacking-cyber-security-tutorial/>

COURSE OUTCOMES:

At the end of the course, the students will be able to:

- To acquire knowledge about Cyber Crimes
- To understand Cyber Forensics
- To know the latest trends in Ethical Hacking
- To understand the fundamentals of computer forensics, Evidence Collection Etc.
- To Gain the knowledge about Web Hacking.
