Department of Computer Science

RATHINAM COLLEGE OF ARTS AND SCIENCE

(AUTONOMOUS)

RATHINAM TECHZONE CAMPUS, POLLACHI ROAD, EACHANARI, COIMBATORE – 21.

Syllabus for

B.Sc. Artificial Intelligence and Machine Learning

(I, II, III, IV, V & VI Semester)

2021-2022 Batch onwards

Vision and Mission of the Institution:

VISION

To emerge as a world renowned Institution that is integrated with Industry to impart Knowledge, Skills, Research Culture and Values in youth who can accelerate the overall development of India.

MISSION

To impart superior quality education at affordable cost, nurture academic and research excellence, maintain eco-friendly and future-ready infrastructure, and create a team of well qualified teaching professionals who can build global competency and employability.

Vision and Mission of the Department:

VISION

To be renowned itself as a reputed organization in education and research aimed towards industrial and societal needs.

MISSION

To provide quality education to meet the need of the profession and society. Establish Industry Institute Interaction program to enhance entrepreneurship skills.

Program Educational Objectives (PEO)

The B.Sc. Artificial Intelligence and Machine Learning program describe accomplishments that graduates are expected to attain within five to seven years after graduation

PEO1	:	Expertise with the principles of Artificial Intelligence and problem solving, inference, perception, knowledge representation, and learning
PEO2	:	Exhibit high standards with regard to application of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models
PEO3	:	Investigate with a machine learning model for simulation and analysis and explore the scope, potential, limitations, and implications of intelligent systems.

Programme Specific Outcomes (PSOs)

After the successful completion of B.Sc. Artificial Intelligence and Machine Learningprogram the students are expected to

PSO1	:	Exhibit good domain knowledge and completes the assigned responsibilities effectively and efficiently in par with the expected quality standards for Artificial Intelligence and Machine Learning professional
PSO2	:	Apply the technical and critical thinking skills in the discipline of artificial intelligence and machine learning to find solutions for complex problems.
PSO3	:	Design and develop research-based solutions for complex problems in artificial intelligence and machine learning industry through appropriate consideration for the public health, safety, cultural, societal, and environmental concerns.
PSO4	:	Establish the ability to Listen, read, proficiently communicate and articulate complex ideas with respect to the needs and abilities of diverse audiences.
PSO5	:	Provide innovative ideas to instigate new business ventures in the hospitality industry

Mapping of Institute Mission to PEO

Institute Mission	PEO's
To impart superior quality education at affordable cost, nurture academic and research excellence, maintain eco-friendly and future-ready infrastructure, and create a team of well qualified teaching professionals who can build global competency and employability.	PEO1, PEO2, PEO3

Mapping of Department Mission to PEO

Department Mission	PEO's
To provide quality education to meet the need of the profession and society. Establish Industry Institute Interaction program to enhance entrepreneurship skills.	PEO1, PEO2, PEO3

Program Outcomes (PO):

On successful completion of the B.Sc. Artificial Intelligence and Machine Learning

PO1	:	Exhibit good domain knowledge and completes the assigned responsibilities effectively and efficiently in par with the expected quality standards.
PO2	:	Apply analytical and critical thinking to identify, formulate, analyze, and solve complex problems in order to reach authenticated conclusions
PO3	:	Design and develop research based solutions for complex problems with specified needs through appropriate consideration for the public health, safety, cultural, societal, and environmental concerns.
PO4	:	Establish the ability to Listen, read, proficiently communicate and articulate complex ideas with respect to the needs and abilities of diverse audiences.
PO5	:	Deliver innovative ideas to instigate new business ventures and possess the qualities of a good entrepreneur
PO6	:	Acquire the qualities of a good leader and engage in efficient decision making.
PO7	:	Graduates will be able to undertake any responsibility as an individual/member of multidisciplinary teams and have an understanding of team leadership
PO8	:	Demonstrate knowledge and understanding of management principles and apply these to one own work to manage projects and in multidisciplinary environment.

Components considered for Course Delivery is listed below:

1. Class room Lecture
2. Laboratory class and demo
3. Assignments
4. Mini Project
5. Project
6. Online Course
7. External Participation
8. Seminar
9. Internship

RATHINAM COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

Scheme of curriculum for B.Sc. Artificial Intelligence and Machine Learning

for the students admitted in the Batch during 2020 - 2021

Board of Studies – Computer Science (UG)

S.No.	Sem	Part	Sub Type	Sub Code	Subject	Credit	Hours	INT	EXT	Total
1	1	1	L1		Language – I	4	4	50	50	100
2	1	2	L2		English for Communication – I	4	4	50	50	100
3	1	3	Core		Core - I – Problem Solving techniques using C	4	4	50	50	100
4	1	3	Core Practical		Core - I Practical - C Programming Lab	2	4	20	30	50
5	1	3	DSC	DSC	DSC 1	4	4	50	50	100
6	1	3	DSC Practical		DSC Practical - 1	2	4	20	30	50
7	1	3	Allied-I	DSA	DSA 1A	4	4	50	50	100
8	1	4	AEC		Ability Enhancement Course I	2	2	50		50
9	1	6	VAC		Value Added Course - I%	2	-	50		50
						28	**30**			
1	2	1	L1		Language – II	4	4	50	50	100
2	2	2	L2		English for Communication – II	4	4	50	50	100
3	2	3	Core		Core - II – Python Programming	4	4	50	50	100

4	2	3	Core Practical		Core Practical II - Python Programming Lab	2	4	20	30	50
5	2	3	DSC	DSC	DSC 2C	4	4	50	50	100
6	2	3	DSC Practical		DSC Practical - 2C	2	4	20	30	50
7	2	3	Allied-II	DSA	DSA 2A	4	4	50	50	100
8	2	4	AEC		Ability Enhancement Course II	2	2	50		50
9	2	6	VAC		Value Added Course - II %	2	-	50		50
						28	**30**			
1	3	3	Core		Core III – Java Programming	4	5	50	50	100
2	3	3	Core Practical		Core Practical III - Java Programming Lab	2	4	20	30	50
3	3	3	DSC		DSC 3C	4	5	50	50	100
4	3	3	DSC Practical		DSC Practical - 3C	2	4	20	30	50
5	3	3	Allied-III	DSA	DSA 3A	4	5	50	50	100
6	3	4	SEC	SEC-I	Skill Enhancement Courses – I	2	5	20	30	50
7	3	4	AEC		Ability Enhancement Course III	2	2	50		50
8	3	6	VAC		Value Added Course - III %	2	-	50		50
9	3	6	IDL		Inter Department Learning – I#	2	-	50		50
						24	**30**			
1	4	3	Core		Core IV – Natural	4	5	50	50	100

					Language Processing					
2	4	3	Core Practical		Core Practical IV - Natural Language Processing Lab	2	4	20	30	50
3	4	3	DSC	DSC	DSC 4C	4	5	50	50	100
4	4	3	DSC Practical		DSC Practical - 4C	2	4	20	30	50
5	4	3	Allied-IV	DSA	DSA 4A	4	5	50	50	100
6	4	4	SEC	SEC-II	Skill Enhancement Courses – II	2	5	20	30	50
7	4	4	AEC		Ability Enhancement Course IV	2	2	50		50
8	4	6	VAC		Value Added Course - IV %	2	-	50		50
9	4	6	IDL		Inter Department Learning – II#	2	-	50		50
						24	**30**			
1	5	3	Core		Core V - Machine Learning techniques	4	4	50	50	100
2	5	3	Core Practical		Core Practical V - Machine Learning Lab	2	4	20	30	50
3	5	3	DSC	DSC	DSC 5C	4	4	50	50	100
4	5	3	DSC Practical		DSC Practical - 5C	2	4	20	30	50
5	5	3	DSE	DSE – I	Elective - I – DSE 1E	4	5	50	50	100
6	5	3	DSE	DSE - II	Elective - II – DSE 2E	4	5	50	50	100
7	5	4	SEC	SEC-III	Skill Enhancement Courses – III	2	4	20	30	50

8	5	6	VAC		Value Added Course - V%	2	-	50		50
						24	**30**			
1	6	3	Core		Core VI – Big Data Analytics	4	6	50	50	100
2	6	3	Core Practical		Core Practical VI – Big Data Analytics using SCALA Lab	2	4	20	30	50
3	6	3	DSE	DSE – III	Elective – III – DSE 3E	4	6	40	60	100
4	6	3	DSE	DSE – IV	Elective – IV – DSE 4E	4	6	50	50	100
5	6	3	Core Course - XI	DSC	Core Project	8	4	80	120	200
6	6	4	SEC	SEC-IV	Skill Enhancement Courses – IV	2	4	20	30	50
7	6	5	EX		Extension Activity- EX %	2	-	50		50
						26	**30**	**1900**	**1950**	**3850**
					Total credit	**154**				

Note :

@ - No End Semester Examination, only Internal Exam.

- No Internal Examination, only End Semester Exam.

Discipline Specific Core					
S.No	**Course Code**	**Course**	**Pre-request**	**Offering Department**	**Mandatory**
1		Data Structures	-	Computer Science	Yes
2		Operating System	-	Computer Application	Yes
3		Deep Learning	-	BCA	
4		Artificial Intelligence and Knowledge Representation	-		Yes
5		Software Engineering	-		
6		Data Mining and warehouse	-		

7		Ethical Hacking	-	Computer Science	Yes
8		Robotic Process Automation	-		Yes
9		Data Structures Lab	DSC 1C S.NO1	Computer Science	
10		Operating System Lab	DSC 1C S.NO2	Computer Application	
11		Data Mining and warehouse Lab	DSC 1C S.NO3	BCA	
12		Artificial Intelligence Lab	DSC 1C S.NO4		
13		Software Engineering Lab	DSC 1C S.NO5		
		Data Mining Lab	DSC 1C S.NO6		
16		Ethical Hacking Lab	DSC 1C S.NO8	Computer Science	
17		Robotic Process Automation Lab	DSC 1C S.NO9		
18		Professional Skills Lab			

Allied

S.No	Course Code	Course	Pre-request	Offering Department	Mandatory
1		Mathematics for Computer Science	-	Maths	
2		Statistics of computer science	-	Maths	Yes
3		Entrepreneurial Development	-	Commerce	
4		Bayesian statistics	-	Maths	Yes

Skill Based Subject

S.No	Course Code	Course	Pre-request	Offering Department	Mandatory
1		Linux & Shell Programming	-	Computer Science	
2		Predictive analysis of R Programming	-	Computer Technology	Yes
3		Internet Of Things	-	Information Technology	Yes
4		Information Security & Cyber Law	-	Computer Science	Yes
5		Wireless sensor network	-	Information Technology	
6		Signal Processing	-	Computer Science	

7		Programming with scala	-	Information Technology	
8		Capstone Project Work (Based on AI & Machine Learning)		Information Technology	
Discipline Specific Elective					
S.No	**Course Code**	**Course**	**Pre-request**	**Offering Department**	**Mandatory**
1		Business Data Analytics	-	-	
2		Social Network Analysis	-	-	
3		Software Agents	-	-	
4		Artificial Neural Networks and Fuzzy System	-	-	
5		Web Application Security	-	-	
6		Embedded Systems	-	-	
7		Principles of Secure Coding	-	-	
8		Open source software	-	-	
Ability Enhancement Course					
S.No	**Course Code**	**Course**	**Pre-request**	**Offering Department**	**Mandatory**
1		Environmental Studies	-	General	Yes
2		Women Studies	-	Commerce II	
3		Constitution of India	-	Commerce I	
4		Human Rights	-	General	Yes
5		Yoga	-	Tamil	
6		NCC	-	Viscom	
7		Communicative English	-	English	
8		Quantitative Apptitude	-	Mathematics	

Value Added Course					
S.No	**Course Code**	**Course**	**Pre-request**	**Offering Department**	**Mandatory**
1		Fundamental of Office Automation	-		Yes
2		Advance Excel	-		
3		Fundamental of Multimedia -I	-		
4		Fundamental of Multimedia -II	-		Yes
5		Video Editing	-		
6		Fundamental of Visual Effects	-		

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Core - I - Problem Solving techniques using C	**4**	**6**	**0**	**0**	**Theory**

Introduction :

This subject covers in detail all aspects of the C language, including its foundation: C. To provide a plat form for the students in C programming.

Course Outcome:

CO1 : Demonstrate the flowchart and design an algorithm for a given problem and to develop C programs using operators

CO2 : Develop conditional and iterative statements to write C programs

CO3 : Exercise user defined functions to solve real time problems

CO4 : Inscribe C programs that use Pointers to access arrays, strings and functions.

CO5 : Exercise user defined data types including structures and unions to solve problem

Unit I **[12 periods]**

Overview of computers and Programming - Computers Hardware - Computer Software - The Software development Method - Applying the software development method - Professional Ethics for Computer Programmers - C Language Elements - Variable Declarations and Data Types - General form of a C Program - Arithmetic Expressions - Common Programming Errors.

Unit II **[12 periods]**

Building Programs from Existing information - Library Functions - Top-Down Design and Structure charts - Functions without Arguments - Functions with Input Arguments - Control Structures - Conditions - The if Statement - If statements with Compound Statements - Nested if statements and Multiple-Alternative decisions- The Switch Statement - Counting Loops and the While statement - Computing a sum or a product in a loop - The For statement - Conditional Loops - Loop Design - Nested Loops - the do-while statement and flag-controlled loops .

Unit III : **[12 periods]**

Pointers and the Indirection Operator - functions with output parameters - Multiple calls to function with Input / Output parameters - Arrays - Declaring and Referencing Arrays - Array subscripts - Using array elements as function arguments- Array arguments - Searching and sorting an Array - Multidimensional Arrays - Strings - String Basics - String Library functions - String Comparison - Arrays of pointers .

Unit IV: **[12 periods]**

Recursion - Problem solving with recursion - CPE - Structure and Union types : User-defined Structure types - Structure type data as input and output parameters - Functions whose result values are structured - Problem solving with structure types - Parallel arrays and Arrays of structures - Union Types.

Unit V: **[12 periods]**

Text and Binary File Processing - Input/Output files:Review and Further Study - Binary Files - Searching a Database - CPE - Using Abstraction to Manage Complexity - Header files - implementation files - Conditional compilation - Defining Macros with parameters.

Text books:

1. Problem Solving and Program Design in C, Jeri R. Hanly and Elliot B. Koffman, Pearson Publication, Seventh Edition, 2012.

Reference Books :

1. Ansi C, E Balagurusamy, Fifth Edition, 2008
2. L.Kathirvelkumaran and R. Muralidharan , "Basic Concepts in C Programming",Coimbatore Institute of Information Technology ,First Edition 2016.
3. Let Us C, Fifth Edition, Yashavant P. Kanetkar, 2004

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	H	L	L	L	L	L	L	L
CO2	L	L	L	L	L	H	L	L
CO3	M	L	L	L	L	L	L	L
CO4	H	M	L	L	L	L	L	L
CO5	H	L	L	L	H	M	H	L

H - High ; M- Medium ; L- Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Core - Practical - I – Programming in C Lab	**4**			**5**	**Practical**

Course Outcome:

CO1 : Understand basic Structure of the C-PROGRAMMING, declaration and usage of variables

CO2 : Understand C programs using operators

CO3 : Exercise conditional and iterative statements to Write C programs

CO4 : Understand for C programs using Pointers to access arrays, strings and functions

CO5 : Understand C programs using pointers and allocate memory using dynamic memory management functions.

1. Write a program for find the max and min from the three numbers.
2. Write the program for the simple, compound interest.
3. Write program for students marks grading.
4. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)
5. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.
6. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
7. Write a C program to find the roots of a Quadratic equation.
8. Write a C program that uses functions to perform the following:
   a) Addition of Two Matrices b) Subtraction of Two Matrices.
9. Write a C program to determine if the given string is a palindrome or not using pointer.

10. Write a C program to count the lines, words and characters in a given text.

11. Write a C program which copies one file to another.

12. Write a C program to reverse the first n characters in a file. (Note: The file name and n are specified on the command line.)

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	H	L	L	L	L	L	L	L
CO2	L	L	L	L	L	H	L	L
CO3	M	L	L	L	L	L	L	L
CO4	H	M	L	L	L	L	L	L
CO5	H	L	L	L	H	M	H	L

H - High ; M- Medium ; L- Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Python Programming	4	5	0	0	Theory

Introduction : After learning the Syntax and Semantics and create Functions, Handle Strings and Files, Understand Lists, Dictionaries and Regular expressions, Implement Object Oriented Programming concepts, Build Web Services and introduction to Network and Database Programming students are able to develop rich dynamic websites in Python.

Course Outcome:

CO1 : Examine Python syntax and semantics and be fluent in the use of Python flow control and functions

CO2 : Demonstrate proficiency in handling Strings and File Systems

CO3 : Understand Lists, Dictionaries and Regular expressions in Python

CO4 : Interpret the concepts of Object-Oriented Programming as used in Python

CO5 : Implement exemplary applications related to Network Programming, Web Services and Databases in Python

Unit I: [12 periods]

Installing Python, Simple program using Python, Expressions and Values, Variables and Computer Memory, error detection, Multiple line statements, Designing and using functions, functions provided by Python, Tracing function calls in memory model, omitting return statement. Working with Text: Creating Strings of Characters, Using Special Characters in Strings, Creating a Multiline String, Printing Information, Getting Information from the Keyboard.

Unit II : [12 periods]

A Boolean Type , Choosing Statements to Execute, Nested If Statements , Remembering the Results of a Boolean Expression Evaluation , A Modular Approach to Program Organization, Importing Modules , Defining Your Own Modules, Testing Code Semi automatically Grouping

Functions Using Methods: Modules, Classes, and Methods , Calling Methods the Object-Oriented Way, Exploring String Methods, Underscores.

Unit III: [12 periods]

Storing Collections of Data Using Lists: Storing and Accessing Data in Lists, modifying Lists, Operations on Lists, Slicing Lists, Aliasing, List Methods, Working with a List of Lists. Repeating Code Using Loops: Processing Items in a List, Processing Characters in Strings, Looping Over a Range of Numbers, Processing Lists Using Indices, Nesting Loops in Loops, Looping Until a Condition Is Reached, Repetition Based on User Input, Controlling Loops Using Break and Continue Reading and Writing.

Unit IV: [12 periods]

Files: Kinds of files, Opening a File, Techniques for Reading Files, Files over the Internet, Writing Files, and Writing Algorithms That Use the File-Reading Techniques, Multiline Records. Storing Data Using Other Collection Types: Storing Data Using Sets, Storing Data Using Tuples, Storing Data Using Dictionaries, Inverting a Dictionary, Using the In Operator on Tuples, Sets, and Dictionaries, Comparing Collections.

Unit V: [12 periods]

Collection of New Information Object-Oriented Programming : Understanding a Problem Domain , Function “Isinstance,” Class Object, and Class Book , Writing a Method in Class Book, Plugging into Python Syntax: More Special Methods, Creating Graphical User interface: Building a Basic GUI, Models, Views, and Controllers, Customizing the Visual Style Introducing few more Widgets, Object-Oriented GUIs, Keeping the Concepts from Being a GUI Mess.

Text Books:

1. L. Halterman, “Fundamentals of Python Programming”, Southern Adventist University July 26, 2018, Copyright © 2017 Richard L. Halterman Richard.
2. John V Guttag, —Introduction to Computation and Programming Using Python‘‘, Revised and expanded Edition, MIT Press , 2013

Reference Books

1. Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
2. Timothy A. Budd, —Exploring Python , Mc-Graw Hill Education (India) Private Ltd.,, 2015.
3. Kenneth A. Lambert, —Fundamentals of Python: First Programs , CENGAGE Learning, 2012.
4
4. Charles Dierbach, Introduction to Computer Science using Python: A Computational

Problem Solving Focus, Wiley India Edition, 2013.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	L	H	L	L	L	L	L	L
CO2	M	M	L	L	L	L	L	L
CO3	L	L	L	L	L	L	L	L
CO4	M	H	M	L	L	L	L	L
CO5	L	L	L	L	L	L	M	H

H - High ; M- Medium ; L- Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Python Programming Lab	2	0	0	4	Practical

Introduction: Understand the basic operations and creations of various applications using python.

Course Outcome:

CO1 : Write, test, and debug simple Python programs.

CO2 : Implement Python programs with conditionals and loops for stack, sorting algorithms.

CO3 : Read and write data from/to files in Python.

CO4 : Use Python lists, dictionaries for representing compound data.

CO5 : Write Script to SQL and Demonstrate Exception in Python.

Lab Experiments:

1. Create a calculator program using Python.
2. Create Python program using different String functions.
3. Implement Selection sort algorithm using Python Program.
4. Implement stack Operation using Python Program.
5. Read and Write into a file using Python Program.
6. Demonstrate use of Dictionaries in Python Program.
7. Create Comma Separate Files (CSV), Load CSV files into internal Data Structure.
8. Write script to work like a SQL SELECT statement for internal Data Structure made in earlier exercise.

9. Write script to work like a SQL Inner Join for an internal Data Structure made in earlier exercise.
10. Demonstrate Exceptions in Python.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	L	H	H	L	L	L	L	L
CO2	M	H	L	L	L	L	M	L
CO3	L	L	L	L	L	L	L	H
CO4	M	H	M	L	L	L	L	L
CO5	L	H	H	H	L	H	L	M

H - High ; M- Medium ; L- Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Java Programming	**4**	**4**	**0**		**Core**

Introduction: This course presents a conceptual and practical introduction to imperative and object oriented programming, exemplified by Java.

Course Outcome:

CO1 : Define the concept of OOP as well as the purpose and usage principles of inheritance, polymorphism, encapsulation and method overloading.

CO2 : Identify the situations of Program Control Statements, Introducing Classes, Objects and Methods of their usages.

CO3 : Identify String Handling , Arrays, classes, objects, members of a class and the relationships among them needed for a specific problem.

CO4 : OOP concepts like inheritance, Interface & package in real time situations.

CO5 : Develop Java application programs using sound OOP practices (e.g., interfaces and APIs) and proper program structuring (e.g., by using access applet, multithreading)K3

Unit I: **[12 periods]**

Java Programming Fundamentals: The Java Language, the Key Attributes of Object-Oriented Programming, the Java Development Kit, a First Simple Program, Handling Syntax Errors, the Java Keywords, Identifies in Java, the Java Class Libraries Introducing. Data Types and Operators: Java's Primitive Types, Literals, A Closer Look at Variables, The Scope and Lifetime of Variables, operators, Shorthand Assignments, Type conversion in Assignments, Using Cast, Operator Precedence, Expressions.

Unit II : **[12 periods]**

Program Control Statements: Input characters from the Keyword, if statement, Nested ifs, if-else-if Ladder, Switch Statement, Nested switch statements, for Loop, Enhanced for Loop, While Loop, do-while Loop, Use break, Use continue, Nested Loops. Introducing Classes, Objects and Methods: Class Fundamentals -Objects - Reference Variables and Assignment, Methods, Returning from a Method, Returning Value, Using Parameters, Constructors, constructor types, The new operator Revisited, Garbage Collection and Finalizers, The this Keyword.

Unit III : **[12 periods]**

More Data Types and Operators: Arrays, Multidimensional Arrays, Alternative Array Declaration Syntax, Assigning Array References, Using the Length Member, The Bitwise operators. String Handling: String Fundamentals, The String Constructors, Three String-Related Language Features, String Buffer and String Builder. A Closer Look at Methods and Classes: Controlling Access to Class Members, Pass Objects to Methods, How Arguments are passed,

Returning Objects, Method Overloading, Overloading Constructors, Recursion, Understanding Static, Introducing Nested and Inner Classes, Var args: Variable-Length Arguments.

Unit IV: **[12 periods]**

Inheritance: Inheritance Basics, Member Access and Inheritance, Constructors and Inheritance, Method Overriding, Overridden Methods support polymorphism, Why Overridden Methods, Using Abstract Classes, Using final keyword. Interfaces: Fundamentals, Creating, Implementing, References, Implementing Multiple Interfaces, Constants, Interface extended, Nested Interfaces. Packages: Fundamentals, Packages and Member Access, Importing Packages, Static Import. Exception Handling: Hierarchy, Fundamentals, Uncaught Exception, Multiple catch clauses, try blocks, throwing an Exception, finally, throws, Java's Built-in Exceptions.

Unit V: **[12 periods]**

Multithreaded Programming: fundamentals, thread creation types, Multiple Threads, Thread Priorities, Synchronization, using Synchronization Methods. Enumerations, Auto boxing and Annotations: Enumerations, Java Enumeration are class types, Auto boxing, Annotations (metadata) Generics: Generics Fundamentals Bounded Types, Methods, Constructors, Some Generic Restrictions. Applets: basics - Skeleton, life cycle of applet – applet methods - Passing parameters to Applets.

Textbook:

1. Herbert Schildt, Java The Complete Reference, 11th Edition, Copyright © 2019 by McGraw-Hill Education (Publisher).

Reference :

1. Mahesh Bhave and Sunil Patekar, "Programming with Java", First Edition, Pearson Education,2008, ISBN:9788131720806.
2. Rajkumar Buyya,S Thamarasi selvi, xingchen chu, Object oriented Programming with java, Tata McGraw Hill education private limited.
3. E Balagurusamy, Programming with Java A primer, Tata McGraw Hill companies.
4. Anita Seth and B L Juneja, JAVA One step Ahead, Oxford University Press, 2017.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	L	H	H	L	L	L	L	L
CO2	M	H	L	L	L	L	M	L
CO3	L	L	L	L	L	L	L	H
CO4	M	H	M	L	L	L	L	L
CO5	L	H	H	H	L	H	L	M

H - High ; M- Medium ; L- Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Java Programming lab	**2**	**4**	**0**		**Practical**

Course Outcome:

CO1 : Execute JAVA programs based on simple constructs like arrays, loops , decision statements, functions etc

CO2 : Incorporate object oriented concepts like classes, objects, inheritance, polymorphism resembling real time situation.

CO3 : Demonstrate the use of packages and interfaces

CO4 : Develop OOP programs containing User created Exception handling & Threading.

CO5 : Familiarize with Java development Environment such as Eclipse, NetBeans etc. Suggestive list of programs.

List of Experiments:

1. To find the sum of any number of integers entered as command line arguments

2. To learn use of single dimensional array by defining the array dynamically.

3. To check if a number is prime or not, by taking the number as input from the keyboard

4. To find the sum of any number of integers interactively, i.e., entering every number from the keyboard, whereas the total number of integers is given as a command line argument

5. Write a program that show working of different functions of String and StringBufferclasss like setCharAt(, setLength(), append(), insert(), concat()and equals().

6. Write a program to show that during function overloading, if no matching argument is found, then java will apply automatic type conversions(from lower to higher data type)

7. Write a program to show the difference between public and private access specifiers. The program should also show that primitive data types are passed by value and objects are passed by reference and to learn use of final keyword

8. Write a program to demonstrate the concept of boxing and un-boxing.

9. Create a multi-file program where in one file a string message is taken as input from the user

10. Write a program to create a multilevel package and also creates a reusable class to generate Fibonacci series, where the function to generate Fibonacci series is given in a different file belonging to the same package.

11. Write a program that creates illustrates different levels of protection in classes/subclasses belonging to same package or different packages

12. Write a program DivideByZero that takes two numbers a and b as input, computes a/b, and invokes Arithmetic Exception to generate a message when the denominator is zero.

13. Write a program to demonstrate priorities among multiple threads.

14. Write a program to generate a window without an applet window using main() function.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	**Program Outcomes**							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	L	H	H	L	L	L	L	L
CO2	M	H	L	L	L	L	M	L
CO3	L	L	L	L	L	L	L	H
CO4	M	H	M	L	L	L	L	L
CO5	L	H	H	H	L	H	L	M

H - High ; M- Medium ; L- Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Core - Natural Language Processing	**4**	**6**	**0**	**0**	**Theory**

Introduction :

To introduce the fundamental concepts and techniques of natural language processing (NLP)

Course Outcome:

CO1 : Understand the fundamental concepts and techniques of natural language processing (NLP)

CO2 : Understanding of the models and algorithms in the field of NLP

CO3 : Demonstrate the computational properties of natural languages and the commonly used algorithms for processing linguistic information.

CO4 : Understanding semantics and pragmatics of languages for processing.

Unit I : Introduction to NLP [12 periods]

Introduction: application of NLP techniques and key issues- MT grammar checkers- dictation – document generation- NL interfaces- Natural language processing key issues- the different analysis level used for NLP: morpho-lexical-syntactic-semantic-pragmatic-markup(TEI, UNICODE)-finite state automata- Recursive and augmented transition networks- open problems.

Unit II : Lexical Level [12 periods]

Lexical level: error tolerant lexical processing(spelling error correction)-transducers for the design of morphologic analyzers features-towards syntax: part-of-speech tagging(BRILL,HMM)- efficient representations for linguistic resources(lexica, grammars,….) tries and finite state automata.

Unit III : Syntactic Level [12 periods]

Syntactic level: grammars(eg.formal/Chomsky hierarchy, DCSGs, systematic case, unification, stochastic)- parsing (top-down ,bottom up, char(early algorithm),CYK algorithm)- automated estimation of probabilistic model parameters(inside-outside algorithm)- data oriented parsing grammar formalisms and tree banks- efficient patsing for context-free grammars(CFGs)-statistical parsing and probabilistic CFGs(PCFGs)-lexicilizedPCFGse.

Unit IV: Semantic Level [12 periods]

Semantic level: logical forms- ambiguity resolution- semantic network and parsers- procedural semantics- montague semantics- vector space approaches- distributional semantics-lexical semantics and word sense disambiguation-compositional semantics semantic role labeling and semantic parsing.

Unit V: Pragmatic Level [12 periods]

Pragmatic level: knowledge representation- reasoning- plan/goal recognition –speech acts/intentions – belief models- discourse- reference. Natural language generation :content determination – sentence planning- surface realization, subjectivity and sentiment analysis: information extraction – automatic summarization- information retrieval and question answering – named entity recognition and relation extraction – IE using sequence labeling- machine translation: basic issues in MT statistical translation-word alignment- phrase-based translation and synchronous grammars.

Text books:

1. Daniel J and James H. Martin, speech and language processing an introduction to natural language processing, computational linguistcs& speech recognitio prentice hall,2009.

Reference Books :

1. Lan H Written and Elbef, Mark A.Hall, data mining: practical machine learning tools and techiniques, Morgan Kaufmann,2013

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	H	L	L	L	L	L	L	L
CO2	L	L	L	L	L	H	L	L
CO3	M	L	L	L	L	L	L	L
CO4	H	M	L	L	L	L	L	L
CO5	H	L	L	L	H	M	H	L

H - High ; M- Medium ; L- Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Core-Natural Language Processing Lab	**4**	**0**	**0**	**5**	**Practical**

Objective: To introduce the fundamental concepts and techniques of natural language processing (NLP)

Course Outcome:

CO1 : Understand the fundamental concepts and techniques of natural language processing (NLP)

CO2 : Understanding of the models and algorithms in the field of NLP

CO3 : Demonstrate the computational properties of natural languages and the commonly used algorithms for processing linguistic information.

CO4 : Understanding semantics and pragmatics of languages for processing.

1. Implementing word similarity

2. Implementing simple problems related to word disambiguation

3. Simple demonstration of part of speech tagging.

4. Lexical analyzer.

5. Semantic Analyzer.

6. Sentiment Analysis.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	H	L	L	L	L	L	L	L
CO2	L	L	L	L	L	H	L	L
CO3	M	L	L	L	L	L	L	L
CO4	H	M	L	L	L	L	L	L

CO5	H	H	M	L	H	M	L	L

H - High ; M- Medium ; L- Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Core - Machine Learning Techniques	**4**	**6**	**0**	**0**	**Theory**

Introduction :

To introduce students to the concepts and techniques of Machine Learning.

Course Outcome:

CO1 : Understand the basic concepts and techniques of Machine Learning.

CO2 : Explain the regression methods, classification methods, clustering methods.

CO3 : Understand the inference and learning algorithms for the hidden Markov model.

CO4 : Demonstrate Dimensionality reduction Techniques

CO5 : Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.

Unit I : Introduction to Machine Learning [12 periods]

Introduction – Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search- Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm – Linear Discriminants – Perceptron – Linear Separability – Linear Regression.

Unit II : Machine Learning Models [12 periods]

Linear Models – Multi-Layer Perceptron – Going Forwards – Going Backwards: Back Propagation Error – Multi-Layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back-Propagation – Radial Basis Functions and Splines – Concepts – RBF Network – Curse of Dimensionality – Interpolations and Basis Functions – Support Vector Machines.

Unit III : Tree & Probabilistic Model [12 periods]

Tree and Probabilistic Models – Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers - Probability and Learning – Data into Probabilities – Basic Statistics – Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms – Vector Quantization – Self Organizing Feature Map.

Unit IV: Dimensionality Reduction and Evolutionary Models [12 periods]

Dimensionality Reduction and Evolutionary Models - Dimensionality Reduction – Linear Discriminant Analysis – Locally Linear Embedding – Isomap – Least Squares Optimization –

Evolutionary Learning – Genetic Algorithms – Genetic Offspring – Genetic Operators – Using Genetic Algorithms – Reinforcements Learning – Overview – Getting Lost Example–Markov Decision Process.

Unit V: Graphical Model [12 periods]

Graphical Models – Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models – Tracking Methods.

Text books:

1. EthemAlpaydin, - introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014.

Reference Books :

1. Jason Bell, - Machine Learning – Hands on for Developers and Technical professionals, First Edition, Wiley, 2014.
2. Peter Flach, - Machine Learning: The Art and Science of Algorithms that Make Sense of Data, First Edition, Cambridge University Press, 2012.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	H	L	L	L	L	L	L	L
CO2	L	L	L	L	L	H	L	L
CO3	M	L	L	L	L	L	L	L
CO4	H	M	L	L	L	L	L	L
CO5	H	L	L	L	H	M	H	L

H - High ; M- Medium ; L- Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Machine Learning Lab	**4**	**0**	**0**	**5**	**Practical**

Objective: Understand the basic concepts and techniques of Machine Learning.

Course Outcome:

CO1 : Understand the basic concepts and techniques of Machine Learning.

CO2 : Explain the regression methods, classification methods, clustering methods.

CO3 : Understand the inference and learning algorithms for the hidden Markov model.

CO4 : Demonstrate Dimensionality reduction Techniques

C05 : Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file

2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples 3. Write a program to demonstrate the working of the decision tree based ID

3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

4. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.

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. Calculate the accuracy, precision, and recall for your data set.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	H	L	L	L	L	L	L	L
CO2	L	L	L	L	L	H	L	L
CO3	M	L	L	L	L	L	L	L
CO4	H	M	L	L	L	L	L	L
CO5	H	H	M	L	H	M	L	L

H - High ; M- Medium ; L- Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Big Data Analytics	**4**	**4**	**0**	**0**	**Theory**

Introduction: In this course, students to understand more advanced tools used to wrangle and analyze big data. Through this course the students got guided in basic approaches to querying and exploring data using higher level tools built on the top of a Hadoop platform.

Course Outcome:

CO1 : To understand the meaning of big data, need of big data and how worth to study by understands their characteristics of big data.

CO2 : To gain knowledge in evolution of Hadoop, understanding the components of Hadoop.

CO3 : To understand the value of data analyst and how to implementing a big data in organization.

CO4 : To analysis the big data in context, getting the knowledge of predictive analytics and big data.

CO5 : To understanding the concepts of humanizing and consumerization of big data analytics.

Unit - I: [12 periods]

Big Data- Form the Business perspective: What is big data- Characteristics of big data- Can There be enough? The Volume of the Data- Variety Is the spice of Life- How Fast Is Fast? The Velocity of Data- Data in the Warehouse and Data in Hadoop- Wrapping It Up.

Unit – II: [12 periods]

Big data- From the Technology perspective: All about Hadoop- The Histroy of Hadoop- Components of Hadoop- Application Development in Hadoop- Getting your Data into Hadoop.

Unit - III: [12 periods]

Getting Started with the big data Analytics- Changing Focus with big data- The role of the Data Analyst- Implementing Big Data Analytics within an Organization Using Alteryx- Blending Data from Multiple Sources- Looking at Alteryx Designer Desktop.

Unit – IV: [12 periods]

Analyzing big data in context: Focus on Context: Focus on Context, Not just Integration- Combining Big Data with Spatial Data- Leveraging External Data provider Resources. **Getting Value form predictive Analytics and big data:** Why do Predictivew Analytics on Big data?- Moving predicitive Analytics to the from predictive analysis.

Unit – V: **[12 periods]**

Humanizing Big Data Analytics: Putting Big Data in the Hands of Those Who Need it- Humanizing Data Design Principles- Humanizing Big Data Analytics Workflow- Considering Consumerization of Big Data Analytics- Getting an Alteryx Analytics Gallery overview- publishing Data and Analytics to Cloud Service- focusing on Consuming Applications- The Best platform for Strategic Analytics.

Text Books:

1. Understanding Big Data(Analytics for Enterprise Class Hadoop and Streaming Data), Chris Eaton, Drik Deroos, Tom Deutsch, George Lapis, Paul Zikopoulos, 2011(Unit-I, II).
2. Big Data Analytics for Dummies, Micheal Wessler, OCP & CISSP, 2012(Unit-III,IV,V)

Reference Books:

1. Big Data Analytics Using Splunk, Peter Zadrozny and Rahu Kodali, Apress 2013.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	L	H	H	L	L	L	L	L
CO2	M	H	L	L	L	L	M	L
CO3	L	L	L	L	L	L	L	H
CO4	M	H	M	L	L	L	L	L
CO5	L	H	H	H	L	H	L	M

H - High ; M- Medium ; L- Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Big Data Analytics Lab	2	0	0	4	Practical

Introduction: In this course, students to understand more advanced tools used to wrangle and analyze big data.

Lab Experiments:

1. Prepare infrastructure and understand objective for software requirement for setting up single node Hadoop cluster.

- WinSCP
- Putty
- Ubuntu
- VMPlayer
- Hadoop version

2. Create single node Hadoop cluster.

- Installing Ubuntu on VM
- Installing Java
- SSH Configuration
- Core-site.xml Configuration
- Hdfs-site.xml Configuration
- Yarn-site.xml Configuration

3. Testing Single Node cluster, Web UI ports and Exploring different daemons of Hadoop Cluster.

4. Perform / Execute below sets of Hadoop basic commands:

- appendToFile
- cat
- chgrp
- chmod
- chown
- copyFromLocal
- copyToLocal
- count
- cp

5. Install eclipse IDE on single node cluster for executing Map Reduce Job and understand the role of dependent libraries for processing job.

Discipline Specific Core

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Data Structures	**4**	**4**	**0**	**0**	**Theory**

Introduction :

Assess how the choice of data structures and algorithm design methods impacts the performance of programs.

Course Outcome:

CO1 : Students develop knowledge of basic data structures for storage and retrieval of ordered or unordered data.

CO2 : Students develop knowledge of linked lists.

CO3 : Students develop knowledge of applications of searching, and sorting of each data structure.

CO4 : Student develop Knowledge of Tree

CO5 : Student develop Knowledge of Graph

Unit I: [12 Periods]

Introduction - Basic Terminology - Data Structures - Abstract Data Types. Stacks – operation of Stack- Array Representation - Arithmetic Expressions - Polish Notation - Application of Stacks - Queue – Operation of Queue- Application of Stacks Queue.

Unit II: [12 Periods]

Linked Lists Introduction - Linked lists- Operation of Linked List - Linked List Implementation of Stack and Queue- Circular Linked list – Doubly Linked List.

Unit III: [12 Periods]

Sorting Introduction- Sorting - Merging - Merge-Sort - Quick Sort - Heap sort.

Unit IV: [12 Periods]

Trees

Introduction- Binary Trees - Representing Binary Trees in memory- Traversing Binary Trees - Traversal Algorithm using Stacks - Binary Search Trees - Searching - Inserting and deleting in Binary Search Trees

Unit V: [12 Periods]

Graphs Introduction – Definitions and terminology – graph representations – Depth first search – Breadth first search.

Text Books:

1. M. A. Weiss, “Data Structure and Algorithm Analysis in C”, Pearson Education Asia,2002.

2. Gilberg, F Richard & Forouzan, A Behrouz, Data Structures: A Pseudocode approach with C, 2nd Edition, Cengage, 2008.
3. Horowitz Sahni Anderson-Freed, Fundamental of Data Structures in C, Universities Press, Reprint 2008.

Reference Books:

1. Richard Johnsonbaugh, Algorithims, Pearson Education, 2nd Edition, 2008.
2.L.Kathirvelkumaran and R. Muralidharan , "Data Structure for Beginners ",Coimbatore Institute of Information Technology ,First Edition 2019.
3. Knuth, Donald E, Art of Computer Programming, Sorting & Searching, Addison-Wesley, 3rd Edition, 2005.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	L	H	H	L	L	L	L	L
CO2	M	H	L	L	L	L	M	L
CO3	L	L	L	L	L	L	L	H
CO4	M	H	M	L	L	L	L	L
CO5	L	H	H	H	L	H	L	M

H - High ; M- Medium ; L- Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Core - Data Structure Practical	**2**	**0**	**0**	**4**	**Practical**

Course Outcome:

CO1 : Understand basic Concept of the data structure using C program

CO2 : Implementing STACK Operations using C Program

CO3 : Exercise linked List using C programs

CO4 : Understand nodes concepts in Linked List using C programs

CO5 : Implementing QUEUE Operations using C Program

1. Write a C program to implement a STACK using array
2. Write a C Program to Implement stack and perform push, and pop operations
3. Write a C program to create Linked List
4. Write a C Program to count the number of nodes in a link list
5. Write a C program to implement a QUEUE using array
6. Write a C program to sort an Array in Ascending and Descending Order

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes		Program Outcomes						
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	H	L	L	L	L	L	L	L
CO2	L	L	L	L	L	L	L	L
CO3	M	L	M	M	L	L	L	L
CO4	H	H	M	M	L	L	L	L
CO5	L	L	L	M	L	L	L	L

H - High ; M- Medium ; L- Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Operating System	**2**	**4**	**0**	**0**	**Theory**

Introduction: The operating system is the most important program that runs on a computer. Every general-purpose computer must have an operating system to run other programs.

CO1 : After learning the fundamental concepts in Operating system including how OS has evolved over the years and different components of OS

CO2 : This will provide the necessary information for students to extract maximum benefits out of the OS while developing programs, working with applications and etc.

CO3 : These chapters cover methods for process scheduling, interprocess communication, process synchronization, and deadlock handling.

CO4 : These chapter covers the how storage is maintain in the computer

CO5 : Have the knowledge of provided by a mechanism that controls the access of programs, processes, or users to the resources defined by a computer system.

Unit-1: Introduction to Operating System [12 Hrs]

Introduction, Objectives and Functions of OS, Evolution of OS, OS Structures, OS Components, OS Services, System calls, System programs, Virtual Machines. History of UNIX, Features & Benefits, Versions of UNIX, Features of UNIX File System,, Commonly Used Commands and getting Started (Login/Logout) . Creating and viewing files using cat, file comparisons, View files, disk related commands, checking disk free spaces.

Unit -2: Process Management – Processes and Threads [12 Hrs]

Processes: Process concept, Process scheduling, Co-operating processes, Inter process Communication Threads: Introduction to Threads, Single and Multi-threaded processes CPU Scheduling: Basic concepts, Scheduling criteria, Scheduling Algorithms, Multiple Processor Scheduling, Real-time Scheduling.

Unit – 3: Process Management – Synchronization and Deadlocks [12 Hrs]

Process Synchronization: Mutual Exclusion, Critical – section problem, Synchronization hardware, Semaphores, Classic problems of synchronization. Deadlocks: System Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

Unit -4: Storage Management **[12 Hrs]**

Memory Management: Logical and physical Address Space, Swapping, Contiguous Memory Allocation, Paging, Segmentation with Paging. Virtual Memory Management: Demand paging, Process creation, Page Replacement Algorithms, Allocation of Frames, Thrashing, File-System Interface: File concept, Access Methods, Directory structure, File- system Mounting, File sharing, Protection and consistency semantics.

Unit -5: Protection and Security [12 Hrs]

Protection: Goals of Protection, Domain of Protection, Security: Security Problem, User Authentication, One – Time Password, Program Threats, System Threats.

Text Books:

1. ABRAHAM SILBERSCHATZ, PETER BAER GALVIN, GREG GAGNE "Operating system concepts" Ninth Edition,WILEY Publication
2. Milonkovic, Operating System Concepts and design, II Edition, McGraw Hill 1992.
3. Tanenbaum, Operation System Concepts, 2nd Edition, Pearson Education.
4. Silberschatz / Galvin / Gagne, Operating System,6thEdition,WSE (WILEY Publication)

Reference Books:

1. William Stallings,Operating System, 4th Edition, Pearson Education.
2. H.M.Deitel, Operating systems, 2nd Edition ,Pearson Education
3. Nutt: Operating Systems, 3/e Pearson Education 2004
4. Operating System by H.M.Deitel , 2nd Edition,Pearson Education
5. Operating Systems by Nutt, 3/e Pearson Education 2004

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes		Program Outcomes						
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	H	L	L	L	L	L	L	L
CO2	L	L	L	L	L	L	L	L
CO3	M	L	M	M	L	L	L	L
CO4	H	H	M	M	L	L	L	L
CO5	L	L	L	M	L	L	L	L

H - High ; M- Medium ; L- Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Core - Data Structure Lab	**2**	**0**	**0**	**4**	**Practical**

Course Outcome:

CO1 : After learning the fundamental concepts in Operating system.

CO2 : To provide the necessary information for developing programs, working with applications and etc.

CO3 : These chapters cover methods for process scheduling, interprocess communication, process synchronization, and deadlock handling.

CO4 : To covers the how storage is maintain in the computer

CO5 : To knowledge of provided by a mechanism that controls the access of programs, processes, or users to the resources defined by a computer system.

1. Write a c program to simulate the CPU scheduling algorithm First Come First Serve (FCFS) 2. Write a program to stimulate the CPU scheduling algorithm Shortest job first (Non- Preemption)
3. Write a program to simulate the CPU scheduling algorithm round-robin.
4. Write a c program to simulate the CPU scheduling priority algorithm.
5. Write a C program to simulate producer-consumer problem using semaphores.
6. Write a C program to simulate the concept of Dining-Philosophers problem

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes		Program Outcomes						
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	H	L	L	L	L	L	L	L
CO2	L	L	L	L	L	L	L	L
CO3	M	L	M	M	L	L	L	L
CO4	H	H	M	M	L	L	L	L
CO5	L	L	L	M	L	L	L	L

H - High ; M- Medium ; L- Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Deep Learning	**2**	**4**	**0**	**0**	**Theory**

Introduction: To introduce students to the basic concepts and techniques of deep Learning.

CO1 : Understand the basic concepts and techniques of Deep Learning.

CO2 : To understand and apply the Machine learning principles

CO3 : To study the deep learning architectures

CO4 : Explore and create deep learning applications with tensor flow

Unit-1: Introduction to Learning **[12 Hrs]**

The Neural Network – Limits of Traditional Computing – Machine Learning – Neuron – FF Neural Networks – Types of Neurons – Softmax output layers

Unit -2: Deep Learning Models **[12 Hrs]**

Tensor flow – Variables – Operations – Placeholders – Sessions – Sharing Variables – Graphs – Visualization.

Unit – 3: CNN **[12 Hrs]**

Convolution Neural Network – Feature Selection – Max Pooling – Filters and Feature Maps – Convolution Layer –Applications.

Unit -4: RNN **[12 Hrs]**

Recurrent Neural Network – Memory cells – sequence analysis – word2vec- LSTM — Memory augmented Neural Networks – NTM—Application.

Unit -5: Reinforcement Learning **[12 Hrs]**

Reinforcement Learning – MDP – Q Learning – Applications

Text Books:

1. Nikhil Buduma, Nicholas Locascio, —Fundamentals of Deep Learning: Designing NextGeneration Machine Intelligence Algorithms , O'ReillyMedia, 2017.

Reference Books:

1. Ian Goodfellow, YoshuaBengio, Aaron Courville, Deep Learning (Adaptive computation and Machine Learning series, MITPress, 2017.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes		Program Outcomes						
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	H	L	L	L	L	L	L	L
CO2	L	L	L	L	L	L	L	L
CO3	M	L	M	M	L	L	L	L
CO4	H	H	M	M	L	L	L	L
CO5	L	L	L	M	L	L	L	L

H - High ; M- Medium ; L- Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Artificial Intelligence and Knowledge Representation	**2**	**4**	**0**	**0**	**Theory**

Introduction: To expose the student sot the fundamental concepts of Artificial Intelligence and its applications.

CO1 : Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.

CO2 : Understanding about the basic concepts of Software agents ad representation of knowledge

CO3 : Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.

CO4 : Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.

Unit-1: Introduction **[12 Hrs]**

Introduction – Definition – Future of Artificial Intelligence – Characteristics of Intelligent Agents – Typical Intelligent Agents – Problem Solving Approach to Typical AI Problems.

Unit -2: Problem Solving Methods **[12 Hrs]**

Problem Solving Methods – Search Strategies – Uninformed – Informed – Heuristics – Local Search Algorithms and Optimization Problems – Searching with Partial Observations – Constraint Satisfaction Problems – Constraint Propagation – Backtracking Search – Game Playing – Optimal Decisions in Games – Alpha – Beta Pruning – Stochastic Games.

Unit – 3: Knowledge Representation **[12 Hrs]**

Knowledge Representation – First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining – Backward – Chaining – Resolution – Knowledge Representation – Ontological Engineering – Categories and Objects – Events – Mental Events and Mental Objects – Reasoning Systems for Categories – Reasoning with Default Information

Unit -4: Software Agents **[12 Hrs]**

Software Agents – Architecture for Intelligent Agents – Agent Communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent Systems.

Unit -5: AI Applications **[12 Hrs]**

AI Applications – Language Models – Information Retrieval – Information Extraction – Natural Language Processing – Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning - Moving.

Text Books:

1. S. Russell and P. Norvig, —Artificial Intelligence: A Modern Approach , Prentice Hall, Third Edition, 2009.
2. I. Bratko, - Prolog: Programming for Artificial Intelligence, Fourth Edition, Addison-Wesley Educational Publishers Inc., 2011.

Reference Books:

1. M. Tim Jones, - Artificial Intelligence: A Systems Approach (Computer Science), Jones and Bartlett Publishers Inc.; First Edition, 2008.
2. Nils J. Nilsson, - The Quest for Artificial Intelligence, Cambridge University Press, 2009
3. William F. Clocksin and Christopher S Mellish, Programming in Prolog: Using the ISO Standard, Fifth Edition, Springer, 2003.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes		Program Outcomes						
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	H	L	L	L	L	L	L	L
CO2	L	L	L	L	L	L	L	L
CO3	M	L	M	M	L	L	L	L
CO4	H	H	M	M	L	L	L	L
CO5	L	L	L	M	L	L	L	L

H - High ; M- Medium ; L- Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Software Engineering	**4**	**4**	**0**	**0**	**Theory**

INTRODUCTION

This Subjects deals with the concept of present the role of software, system analysis, design concepts, testing methods and strategies.

CO1 : This gives the Knowledge about various models in software engineering.

CO2 : It gives the brief description about requirements.

CO3 : To understand knowledge about Planning.

CO4 : To analyze various testing in software testing

CO5 : It deals the concept of Maintenance.

UNIT I **[12 periods]**

The Evolving Role of Software – Definition of Software Engineering – The Changing Nature of Software – Software Myths – Terminologies – Software Life Cycle Models: Build and Fix Model – Evolutionary Process Models – Selection of a Life Cycle Model.

UNIT II **[12 periods]**

Requirements: Analysis and Specifications: Type of Requirements – Feasibility Studies – Requirement Elicitation: interviews, brain storming sessions, FAST – Requirement analysis: Data flow diagram, Data Dictionaries - Requirements Validation

UNIT III **[12 periods]**

Project Planning: Size Estimation – The Constructive Cost Model (COCOMO) – The Putnam Resource Allocation Model.

UNIT IV **[12 periods]**

Software Design: Design: Conceptual and Technical designs, Objectives of design – Modularity - Function Oriented Design – Software reliability: Basic concepts, software reliability, maturity levels.

UNIT V **[12 periods]**

Software Testing: A Strategic Approach to Software Testing – Testing – Functional Testing – Structural Testing – Levels of Testing – Validation Testing. **Software Maintenance:** Categories of Maintenance – Problems during Maintenance –Maintenance is Manageable – Potential Solutions to maintenance problems – Maintenance process –Estimation of maintenance cost.

Text Book:

1. K.K.Aggarwal, Yogesh Singh, "Software Engineering", New Age International Publishers, Jan 2008

Reference Book:

2. Richard e.Fairley “Software Engineering Concepts”, , McGrawHill,2012.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	L	H	H	L	L	L	L	L
CO2	M	H	L	L	L	L	M	L
CO3	L	L	L	L	L	L	L	H
CO4	M	H	M	L	L	L	L	L
CO5	L	H	H	H	L	H	L	M

H - High ; M- Medium ; L- Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Software Engineering Lab	2	0	0	4	Practical

Introduction: Understand the basic ideas and its usage of key diagrams in Software Engineering.

Course Outcome:

CO1 : To Understanding the Requirement tasks.

CO2 : To Understanding the Requirement analysis and SRS.

CO3 : To Implement a DFD and Structured chart.

CO4 : To Understand and Implement the concept of Use case Diagram.

CO5 : To Understand and Implement the concept of Class Diagram & Object Diagram.

Lab Experiments:

1. To assign the requirement engineering tasks
2. To perform the system analysis : Requirement analysis, SRS
3. To perform the function oriented diagram : DFD and Structured chart
4. To perform the user's view analysis : Use case diagram
5. To draw the structural view diagram : Class diagram, object diagram

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	L	H	H	L	L	L	L	L
CO2	M	H	L	L	L	L	M	L
CO3	L	L	L	L	L	L	L	H
CO4	M	H	M	L	L	L	L	L
CO5	L	H	H	H	L	H	L	M

6.

7. H - High ; M- Medium ; L- Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Data Mining and warehouse	4	4	0	0	Elective

Introduction:

This subject gives the Knowledge of Fundamentals of Data warehousing, Data mining and Data Mining Techniques.

CO1 : To explain the core concepts of the Data Warehousing. This Explain about the Concept of Different Types of Data warehouse and its features.

CO2 : To discuss Data Mining Techniques and issues.

CO3 : To analyze various Association Rules in Data Warehousing.

CO4 : To understand various Clustering techniques.

CO5 : To deploy applications of Web Mining.

UNIT I **[12 periods]**

Data Warehousing: Introduction – Definition – Multidimensional Data Model - OLAP Operations – Warehouse Schema – Data warehousing Architecture – Metadata – OLAP Engine - Data Warehouse Backend Process.

UNIT II **[12 periods]**

Data Mining: Definition – Comparison with other fields – DM Techniques – Issues - Application Areas.

UNIT III **[12 periods]**

Association Rules: Methods – A Priori algorithm – Partition Algorithm – Pincer-Search Algorithm – Border Algorithm – Generalized Association Rules with Item constraints.

UNIT IV **[12 periods]**

Clustering Techniques : Clustering Paradigms – Partitioning Algorithms – CLARA – CLARANS- Hierarchical Clustering – DBSCAN – Categorical Clustering Algorithms – STIRR. Decision Trees: Tree Construction Principle – Best Split – Splitting Indices – Splitting Criteria CART – ID3.

UNIT V **[12 periods]**

Web Mining: Introduction – Web Content Mining – Web Structure Mining – Web Usage Mining – Text Mining – Hierarchy of Categories – Text Clustering.

Text Books:

1. Arun K Pujari , "Data Mining Techniques", Universities Press, Second Edition 2013.

Reference books:

1. Jewie Han, Michelins Kamber, Jian pei, "Data Mining: Concepts and Techniques", Morgan Kaufmann Publishers, Third Edition,2012.

2. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, "Introduction to Data Mining" , Pearson India Education Publishers, Second Edition, 2016.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	L	H	H	L	L	L	L	L
CO2	M	H	L	L	L	L	M	L
CO3	L	L	L	L	L	L	L	H
CO4	M	H	M	L	L	L	L	L
CO5	L	H	H	H	L	H	L	M

H - High ; M- Medium ; L- Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Core - Data Mining and warehouse Lab	**2**	**0**	**0**	**4**	**Practical**

Course Outcome:

CO1 : To explain the core concepts of the Data Warehousing. This Explain about the Concept of Different Types of Data warehouse and its features.

CO2 : To discuss Data Mining Techniques and issues.

CO3 : To analyze various Association Rules in Data Warehousing.

CO4 : To understand various Clustering techniques.

CO5 : To deploy applications of Web Mining.

1. Create an Employee Table with the help of Data Mining Tool WEKA
2. Create a Weather Table with the help of Data Mining Tool WEKA.
3. Normalize Weather Table data using Knowledge Flow.
4. Normalize Employee Table data using Knowledge Flow
5. Apply Pre-Processing techniques to the training data set of Employee Table
6. Finding Association Rules for Employee data.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	L	H	H	L	L	L	L	L
CO2	M	H	L	L	L	L	M	L
CO3	L	L	L	L	L	L	L	H
CO4	M	H	M	L	L	L	L	L
CO5	L	H	H	H	L	H	L	M

H - High ; M- Medium ; L- Low

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Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Robotic Process Automation	**5**	**6**		**5**	**Practical**

Introduction:

To help students understand progress rapidly from selecting the right use case for RPA vs other automation methods to scaling their RPA program.

Course Outcome:

CO1 : Explain the technology, the benefits and drawbacks, and comparisons to automation technologies.

CO2 : To takes a look at core technologies like on-premise software, cloud computing, OCR (optical character recognition), databases, APIs.

CO3 : To learn methodologies like lean, Six Sigma, and lean Six Sigma..

CO4 : To provides help on assessing processes, determining what to automate, and how to measure ROI.

CO5 : To find the steps in selecting the right RPA software, such as looking at costs, training, functionality, and security.

UNIT -I : RPA Foundations **[12 periods]**

What Is RPA? - Flavors of RPA - History of RPA - The Benefits of RPA- The Downsides of RPA - RPA Compared to BPO - BPM and BPA -Consumer Willingness for Automation - The Workforce of the Future.

UNIT–II: RPA Skills **[12 periods]**

On-Premise Vs. the Cloud - Web Technology - Programming Languages and Low Code - OCR (Optical Character Recognition) - Databases APIs (Application Programming Interfaces) - AI (Artificial Intelligence) - Cognitive Automation - Agile, Scrum, Kanban, and Waterfall - DevOps - Flowcharts.

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UNIT–III: Process Methodologies **[12 periods]**

Lean - Six Sigma - How to Implement Six Sigma - Six Sigma Roles and Levels - Lean Six Sigma Finding the Right Balance - Applying Lean and Six Sigma to RPA.

UNIT–IV: Planning **[12 periods]**

The Preliminaries - Use a Consulting Firm? - RPA Consulting: Some Case Studies - What to Automate? - ROI for RPA - RPA Use Cases - The Plan.

UNIT– V: RPA Vendor Evaluation **[12 periods]**

RPA Vendor Evaluation - Be Realistic - Check Out Third Parties - Minimum Capabilities -Who Is the User? - Funding - Ecosystem - Costs - Training and Education - Support - Best-of-Breed vs.

End-to-End - Thought Leadership and Vision - Industry Expertise - Security, Monitoring, and Deployment - What Type of RPA? - The Design - Next-Generation Technologies.

Text books:

1. Tom Taulli,- The Robotic Process Automation Handbook, APress, 2020.

References:

1. Alok Mani Tripathi, – Learning Robotic Process Automation: Create Software Robots and Automate Business Processes with the Leading RPA Tool, 2018.
2. Husan Mahey – Robotic Process Automation with Automation Anywhere: Techniques to Fuel Business Productivity and Intelligent Automation Using RPA, 2020.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	M	M	L	L	L	L	L	L
CO2	M	M	L	L	L	L	L	L
CO3	H	M	M	L	L	L	L	L
CO4	H	M	M	L	L	L	L	L
CO5	H	H	M	M	L	L	L	L

H - High ; M- Medium ; L- Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Ethical Hacking	**5**	**6**		**5**	**Practical**

Introduction:

To help students understand how ethical hacking is used as a method to prevent hacking. To facilitate students, appreciate the need for understanding non-technology aspects of ethical hacking such as legal frameworks, documentation and report writing.

Course Outcome:

CO1 :Explain the importance of numerous methods of real-world information intelligence.

CO2 :Differentiate the processes of vulnerability assessment and ethical hacking from penetration testing.

CO3 :Comprehend the importance of appropriate countermeasures for managing vulnerabilities.

CO4 :To familiarize with the methodologies that can be used to hack into a target.

CO5 :To appreciate the wide variety of attacks that can be performed against a wireless network.

UNIT -I [12 periods]

Introduction To Hacking: Terminologies, Categories of Penetration Test, Writing Reports, Structure of a Penetration Testing Report, Vulnerability Assessment Summary, Risk Assessment, Methodology, Linux Basics: File Structure, Cron Job, Users, Common Applications , BackTrack, Services.

UNIT–II: [12 periods]

Information Gathering, Target Enumeration And Port Scanning Techniques: Active, Passive and Sources of information gathering, Copying Websites Locally, NeoTrace, Cheops-ng, Intercepting a Response, What Web, Net craft, Basic Parameters, Code Exploit Scanner, Interacting with DNS Servers, Fierce, Zone Transfer with Host Command and Automation, DNS Cache Snooping- Attack Scenario, Automating Attacks, SNMP - Problem, Sniffing Passwords, SolarWinds Toolset, sweep, Brute Force and Dictionary- Tools , Attack, Enumeration, Intelligence Gathering Using Shodan, Target enumeration and Port Scanning Techniques.

UNIT–III: [12 periods]

Vulnerability Assessment & Network Sniffing: Introduction to Vulnerability Assessment - Pros and Cons, NMap, Updation of database, Testing SCADA Environments with Nmap, Nessus, Sniffing: Types, Hubs versus Switches, Modes, MITM Attacks, ARP Protocol Basics- working, Attacks, DoS Attacks, Dsniff tool, Using ARP Spoof to Perform MITM Attacks, Sniffing the Traffic with Dsniff, Sniffing Pictures with Drifnet, Urlsnarf and Webspy, Sniffing with Wireshark, Ettercap- ARP Poisoning, Hijacking Session with MITM Attack, ARP Poisoning with Cain and Abel, Sniffing

Session Cookies with Wireshark, Hijacking the Session, SSL Strip: Stripping HTTPS Traffic, Requirements, Automating Man in the Middle Attacks, DNS Spoofing, DHCP Spoofing.

UNIT–IV: [12 periods]

Remote Exploitation : Understanding Network Protocols, Attacking Network Remote Services, Common Target Protocols, tools for cracking network remote services, Attacking SMTP, Attacking SQL Servers, Client Side Exploitation Methods: E-Mails Leading to Malicious Attachments & Malicious Links, Compromising Client Side Update, Malware Loaded on USB Sticks, **Post exploitation:** Acquiring Situation Awareness, Privilege Escalation, Maintaining Access, Data Mining, Identifying and Exploiting Further Targets, Windows Exploit Development Basics.

UNIT– V: [12 periods]

Wireless Hacking : Requirements , Aircracking , Hidden SSIDs , Monitor Mode , Monitoring Tool-Beacon Frames on Wireshark ,Airodump-ng , Wireless Adapter in Monitor Mode , Determining the Target , Cracking a WPA/WPA2 Wireless Network Using Aircrack-ng , Capturing Packets and Four-Way Handshake , Web Hacking : Attacking the Authentication , Brute Force and Dictionary Attacks , Types of Authentication , Crawling Restricted Links , Testing for the Vulnerability , Authentication Bypass with Insecure Cookie Handling , SQL injection, XSS – DOM based,BeEF,CSRF, Bypassing CSRF and BeEF with XSS, Vulnerability in FCKeditor, efront.

Text books:

1. Rafay Baloch ,-Ethical Hacking and Penetration Testing Guide, CRC Press, 2015.

References:

1. Patrick Engebretson, ‑The Basics of Hacking and Penetration Testing : Ethical Hacking and Penetration Testing Made Easy, Syngress Media, Second Revised Edition, 2013.
2. Michael T. Simpson, Kent Backman, James E. Corley, ‑Hands On Ethical Hacking and Network Defense, Cengage Learning, 2012.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	M	M	L	L	L	L	L	L
CO2	M	M	L	L	L	L	L	L
CO3	H	M	M	L	L	L	L	L
CO4	H	M	M	L	L	L	L	L
CO5	H	H	M	M	L	L	L	L

H - High ; M- Medium ; L- Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type

Ethical Hacking Lab	**2**	**0**	**0**	**4**	**Practical**

Course Outcome:

CO1	Implement the importance of ethical hacking in achieving the goals of information security.
CO2	Differentiate the processes of vulnerability assessment and ethical hacking from penetration testing.
CO3	Comprehend the importance of appropriate countermeasures for managing vulnerabilities.
CO4	Justify the need for meticulous documentation in writing reports for consumption of both technical and management audiences.
CO5	Articulate the rationale for having an adequate legal framework for dealing with hacking and ethical hacking.

List of Experiments:

Software:

- VM Player; Windows server; Windows 7/ 10; Kali Linux; All-in-one keylogger; DELmE virus maker

Experiments:

1. Perform network scan to revile active hosts, open ports and services running

2. Perform privilege escalation attack on Client operating system and gain control of a Client operating system and write a short note on its mitigation strategy

3. Demonstrate ARP Poisoning and detect ARP Poisoning in switch-based network

4. Perform man-in-the-middle attack and hijack an established session of a user. Write a report on the same with mitigation strategy

5. Crack FTP credentials using dictionary attack and write a report of possible suggestion on hardening the login services

6. Perform user system surveillance and write a mitigation report on the same

7. Exploiting NetBIOS vulnerability and password revelation from browsers and social networking application using Key Logger and Trojan

8. Perform denial service attack on a server operating system and write a report on the same with mitigation strategy

Allied

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type

	Mathematics for Computer Science	4	4	0	0	Allied

Introduction : This paper focuses on the Mathematical logic, Relations& Functions, Formal languages and Graph Theories.

Course Outcome:

CO1 : To demonstrate a working knowledge of set notation and elementary set theory with its corresponding set operations and also Venn diagram.

CO2 : To apply the fundamental concepts of Mathematical Logic and Tautologies.

CO3 : To apply and understand the fundamental concepts of Relations and Functions.

CO4 : To demonstrate different traversal methods for graphs.

CO5 : To demonstrate different methods for trees and its properties.

Unit I: **[12periods]**

Set theory - Introduction-Basic definition-Types of sets-Operations on sets-Venn-Euler diagrams-Laws of set theory-Power sets and products-Inclusion and exclusion principle.

Unit II: **[12periods]**

Mathematical logic - Introduction to propositional logic-Basic logical operations-Tautologies-Contradiction - Predicates and Quantification.

Unit III: **[12periods]**

Relations-Binary Relations-Set operation on relations-Types of Relations-Partial order relation-Equivalence relation-Composition of relations-Functions-Types of functions-Invertible functions-Composition of functions

Unit IV: **[12periods]**

Graph theory - Basic terminology-Paths, cycle and connectivity-sub graphs-Types of graphs-Representation of graphs in computer memory.

Unit V: **[12periods]**

Trees-Properties of Trees- Binary trees- traversing Binary trees – Computer Representation of general trees.

Text Book:

1. Discrete Mathematics for Computer Science by Gary Haggard,JohnSchlipf and Sue Whitesides
2. Discrete Mathematics by J.K.Sharma second edition – 2005. Macmillan India Ltd.

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type

Entrepreneurial Development	4	**4**	**0**	**0**	**Theory**

Introduction:

To build the necessary competencies and creativity and prepare them to undertake entrepreneurship as a desirable and feasible career option.

COURSE OUTCOME:

CO1 : To know about the role of the entrepreneur in India and around and the globe, understand the benefits and drawbacks of entrepreneurship and students has to avoid them; entrepreneurial failure.

CO2 : The course aims to develop student's ability to create, lead and coordinate projects within the textile and fashion sector. It also intends to provide tools and methods in order to make use of entrepreneurial thinking to develop a business project.

CO3 : Students will be able to define, identify and/or apply the principles of new venture financing, growth financing, and growth financing for existing businesses.

CO4 : To understand process of women entrepreneur and how faced their problems

CO5 : To understand difference between Micro, small and medium Enterprises.

Unit I **[12 Periods]**

Entrepreneur – importance- qualities, nature types – difference between entrepreneur and entrepreneurship and economic development – its importance – role of entrepreneurship – entrepreneurial environment.

Unit II **[12 Periods]**

Project management: sources of business idea – project classifications – identifications – formulation and design – feasibility analysis – preparation of project report and presentation. Financial analysis – concept and scope project cost estimate – operating revenue estimate – ratio analysis – investment.

Unit III **[12 Periods]**

Project finance: sources of finance – institutional finance – role of IFC, IDBI, ICICI, LIC, SFC, SIPCOT, commercial bank – appraisal of bank for loans. Institutional aids for entrepreneurship development.

Unit IV **[12 Periods]**

The innovation process – the diagnosis – the consultation of group – selecting a strategy preparing the organization setting up the investment. Women entrepreneur – problems faces by women entrepreneur – economic impact of women entrepreneur.

Unit V **[12 Periods]**

Setting small scale industries – step in setting SSI unit – problems of entrepreneur – sickness in small industries – reason and remedies – Incentives and subsidies role of DICS, SIDCO, NSICS, IRCI, NIDC, SIDBI, SISI, SIPCOT.

Textbook:

1. Robert D. Hisrich, Mathew J Manimala, Michael P Peters, Dean A Shepherd, "Entrepreneurship", McGraw Hill Education, 2014.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	L	H	H	L	L	L	L	L
CO2	M	H	L	L	L	L	M	L
CO3	L	L	L	L	L	L	L	H
CO4	M	H	M	L	L	L	L	L
CO5	L	H	H	H	L	H	L	M

H - High ; M- Medium ; L- Low

Skill Based Subject

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Skill - Linux and Shell Programming	**4**	**4**	**-**	**-**	**Theory**

Introduction : To give students knowledge about Linux File systems and use of basic Commands and Shell programming.

Course Outcome:

CO1 : Understanding the basic set of commands and utilities in Linux/UNIX systems.

CO2 : To learn to develop software for Linux/UNIX systems.

CO3 : To learn the important Linux/UNIX library functions and system calls.

CO4 : To obtain a foundation for an advanced file system manipulation.

CO5 : To understand the Pattern, URL and E-mail for web content.

Unit I **12 Hours**

Introduction-Printing in the terminal-Playing with variables and environment variables-Function to prepend to environment variables-Math with the shell-Playing with file descriptors and redirection-Arrays and associative arrays-Visiting aliases-Grabbing information about the terminal-Getting and setting dates and delays.

Unit II **12 Hours**

Concatenating with cat-Recording and playing back of terminal sessions-Finding files and file listing-Playing with xargs-Translating with tr-Checksum and verification-Cryptographic tools and hashes-Sorting unique and duplicates-Temporary file naming and random numbers-Splitting files and data.

Unit III **12 Hours**

Generating files of any size-The intersection and set difference (A-B) on text files-Finding and deleting duplicate files-Working with file permissions, ownership, and the sticky bit-Making files immutable-Generating blank files in bulk-Finding symbolic links and their targets-Enumerating file type statistics-Using loopback files-Creating ISO files and hybrid ISO-Finding the difference between files, patching.

Unit IV **12 Hours**

Using regular expressions-Searching and mining a text inside a file with grep-Cutting a file column-wise with cut-Using sed to perform text replacement-Using awk for advanced text

processing-Finding the frequency of words used in a given file-Compressing or decompressing JavaScript-Merging multiple files as columns-Printing the nth word or column in a file or line.

Unit V **12 Hours**

Printing text between line numbers or patterns-Printing lines in the reverse order-Parsing e-mail addresses and URLs from a text-Removing a sentence in a file containing a word-Replacing a pattern with text in all the files in a directory-Text slicing and parameter operations

Text Book :

1. "Linux Shell Scripting Cookbook", by Shantanu Tushar & Sarath Lakshman,Published by Packt Publishing Ltd., Second Edition.

Reference Book:

1. Eric Foster Johnson, John C. Welch and Micah Anderson, " Beginning Shell Scripting",Wiley, 2005.
2. Carl Albing, JP Vossen and Cameron Newham,"Bash Cookbook", O'Reilly Media, 2007.
3. Richard Blum, "Linux Command Line and Shell Scripting Bible", Wiley, 2008.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	L	H	H	L	L	L	L	L
CO2	M	H	L	L	L	L	M	L
CO3	L	L	L	L	L	L	L	H
CO4	M	H	M	L	L	L	L	L
CO5	L	H	H	H	L	H	L	M

4.

5. H - High ; M- Medium ; L- Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type

Skill - Internet Of Things	**2**	**4**	**-**	**-**	**Theory**

Introduction : The internet of things paradigm promises to make things including consumer electronic devices or home appliances, such as medical devices, fridge, cameras, and sensors, part of the internet environment.

Course Objective:

CO1 : Students can understand and develop their knowledge of Internet of Things
CO2 : Analyze basic protocols in wireless sensor network
CO3 : Students can develop their knowledge of applications related with IOT.
CO4 : Design IoT applications in different domain and be able to analyze their performance
CO5 : Implement basic IoT applications on embedded platform.

UNIT- I Introduction to IoT **[12 periods]**

Defining IoT - Characteristics of IoT - Physical design of IoT – Logical design of IoT - Functional blocks of IoT - Communication models & APIs - Machine to Machine - Difference between IoT and M2M - Software define Network.

UNIT-II Network & Communication aspects **[12 periods]**

Wireless medium access issues - MAC protocol survey - Survey routing protocols - Sensor deployment & Node discovery - Data aggregation & dissemination.

UNIT-III Challenges in IoT **[12 periods]**

Design challenges - Development challenges - Security challenges - Other challenges.

UNIT-IV Domain specific applications of IoT **[12 periods]**

Home automation - Industry applications - Surveillance applications - Other IoT applications.

UNIT-V Developing IoTs **[12 periods]**

Introduction to Python - Introduction to different IoT tools - Developing applications through IoT tools - Developing sensor based application through embedded system platform - Implementing IoT concepts with python

Text Books:

1. Vijay Madisetti, Arshdeep Bahga, “Internet of Things: A Hands-On Approach”

Waltenegus Dargie,Christian Poellabauer, "Fundamentals ofWireless Sensor Networks: Theory and Practice

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	L	L	L	L	L	L	L	L
CO2	L	L	L	L	L	L	L	L
CO3	M	L	L	L	L	L	L	L
CO4	H	M	M	L	L	L	L	L
CO5	H	H	L	L	L	L	L	L

H - High ; M- Medium ; L- Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type

Skill– Information Security and Cyber	**2**	**4**	**0**	**0**	**Theory**

Introduction : To give students knowledge about information Vulnerability in the modern cyber environment and need of cyber Security preparations are essential.

Course Outcome:

CO1 : The objective of this course is to provide students with a basic understanding of Information and Cyber Security issues and make them aware of the Challenges.

CO2 : To provide components of the Information and Cyber Security Organization.

CO3 : To achieve a basic understanding of information and Cyber Security.

CO4 : To master information security governance, and related legal and regulatory Issues

CO5 : To be familiarity with information security awareness and a clear understanding of its importance

Unit - I : Information Security Overview [12 periods]

The Importance of Information Protection-The Evolution of Information Security -Justifying Security Investment -Security Methodology -How to Build a Security Program -The Impossible Job-The Weakest Link-Strategy and Tactics-Business Processes vs. Technical Controls

Unit – II : Risk Analysis [12 periods]

Threat Definition -Types of Attacks - Malicious Mobile Code -Advanced Persistent Threats (APTs) -Manual Attacks -Risk Analysis.

Unit – III: [12 periods]

Cyber Security Fundamentals - Network and Security Concepts - Information Assurance Fundamentals - Authentication – Authorization – Nonrepudiation – Confidentiality – Integrity – Availability - Basic Cryptography - Symmetric Encryption - Example of Simple Symmetric Encryption with Exclusive OR(XOR) - Improving upon Stream Ciphers with Block Ciphers - Public Key Encryption -The Domain Name System (DNS) - Security and the DNS – Firewalls -History Lesson - What's in a Name? – Packet - Filtering Firewalls - Stateful Firewalls- Application Gateway Firewalls.

Unit – IV [12 periods]

Virtualization- In the Beginning, There Was Blue - The Virtualization Menu - Full Virtualization-Getting a Helping Hand from the Processor - If All Else Fails, Break It to Fix It - Use What You Have-Doing It the Hard Way-Biting the Hand That Feeds-Radio-Frequency Identification -Identify What?-Security and Privacy Concerns

Unit – V: **[12 periods]**

Microsoft Windows Security Principles-Windows Tokens-Introduction-Concepts behind Windows Tokens-Access Control Lists-Conclusions-Window Messaging - Malicious Uses of Window Messages -Solving Problems with Window Messages-Windows Program Execution-Validation of Parameters - Load Image, Make Decisions-Creating the Process Object-Context Initialization - Windows Subsystem Post Initialization - Initial Thread-Down to the Final Steps-Exploiting Windows Execution for Fun and Profit - The Windows Firewall.

Text Books:

1."Information Security - The Complete Reference", by Mark Rhodes-Ousley, 2nd Edition.

2."Cyber Security Essentials", by James Graham, Richard Howard & Ryan Olson , Published by CRC Press.

Reference Books:

1.John R. Vacca, "Computer and Information Security Handbook", Elsevier, Third Edition

2.Salvatorre J. Stolfo,Steven M. Bellovin, Shlomo Hershkop, Angelos Keromytis, Sara Sinclair, Sean W. Smith, "Insider Attack and Cyber Security beyond the Hacker", Springer Science, 2008.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	L	H	H	L	L	L	L	L
CO2	M	H	L	L	L	L	M	L
CO3	L	L	L	L	L	L	L	H
CO4	M	H	M	L	L	L	L	L
CO5	L	H	H	H	L	H	L	M

H - High ; M- Medium ; L- Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Animation and Multimedia	**2**	**4**			**Theory**

Course Outcome:

CO1 : To develop an understanding and awareness how issues such as content, information architecture, motion, sound, design, and technology merge to form effective and compelling interactive experiences for a wide range of audiences and end users.

CO2 : To become familiar with various tools used in the creation and implementation of multi- media

CO3 : To understand about the color and 3D Cloud

CO4 : To become familiar with Blender with images

CO5 : To create an animation and An introduction to the development of Graphics.

Unit I **[12 periods]**

Introduction: About Blender- Rendering and Animation Basics- Basic Blender Commands- The Basic Blender Buttons- The Blender Screen- The User Preferences Window-Open, Saving and Appending Files- Importing Objects (from other file formats). Working with view points: Moving Around in 3D -Window and Button Control- Creating Viewports (also called windows)- Typical Views and Buttons-Working with Basic Meshes.

Unit II : **[12 periods]**

Creating and Editing objects- Using Main Modifiers to Manipulate Meshes- Using the Transform Widgets- Edit Mode- Mesh Editing. Using the Shading Smooth-Flat Options and Auto Smooth- The Tool Shelf- Proportional Editing-Joining/Separating Meshes and Boolean Operations. Verticies and Faces Logo Design- Boolean Operations.

Unit III : **[12 periods]**

Materials and textures: Material Panels- Transparency Using Z-Transparency - Halo Settings- Applying Materials. Basic Textures Settings - Blender's Built-In Textures - Using Images and Movies as Texture - Displacement Mapping - Using Color, Stars and Mist - Creating a 3D Cloud Backgrounds – Adding world to your Landscape.

Unit IV: **[12 periods]**

Lighting and Cameras: Lighting Types and Settings - Basic Setup Options – Render settings Scene Settings - Rendering a JPEG (.jpg) Image - Creating an MPEG Movie File - Lighting and Shadows. Ray Tracing - Reflection (mirror) and Refraction (transparency).

Unit V: **[12 periods]**

Animation Basics: Basic Key-framing and Auto Key-framing - Moving, Rotating and Scaling - Automatic Key-Framing - Viewing Your Animation - Working with the Graph Editor and Dope Sheet - Modifying Curves in the Graph Editor - Animating Materials, Lamps and World Settings (and more).

Textbook:

1. James Chronister, "Blender Basics", Classroom Tutorial Book 4th Edition 2011.

Reference :

1. Andleigh, P. K and Kiran Thakrar, —Multimedia Systems and Design , PHI, 2003.
2. Judith Jeffcoate, —Multimedia in practice: Technology and Applications , PHI, 1998

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	L	H	H	L	L	L	L	L
CO2	M	H	L	L	L	L	M	L
CO3	L	L	L	L	L	L	L	H
CO4	M	H	M	L	L	L	L	L
CO5	L	H	H	H	L	H	L	M

H - High ; M- Medium ; L- Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type

Computer Architecture and Design	**2**	**4**	**0**	**0**	**Theory**

Introduction : This course aims to provide a strong foundation for students to understand modern computer system architecture and to apply these insights and principles to future computer designs.

Course Outcome:

CO1 : To make students understand the basic structure and operation of digital computer.

CO2 : To understand the hardware-software interface.

CO3 : To familiarize the students with arithmetic and logic unit and implementation of fixed point and floating-point arithmetic operations.

CO4 : To expose the students to the concept of pipelining.

CO5 : To familiarize the students with hierarchical memory system including cache memories and virtual memory. To expose the students with different ways of communicating with I/O devices and standard I/O interfaces.

UNIT I OVERVIEW & INSTRUCTIONS [12 periods]

Eight ideas – Components of a computer system – Technology – Performance – Power wall – Uniprocessors to multiprocessors; Instructions – operations and operands – representing instructions – Logical operations – control operations – Addressing and addressing modes.

UNIT II ARITHMETIC OPERATIONS [12 periods]

ALU – Addition and subtraction – Multiplication – Division – Floating Point operations – Subword parallelism.

UNIT III PROCESSOR AND CONTROL [12 periods]

Basic MIPS implementation – Building datapath – Control Implementation scheme – Pipelining – Pipelined datapath and control – Handling Data hazards & Control hazards – Exceptions.

UNIT IV PARALLELISM [12 periods]

Instruction-level-parallelism – Parallel processing challenges – Flynn's classification – Hardware multithreading – Multicore processors

UNIT V MEMORY AND I/O SYSTEMS [12 periods]

Memory hierarchy – Memory technologies – Cache basics – Measuring and improving cache performance – Virtual memory, TLBs – Input/output system, programmed I/O, DMA and interrupts, I/O processors.

TEXT BOOK:

1. David A. Patterson and John L. Hennessey, "Computer Organization and Design", Fifth edition, Morgan Kauffman / Elsevier, 2014.

REFERENCES:

1. V.Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, "Computer Organisation", VI edition, Mc Graw-Hill Inc, 2012.
2. William Stallings "Computer Organization and Architecture", Seventh Edition , Pearson Education, 2006.
3. Vincent P. Heuring, Harry F. Jordan, "Computer System Architecture", Second Edition, Pearson Education, 2005.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	L	H	H	L	L	L	L	L
CO2	M	H	L	L	L	L	M	L
CO3	L	L	L	L	L	L	L	H
CO4	M	H	M	L	L	L	L	L
CO5	L	H	H	H	L	H	L	M

H - High ; M- Medium ; L- Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Enterprise Resource Planning	**4**	**5**	**1**	**0**	**Theory**

Introduction :

The course provides an overview of Enterprise Resource Planning (ERP) software systems and their role within an organization. It introduces key concepts integrated information systems and explains why such systems are valuable to businesses and their impact on organizations.

Course Outcome:

CO1 : To understand about ERP systems

CO2 : To expose the students to ERP software and modules, Implementation of ERP

CO3 : To familiarize Emerging trends on ERP

CO4 : Enhanced Evaluation of ERP systems, Business Analytics, Future trends in ERP Systems.

CO5 : To familiarize ERP SOLUTIONS AND FUNCTIONAL MODULES.

UNIT I INTRODUCTION [12 periods]

Overview of enterprise systems – Evolution - Risks and benefits - Fundamental technology - Issues to be consider in planning design and implementation of cross functional integrated ERP systems.

UNIT II ERP SOLUTIONS AND FUNCTIONAL MODULES [12 periods]

Overview of ERP software solutions- Small medium and large enterprise vendor solutions, BPR, Business Engineering and best Business practices - Business process Management. Overview of ERP modules -sales and Marketing, Accounting and Finance, Materials and Production management.

UNIT III ERP IMPLEMENTATION [12 periods]

Planning Evaluation and selection of ERP systems- Implementation life cycle - ERP implementation, Methodology and Frame work- Training – Data Migration. People Organization in implementation- Consultants,
Vendors and Employees.

UNIT IV POST IMPLEMENTATION [12 periods]

Maintenance of ERP- Organizational and Industrial impact; Success and Failure factors of and ERP Implementation.

UNIT V EMERGING TRENDS ON ERP [12 periods]

Extended ERP systems and ERP add–ons -CRM,SCM, Business analytics etc- Future trends in ERP systems-web enabled, Wireless Technologies.

TEXT BOOKS:

1. Alexis Leon, ERP demystified, second Edition Tata McGraw-Hill, 2007.

REFERENCE BOOKS:

1. Jagan Nathan Vaman, ERP in Practice, Tata McGraw-Hill, 2008
2. Alexis Leon, Enterprise Resource Planning, second edition, Tata McGraw-Hill, 2008.
3. Mahadeo Jaiswal and Ganesh Vanapalli, ERP Macmillan India, 2009.
4. Vinod Kumar Grag and N.K. Venkitakrishnan, ERP- Concepts and Practice, Prentice Hall of India,2nd edition, 2006.
5. Summer, Enterprise Resource Planning,, Pearson Education, 2008.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	L	H	H	L	L	L	L	L
CO2	M	H	L	L	L	L	M	L
CO3	L	L	L	L	L	L	L	H
CO4	M	H	M	L	L	L	L	L
CO5	L	H	H	H	L	H	L	M

H - High ; M- Medium ; L- Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Distributed Programming	**2**	**4**	**0**	**0**	**Theory**

Introduction :

To enable the students to learn the introduction to Distributed system fundamentals, processing, models, memory systems.

Course Outcome:

CO1 : To understand the foundations of distributed systems.

CO2 : To learn process and naming concepts in distributed systems.

CO3 : To learn issues related to clock Synchronization and the need for global state in distributed systems.

CO4 : To understand the fault tolerance and recovery protocols in Distributed Systems.

CO5 : To learn the characteristics of distributed object based System and file systems.

UNIT I **12 Hrs**

Introduction :Definition of a Distributed System - Goals – Making Resources Accessible – Diatribution Transparency – Openness – Scalability –Pitfalls -Types of Distributed Systems.Architecure – System Architectures – Architecture Versus Middleware.

UNIT II **12 Hrs**

Processes: Threads - Virtualization - Clients - Servers - Code Migration: Approaches to Code Migration – Migration and Local Resources – Migration in Heterogeneous Systems .**Naming:** Names, Identifiers and Addresses – Structured Naming –Name Spaces - Name Resolution – The Implementation of a Name Space –Example :The Domain Name System.

UNIT III **12 Hrs**

Synchronization: Clock Synchronization – Physical Clock –Global Positioning System - Clock Synchronization Algorithms - Logical Clocks– Mutual Exclusion – Global Positioning of nodes - Election Algorithms . **Consistency and Replication** : Introduction -Data-Centric Consistency Models-Client – Centric Consistency Models - Replica Management - Consistency Protocols.

UNIT IV **12 Hrs**

Fault Tolerance: Introduction to Fault Tolerance – Process Resilience - Design Issues – Failure Masking and Replication – Reliable Client-Server Communication - Point-to-point Communication – RPC Semantics in the Presence of Failures – Reliable Group Communication - Basic Reliable –

Multicasting Schemes – Atomic Multicast – Distributed Commit- Two-Phase Commit – Three - Phase Commit – Recovery.

UNIT V **12 Hrs**

Distributed Object Based Systems: Architecture – Processes –Communication – Naming – Synchronization- Fault Tolerance. **Distributed File Systems**: Architecture – Processes – Communication – Naming –Synchronization- Consistency and Replication - Fault Tolerance – Security.

Text books:

1. Andrew S. Tanenbaum, Maarten van Steen, " Distributed Systems – Principles and Paradigms ", PHI, 2004.

Reference books:

1. "Distributed Computing Principles, Algorithms, and Systems", Ajay D. Kshemkalyani, Mukesh Singhal, Cambridge University Press.
2. George Coulouris, Jean Dollimore and Tim Kindberg, "Distributed Systems-Concepts and Design", 3rd Edition, Pearson Education, 2002.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	L	H	H	L	L	L	L	L
CO2	M	H	L	L	L	L	M	L
CO3	L	L	L	L	L	L	L	H
CO4	M	H	M	L	L	L	L	L
CO5	L	H	H	H	L	H	L	M

H - High ; M- Medium ; L- Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Skill Enhancement Course : Digital Image Processing	**2**	**4**	**0**	**0**	**Theory**

Introduction :

To enable the students to learn the introduction to digital image processing, fundamentals, image enhancement and image restoration techniques.

Course Outcome:

CO1 : Understand the fundamentals of digital image processing and sampling and quantization concepts.

CO2 : Apply image processing techniques in both the spatial and frequency domains using various transform techniques.

CO3 : Understanding the filtering techniques for Image restoration and reconstruction.

CO4 : Understanding fundamentals and some basic models of Image Compression

CO5 : Applying the image segmentation process.

UNIT- I **12 Hrs**

Introduction: What is digital image processing – The origin of DIP – Examples of fields that use DIP – Fundamentals steps in DIP – Components of an image processing system. Digital image fundamentals: Elements of Visual perception – Light and the electromagnetic spectrum – Image sensing and acquisition – Image sampling and quantization – Some basic relationship between pixels – Linear & Nonlinear operations

UNIT- II **12 Hrs**

Intensity Transformations and Spatial Filtering: - Background – Some basic intensity transformation functions– Histogram processing – Fundamentals of spatial filtering – Smoothing spatial filters – Sharpening spatial filters – Combining spatial enhancement methods.

UNIT- III **12 Hrs**

Image restoration and reconstruction: A model of the image degradation /restoration process – Noise models – Restoration is the presence of noise only - Spatial filtering - Periodic Noise Reduction by Frequency Domain Filtering - Estimating the degradation function – Inverse filtering – Minimum mean square error filtering – Constrained least squares filtering – Geometric mean filter .

UNIT- IV **12 Hrs**

Image compression: fundamentals – image compression models – Image Formats, Containers and Compression Standards .Some Basic Compression Methods – Digital Image Watermarking.

UNIT- V **12 Hrs**

Image segmentation: Fundamentals – Points, Lines and Edge Detection – Threshold – Region-based segmentation

Text Book:

1. Rafael C.Gonazalez, Richard E. Woods, "Digital Image Processing", Pearson Education, Third Edition.

Reference Books:

1. B.Chanda, D.Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2003.

2. William K.Pratt, "Digital Image Processing", 3 rd edition, Wiley India Pvt. Ltd, 2013

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	L	H	H	L	L	L	L	L
CO2	M	H	L	L	L	L	M	L
CO3	L	L	L	L	L	L	L	H
CO4	M	H	M	L	L	L	L	L
CO5	L	H	H	H	L	H	L	M

H - High ; M- Medium ; L- Low

Discipline Specific Elective

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Elective - Business Data Analytics	**4**	**6**	**0**	**0**	**Theory**

Introduction : To introduce the fundamental concepts of Business data analytics and associated methodologies

Course Outcome:

CO1 : Understand and critically apply the concepts and methods of business analytics
CO2 : Demonstration the various methodologies of descriptive statistics
CO3 : Understanding of modeling uncertainty and statistical inference
CO4 : Understanding of analytical frameworks

Unit I: OVERVIEW OF BUSINESS ANALYTICS [12 Periods]

Introduction – Drivers for Business Analytics – Applications of Business Analytics: Marketing and Sales, Human Resource, Healthcare, Product Design, Service Design, Customer Service and Support – Skills Required for a Business Analyst – Framework for Business Analytics Life Cycle for Business Analytics Process.

Unit II: ESSENTIALS OF BUSINESS ANALYTICS [12 Periods]

Descriptive Statistics – Using Data – Types of Data – Data Distribution Metrics: Frequency, Mean, Median, Mode, Range, Variance, Standard Deviation, Percentile, Quartile, z-Score, Covariance, Correlation – Data Visualization: Tables, Charts, Line Charts, Bar and Column Chart, Bubble Chart, Heat Map – Data Dashboards.

Unit III: MODELING UNCERTAINTY AND STATISTICAL INFERENCE [12 Periods]

Modeling Uncertainty: Events and Probabilities – Conditional Probability – Random Variables – Discrete Probability Distributions – Continuous Probability Distribution – Statistical Inference: Data Sampling – Selecting a Sample – Point Estimation – Sampling Distributions – Interval Estimation – Hypothesis Testing.

Unit IV: ANALYTICS USING HADOOP AND MAPREDUCE FRAMEWORK [12 Periods]

Introducing Hadoop – RDBMS versus Hadoop – Hadoop Overview – HDFS (Hadoop Distributed File System) – Processing Data with Hadoop – Introduction to MapReduce – Features of MapReduce – Algorithms Using Map-Reduce: Matrix-Vector Multiplication, Relational Algebra Operations, Grouping and Aggregation – Extensions to MapReduce

Unit V: **OTHER DATA ANALYTICAL FRAMEWORKS** **[12 Periods]**

Effort Estimation- Estimation Basis – Techniques – COCOMO Model- Activity planning – CPM/PERT-Risk Management and its Techniques – Resource allocation – Monitoring control

Text Books :

1. VigneshPrajapati, —Big Data Analytics with R and Hadoop , Packt Publishing, 2013.
2. Umesh R Hodeghatta, UmeshaNayak, —Business Analytics Using R – A Practical Approach , Apress, 2017.

Reference Books :

1. AnandRajaraman, Jeffrey David Ullman, —Mining of Massive Datasets , Cambridge University Press, 2012.
2. Jeffrey D. Camm, James J. Cochran, Michael J. Fry, Jeffrey W. Ohlmann, David R. Anderson, —Essentials of Business Analytics , Cengage Learning, second Edition, 2016
3. U. Dinesh Kumar, —Business Analytics: The Science of Data-Driven Decision Making , Wiley, 2017
4. A. Ohri, —R for Business Analytics , Springer, 2012 7. Rui Miguel Forte, —Mastering Predictive Analytics with R , Packt Publication, 2015.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	L	L	L	L	L	L	L	L
CO2	M	M	L	L	L	L	L	L
CO3	H	M	M	L	L	L	L	L
CO4	H	H	H	L	L	L	L	L

*H-High; M-Medium; L-Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Elective - Social Network Analysis	**4**	**6**	**0**	**0**	**Theory**

Introduction : To explain the methodologies used in social network analysis

Course Outcome:

CO1 : Understand a broad range of network concepts and theories

CO2 : Appreciate how network analysis can contribute to increasing knowledge about diverse aspects of society.

CO3 : Use a relational approach to answer questions of interest to them (i.e. be able to apply 'network thinking').

CO4 : Analyse social network data using various software packages.

CO5 : Present results from social network analysis, both orally and in writing

Unit I: CLUSTERING AND CLASSIFICATION [12 Periods]

Supervised Learning – Decision tree - Naïve Bayesian Text Classification - Support Vector Machines - Ensemble of Classifiers – Unsupervised Learning – K-means Clustering – Hierarchical Clustering – Partially Supervised Learning – Markov Models – Probability-Based Clustering – Vector Space Model

Unit II: SOCIAL MEDIA MINING [12 Periods]

Data Mining Essentials –Data Mining Algorithms - Web Content Mining –Latent semantic Indexing – Automatic Topic Extraction – Opinion Mining and Sentiment Analysis – Document Sentiment Classification

Unit III: EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS [12 Periods]

Extracting evolution of Web Community from a Series of Web Archive – Detecting Communities in Social Networks – Definition of Community – Evaluating Communities – Methods for Community Detection & Mining – Applications of Community Mining Algorithms – Tools for Detecting Communities – Social Network Infrastructure and Communities – Decentralized Online Social Networks – Multi-Relational Characterization of Dynamic Social Network Communities.

Unit IV: HUMAN BEHAVIOR ANALYSIS AND PRIVACY ISSUES [12 Periods]

Understanding and Predicting Human Behavior for Social Communities – Use Data Management, Inference and Distribution – Enabling New Human Experiences – Reality Mining – Context Awareness – Privacy in Online Social Networks – Trust in Online Environment – Trust Models Based on Subjective Logic – Trust Network Analysis – Trust Transitivity Analysis – Combining Trust and Reputation – Trust Derivation Based on Trust Comparisons – Attack Spectrum and Countermeasures.

Unit V: **VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS [12 Periods]**

Graph Theory – Centrality – Clustering – Node-Edge Diagrams – Matrix representation – Visualizing Online Social Networks – Visualizing Social Networks with Matrix-Based Representations – NodeLink Diagrams – Hybrid Representations – Applications – Covert Networks – Community Welfare – Collaboration Networks – Co-Citation Networks – Recommendation in Social Media: Challenges –Classical Recommendation Algorithms – Recommendation Using Social Context – Evaluating Recommendations.

Text Books :

1. Peter Mika, —Social networks and the Semantic Web , Springer, 2007.
2. BorkoFurht, —Handbook of Social Network Technologies and Applications , Springer, 2010.

Reference Books :

1. Bing Liu, —Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data (DataCentric Systems and Applications) , Springer; Second Edition, 2011.
2. Reza Zafarani, Mohammad Ali Abbasi, Huan Liu, Social Media Mining , Cambridge University Press, 2014.
3. GuandongXu, Yanchun Zhang and Lin Li, —Web Mining and Social Networking Techniques and applications , Springer, 2011
4. Dion Goh and Schubert Foo, —Social information retrieval systems: emerging technologies and Applications for searching the Web effectively , Idea Group, 2007.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	L	L	L	L	L	L	L	L
CO2	M	L	L	L	L	L	L	L
CO3	H	M	L	L	L	L	L	L
CO4	H	M	M	L	L	L	L	L
CO5	H	H	H	L	L	L	L	L

*H-High; M-Medium; L-Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Elective - Software Agents	**4**	**6**	**0**	**0**	**Theory**

Introduction :

- To explain the fundamentals of agents and agent programming paradigms.
- To explain about agents and security

Course Outcome:

CO1 : Understanding the fundamentals of agents and agent programming paradigms.
CO2 : Discussing the basics of java agents.
CO3 : Learning the concepts of multivalent systems
CO4 : Understanding the concepts of intelligent software agents.
CO5 : Understanding the agents and security.

Unit I: AGENTS – OVERVIEW [12 Periods]

Agent Definition – Agent Programming Paradigms – Agent Vs Object – Aglet – Mobile Agents –Agent Frameworks – Agent Reasoning

Unit II: JAVA AGENTS [12 Periods]

Processes – Threads – Daemons – Components – Java Beans – ActiveX – Sockets – RPCs – Distributed Computing –Aglets Programming – Jini Architecture – Actors and Agents – Typed and Proactive Messages

Unit III: MULTIAGENT SYSTEMS [12 Periods]

Interaction between Agents – Reactive Agents – Cognitive Agents – Interaction Protocols – Agent Coordination – Agent negotiation – Agent Cooperation – Agent Organization – Self-Interested Agents in Electronic Commerce Applications

Unit IV: INTELLIGENT SOFTWARE AGENTS [12 Periods]

Interface Agents – Agent Communication Languages – Agent Knowledge Representation – Agent Adaptability – Belief Desire Intension – Mobile Agent Applications

Unit V: **AGENTS AND SECURITY [12 Periods]**

Agent Security Issues – Mobile Agents Security – Protecting Agents against Malicious Hosts – Untrusted Agent – Black Box Security – Authentication for Agents – Security Issues for Aglets.

Text Books :

1. Bigus&Bigus, —Constructing Intelligent agents with Java , Wiley, 2010.
2. Bradshaw, —Software Agents , MIT Press, 2012.

Reference Books :

1. Russel&Norvig, —Artificial Intelligence a modern approach , Prentice Hall, 1994.
2. Richard Murch and Tony Johnson, —Intelligent Software Agents , Prentice Hall, 2000.
3. Michael Wooldridge, —An Introduction to Multi Agent Systems , John Wiley, 2002.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	L	L	L	L	L	L	L	L
CO2	M	L	L	L	L	L	L	L
CO3	H	M	L	L	L	L	L	L
CO4	H	M	M	L	L	L	L	L
CO5	H	H	H	L	L	L	L	L

*H-High; M-Medium; L-Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Elective - Artificial Neural Networks and Fuzzy System	**4**	**6**	**0**	**0**	**Theory**

Introduction :

- To introduce the concepts of artificial neural networks and fuzzy systems
- To explain the basic mathematical elements of the theory of fuzzy sets.

Course Outcome:

CO1 : Explain the concepts of neural networks and , fuzzy logic
CO2 : Understanding of the basic mathematical elements of the theory of fuzzy sets.
CO3 : Understanding the differences and similarities between fuzzy sets and classical sets theories
CO4 : Solve problems that are appropriately solved by neural networks and fuzzy logic

Unit I: Introduction [12 Periods]

Basic concepts-single layer perceptron-Multi layer perceptron - Adaline - Madaline- Learning rulesSupervised learning-Back propagation networks-Training algorithm, Advanced algorithms-Adaptive network- Radial basis network modular network-Applications.

Unit II: Learning [12 Periods]

Introduction- unsupervised learning -Competitive learning networks-Kohonen self organising networks-Learning vector quantisation - Hebbian learning – Hopfield network-Content addressable nature, Binary Hopfield network, Continuous Hopfield network Travelling Salesperson problem - Adaptive resonance theory –Bidirectional Associative Memory-Principle component Analysis.

Unit III: Fuzzy Sets [12 Periods]

Introduction – crisp sets an overview – the notion of fuzzy sets – Basic concepts of fuzzy sets – classical logic an overview – Fuzzy logic. Operations on fuzzy sets - fuzzy complement – fuzzy union – fuzzy intersection – combinations of operations – general aggregation operations .

Unit IV: Relations [12 Periods]

Crisp and fuzzy relations – binary relations – binary relations on a single set– equivalence and similarity relations – Compatibility or tolerance relations– orderings – Membership functions – methods of generation – defuzzification methods .

Unit V: **Tree Learning** **[12 Periods]**

Adaptive Neuro Fuzzy based inference systems – classification and regression trees: decision tress, Cart algorithm – Data clustering algorithms: K means clustering, Fuzzy C means clustering, Mountain clustering, Subtractive clustering – rule base structure identification – Neuro fuzzy control: Feedback Control Systems, Expert Control, Inverse Learning, Specialized Learning, Back propagation through Real –Time Recurrent Learning.

Text Books :

1. Neuro Fuzzy and Soft computing, Jang J.S.R.,Sun C.T and Mizutani E – Pearson education, 2004 2. Bradshaw, —Software Agents , MIT Press, 2012.
2.Fundamentals of Neural Networks, LaureneFauseett, Prentice Hall India, New Delhi,1994.

Reference Books :

1. Fuzzy Logic Engineering Applications, Timothy J.Ross, McGrawHill,NewYork,1997.
2. Neural networks,Fuzzy logics,and Genetic algorithms, S.Rajasekaran and G.A.VijayalakshmiPai Prentice Hall of India,2003.
3. Fuzzy Sets and Fuzzy Logic, George J.Klir and Bo Yuan, Prentice Hall Inc., New Jersey,1995.
4. Principles of Soft Computing S.N.Sivanandam, S.N.Deepa Wiley India Pvt Ltd.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	L	L	L	L	L	L	L	L
CO2	M	L	L	L	L	L	L	L
CO3	H	M	L	L	L	L	L	L
CO4	H	M	M	L	L	L	L	L

*H-High; M-Medium; L-Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Elective - Web Application Security	**4**	**6**	**0**	**0**	**Theory**

Introduction :

- To introduce the concepts of security in web applications
- To explain about crime prevention and routine duties in a police station.

Course Outcome:

CO1 : Illustrate about the concept of HTML,DHTML, CSS and Java Script
CO2 : Explain the history, characteristics, technologies, concepts, usage in web2.0 and web 3.0
CO3 : Apply the core concepts of web applications to create web pages
CO4 : Apply the concepts of servers side programming

Unit I: Introduction to Web [12 Periods]

Data with URL- HTML - DHTML: Cascading Style Sheets, Common Gateway Interface: Programming CG! Scripts - HTML Forms-:- Custom Database Query Scripts - Server Side Includes - Server _security issues.

Unit II: XHTML [12 Periods]

XHTML: Introduction, CSS- Scripting languages- Java Script: Control statements, Functions, Arrays, Objects - DOM- Aiax enable rich internet applications.

Unit III: Server Side Programming [12 Periods]

Server side Programming - Active server pages - Java server pages - Java Servlets: Servlet container Exceptions - Sessions and Session Tracking_ - Using Servlet context - Dynamic Content Generation - Servlet Chaining and Communications.

Unit IV: HTML 5 [12 Periods]

HTML review, Feature detection , The HTML5 new Elements, Canvas, Video and audio, Web storage, Geo location, Offline Web pages , Micro data, HTML5 APLS, Migrating from HTML4 to HTML5, CSS3

Unit V: WEB 2.0 [12 Periods]

WEB 2.0- HISTORY, characteristics, technologies, concepts, usage, web2.0 in education, philanthropy, social work. Web 3.0- Theory-and history understanding. basic web artifacts and applications, implementation. MS share point - Share point 2013 overview ,share (Put social to work ,Share your stuff, Take share point on the go), Discover (find experts, discover answers, find what you are looking for), Manage (cost, risk, time)

Text Books :

1. Deitel, Deitel and Neita, -Internet and World Wide _Web- How to programll, Pearson Education Asia, 4th Edition, 2009.
2. Elliotte Rusty Herold, -Java Network Programming II, O'Reilly Publications, 3rd Edition, 2004.

Reference Books :

1. Jeffy Dwight, Michael Erwin and Robert Nikes -USING CGIII, PH.I Publications, 1997.
2. Jason Hunter, William Crawford -Java Servlet Programming O'Reilly Publications, 2nd Edition, 2001.
3. Eric Ladd and Jim O'Donnell, etal, -USING HTML4, XML, and JAVA1.2, Prentice Hall, 2003
4. Jeremy Keith, -Html5 for web designers.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
CO1	L	L	L	L	L	L	L	L
CO2	M	L	L	L	L	L	L	L
CO3	H	M	L	L	L	L	L	L
CO4	H	M	M	L	L	L	L	L

*H-High; M-Medium; L-Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Elective - Embedded Systems	**4**	**6**	**0**	**0**	**Theory**

Introduction :

- To introduce the concepts of embedded systems and its architecture.

Course Outcome:

CO1 : Understand hardware and software design requirements of embedded systems.
CO2 : Explain about the architecture of microprocessor and operating systems in embedded systems
CO3 : Analyze the embedded systems' specification and develop software programs.
CO4 : Evaluate the requirements of programming Embedded Systems, related software architectures and tool chain for Embedded Systems.

Unit I: Introduction to Embedded System [12 Periods]

Examples of Embedded Systems – Typical Hardware – Memory – Microprocessors – Busses –Direct Memory Access – Introduction to 8051 Microcontroller – Architecture-Instruction set –Programming.

Unit II: Microprocessor [12 Periods]

Microprocessor Architecture – Interrupt Basics – The Shared-Data problem – Interrupt Latency Round–Robin Architecture - Round–Robin with Interrupts Architecture - Function-Queue Scheduling Architecture – Real-Time Operating Systems Architecture – Selection of Architecture.

Unit III: Semaphores [12 Periods]

Tasks and Task States – Tasks and Data – Semaphores and Shared Data – Semaphore Problems – Semaphore variants

Unit IV: Message Queues & RTOS [12 Periods]

Message Queues – Mailboxes – Pipes – Timer Functions – Events – Memory Management – Interrupt Routines in RTOS Environment. RTOS design – Principles – Encapsulation Semaphores and Queues – Hard Real-Time Scheduling Considerations – Saving Memory Space – Saving Power.

Unit V: Host machine & Testing [12 Periods]

Host and Target Machines – Linker/Locator for Embedded Software- Getting Embedded Software into the Target System. Testing on your Host Machine – Instruction Set Simulators – Laboratory Tools used for Debugging.

Text Books :

1. The 8051 Microcontroller Architecture, Programming & Applications, Kenneth J. Ayala, Penram International.

2. An Embedded Software Primer, David E. Simon, Pearson Education , 2005.

Reference Books :

1. Embedded Systems: Architecture , Programming and Design, Raj Kamal, Tata McGraw-Hill Education, 2008.

Mapping of Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes							
	P01	**PO2**	**P03**	**P04**	**P05**	**P06**	**P07**	**P08**
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CO2	M	L	L	L	L	L	L	L
CO3	H	M	L	L	L	L	L	L
CO4	H	M	M	L	L	L	L	L

*H-High; M-Medium; L-Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Elective - Principles of Secure Coding	**4**	**6**	**0**	**0**	**Theory**

Introduction :

- To understand the secure software development life cycle
- To explain about the secure coding techniques

Course Outcome:

CO1 : Explain about the secure software development life cycle.
CO2 : Understand the secure coding techniques
CO3 : Demonstrate the threat modeling process and benefits.
CO4 : Explain about the database and web specific issues.

Unit I: **Introduction to Security** **[12 Periods]**

Need for secure systems: Proactive Security development process, Secure Software Development Cycle (S-SDLC) , Security issues while writing SRS, Design phase security, Development Phase, Test Phase, Maintenance Phase, Writing Secure Code - Best Practices SD3 (Secure by design, default and deployment), Security principles and Secure Product Development Timeline.

Unit II: Threat modeling process and its benefits **[12 Periods]**

Threat modelling process and its benefits: Identifying the Threats by Using Attack Trees and rating threats using DREAD, Risk Mitigation Techniques and Security Best Practices. Security techniques, authentication, authorization. Defense in Depth and Principle of Least Privilege .

Unit III: Secure Coding Techniques **[12 Periods]**

Secure Coding Techniques: Protection against DoS attacks, Application Failure Attacks, CPU Starvation Attacks, Insecure Coding Practices In Java Technology. ARP Spoofing and its countermeasures. Buffer Overrun- Stack overrun, Heap Overrun, Array Indexing Errors, Format String Bugs. Security Issues in C Language: String Handling, Avoiding Integer Overflows and Underflows and Type Conversion Issues- Memory Management Issues, Code Injection Attacks, Canary based counter measures using Stack Guard and Propolice. Socket Security, Avoiding Server Hijacking, Securing RPC.

Unit IV: Database and Web-specific issues [12 Periods]

Database and Web-specific issues: SOL Injection Techniques and Remedies, Race conditions, Time of Check Versus Time of Use and its protection mechanisms. Validating Input and Inter process Communication, Securing Signal Handlers and File Operations. XSS scripting attack and its types - Persistent and Non persistent attack XSS Countermeasures and Bypassing the XSS Filters.

Unit V: Testing Secure Applications [12 Periods]

Testing Secure Applications: Security code overview, secure software installation. The Role of the Security Tester, Building the Security Test Plan. Testing HTTP- Based Applications, Testing FileBased Applications, Testing Clients with Rogue Servers.

Text Books :

1. Writing Secure Code, Michael Howard and David LeBlanc,Microsoft Press, 2nd Edition, 2004

Reference Books :

1. Programming PHP, RasmusLerdorf and Levin Tatroe, O_Reilly, 2002
2. Core Python Programming, Wesley J. Chun, Prentice Hall, 2001.
3. Perl: The Complete Reference, 2ndEdn, Martin C. Brown, TMH , 2009
4. MySQL: The Complete Reference, 2ndEdn, VikramVaswani, TMH, 2009

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CO3	H	M	L	L	L	L	L	L
CO4	H	M	M	L	L	L	L	L

*H-High; M-Medium; L-Low

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Elective - Open Source Software	**4**	**6**	**0**	**0**	**Theory**

Introduction :

- To explain the need and importance of open source software
- To introduce the various open source software's like Linux, MySQL, PHP and Python

Course Outcome:

CO1 : Explain about the need and importance of open source software.
CO2 : Demonstrate the concepts of open source software's
CO3 : Apply the programming constructs of MySQL, PHP, Python and PERL to create programs.
CO4 : Develop small programs using open source software's.

Unit I: Introduction to open sources [12 Periods]

Introduction to open sources–Need of open sources–advantages of open sources–application of open sources. Open source operating systems: LINUX: Introduction – general overview –Kernel mode and user mode –process – advanced concepts –scheduling – personalities – cloning – signals – development with Linux..

Unit II: MySQL [12 Periods]

MySQL: Introduction–setting up account–starting, terminating and writing yourown SQL programsrecord selection Technology – working with strings – Date and Time – sorting Query results – generating summary –working with meta data –using sequences – MySQL and Web.

Unit III: PHP [12 Periods]

PHP: Introduction–programming in web environment–variables- constants–data types –operators – statements – functions – arrays – OOP – string manipulations and regular expression – file handling and data storage – PHP and SQL database – PHP andLDAP – PHP connectivity – sending and receiving E-mails – debugging and error handling – security –templates.

Unit IV: Python **[12 Periods]**

Syntax and style–python objects–numbers–sequences–strings–lists and tuples – dictionaries – conditional loops –files – input and output – errors and exceptions – functions – modules – classes and OOP – execution environment.

Unit V: Pearl **[12 Periods]**

Pearl backgrounder–pearl overview–pearl parsing rules–variables and data–statements and control structures – subroutines -, packages and modules – working with files– data manipulation.

Text Books :

1. The Linux Kernel Book, Remy Card, Eric and Frank Mevel, Wiley Publications 2003
2. MySQL Bible, Steve Suchring, John Wiley 2002.

Reference Books :

1. Programming PHP, RasmusLerdorf and Levin Tatroe, O_Reilly, 2002
2. Core Python Programming, Wesley J. Chun, Prentice Hall, 2001.
3. Perl: The Complete Reference, 2ndEdn, Martin C. Brown, TMH , 2009
4. MySQL: The Complete Reference, 2ndEdn, VikramVaswani, TMH, 2009

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CO3	H	M	L	L	L	L	L	L
CO4	H	M	M	L	L	L	L	L

*H - High ; M-Medium; L-Low

Ability Enhancement Course

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BCMAFC	Women Studies	**2**	**2**	**0**	**0**	**FC**

Unit I

Laws, Legal Systems and Change

Definition - Constitutional law, CEDAW and International Human Rights – Laws and Norms – Laws and Social Context – Constitutional and Legal Framework.

Unit II

Politics of land and gender in India

Introduction – Faces of Poverty – Land as Productive Resources – Locating Identities – Women's Claims to Land – Right to Property - Case Studies.

Unit III

Women's Rights: Access to Justice

Introduction – Criminal Law – Crime Against Women – Domestic Violence – Dowry Related Harassment and Dowry Deaths – Molestation – Sexual Abuse and Rape – Loopholes in Practice – Law Enforcement Agency.

Unit IV

Women's Rights

Violence Against Women – Domestic Violence - The Protection of Women from Domestic Violence Act, 2005 - The Marriage Validation Act, 1982 - The Hindu Widow Re-marriage Act, 1856 - The Dowry Prohibition Act, 1961

Unit V

Special Women Welfare Laws

Sexual Harassment at Work Places – Rape and Indecent Representation – The Indecedent Representation (Prohibition) Act, 1986 - Immoral Trafficking – The Immoral Traffic (Prevention) Act, 1956 - Acts Enacted for Women Development and Empowerment - Role of Rape Crisis Centers.

Reference books:

1. Nitya Rao "Good Women do not Inherit Land" Social Science Press and Orient Blackswan 2008
2. International Solidarity Network "Knowing Our Rights" An imprint of Kali for Women 2006
3. P.D.Kaushik "Women Rights" Bookwell Publication 2007
4. Aruna Goal "Violence Protective Measures for Women Development and Empowerment" Deep and Deep Publications Pvt 2004
5. Monica Chawla "Gender Justice" Deep and Deep Publications Pvt Ltd.2006
6. Preeti Mishra "Domestic Violence Against Women" Deep and Deep Publications Pvt 2007
7. ClairM.Renzetti, Jeffrey L.Edleson, Raquel Kennedy Bergen, Source Book on "Violence Against Women" Sage Publications 2001

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BENAFC	Communicative English	**2**	**2**	**0**	**0**	**FC**

Unit I - Vocabulary building - Puzzle

Unit II - Common error in English - Role Play

Unit III - Advertising - Newspaper Reading

Unit IV - Write the missing Verbs - Question Framing

Unit V - Description - Letter writing

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BCCAFC	Constitution of India	**2**	**2**	**0**	**0**	**FC**

Unit I

Making of Constitution - Constituent Assembly - Dr.Rajendra Prasath - Dr.B.R.Ambedkar - Salient features - Fundamental Rights.

Unit II

Union Executive - President of India - Vice-President - Prime Minister - Cabinet - Functions

Unit III

Union Legislature - Rajiya Sabha - Lok Sabha - Functions and Powers

Unit IV

Union Judiciary - Supreme Court - Functions - Rule of law

Unit V

State - Executive - Legislature - Judiciary

Reference books:

1. Agharwal.R.C. - National Moment and Constitutional Development – New Delhi, 1977
2. Chapra B.R., Constitution of India, New Delhi, 1970
3. Rao B.V., Modern Indian Constitution, Hyderabad, 1975.
4. Nani Palkhivala - Constitution of India, New Delhi, 1970
5. Krishna Iyer, V.R., Law and Justice, New Delhi, 2009

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BCSAFC	Environmental Studies	**2**	**2**	**0**	**0**	**FC**

Unit I

A Multidisciplinary Subject – Natural Resources – Forest Resources – Water Resources – Mineral Resources – Food Resources – Energy Resources – Land Resources.

Unit II

Ecosystem – Concepts of Ecosystem – Characteristics – Food Chains – Food Web – Ecological Pyramids – Energy Flow in an Ecosystem – Nutrient Cycling – Primary Production – Ecosystem Regulation – Ecological Succession – Major Ecosystem Types.

Unit III

Biodiversity and its Conservation – Diversity – Biogeographically Classification of India – Value of Biodiversity – Global Biodiversity – Biodiversity: National, Regional or Local – Hot Spots of Bio Diversity – Threats to Biodiversity – Loss of Habitat – Poaching – Man-wildlife Conflicts – Endangered Species of India – Endemic Species of India – Conservation of Biodiversity.

Unit IV

Environmental Pollution – Air pollution – Noise Pollution – Water Pollution – Thermal Pollution – Marine Pollution – Soil Pollution – Nuclear Hazards – Solid Waste Management – Role of an Individual in Prevention of Pollution – disaster Management.

Unit V

Social Issues and the Environment – From unsustainable to sustainable development – Urban problems related to energy – Water Conservation – Rainwater Harvesting – Watershed Management – Resettlement and Rehabilitation Issues – Environmental Ethics – Climate change – Global Warming – Acid Rain – Ozone Layer Depletion – Environmental Legislation.

Reference books:

1. Perspectives in Environmental Studies – Aubha Kaushik, C. P. Kaushik, New Age International Publishers, Second Edition, 2004.
2. Basics of Environmental Science – Michael Allaby, Routledge – London, 2nd Edition, 1996.
3. Principles of Environmental Science and Technology – K. Saravanan, S. Ramachandran and R. Baskar, New Age International Publishers, 2005.

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BTAAFC	Yoga	**2**	**2**	**0**	**0**	**FC**

Unit I - Yoga and Physical Health

1.1. Physical Structure - Three bodies - Five limitations
1.2. Simplified Physical Exercises - Hand Exercises -Leg Exercises – Breathing Exercises - Eye Exercises – Kapalapathi
1.3. Maharasanas 1-2 - Massages - Acu-puncture – Relaxation
1.4. Yogasanas - Padmasana- Vajrasanas - Chakrasanas . (Side)- Viruchasanas- Yoga muthra- Patchimothasanas – Ustrasanas - Vakkarasanas - Salabasanas

Unit II - Art of Nurturing the life force and Mind

2.1. Maintaining the youthfulness - Postponing the ageing process
2.2. Sex and Spirituality - Significance of sexual vital fluid - Married life - Chastity
2.3. Ten stages of Mind
2.4 Mental frequency - Methods for concentration

Unit III – Sublimation

3.1. Purpose and Philosophy of life
3.2. Introspection - Analysis of Thought
3.3. Moralization of Desires
3.4. Neutralization of Anger

Unit IV - Human Resources Development

4.1. Eradication ofworries
4.2. Benefits of Blessings
4.3. Greatness ofFriendship
4.4. Individual Peace and World Peace

Unit V - Law of Nature

5.1. Unified force- Cause and Effect system
5.2. Purity of Thought and Deed and Genetic Centre
5:3. Love and Compassion
5.4. Cultural Education - Five fold Culture

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
19BPYAFC	Value Education – Human Rights	**2**	**2**	**0**	**0**	**FC**

UNIT – I: Concept of Human Values, Value Education Towards Personal Development - Aim of education and value education; Evolution of value oriented education; Concept of Human values; types of values; Components of value education. Personal Development: Self-analysis and introspection; sensitization towards gender equality, physically challenged, intellectually challenged. Respect to - age, experience, maturity, family members, neighbors, co-workers.
Character Formation towards Positive Personality: Truthfulness, Constructively, Sacrifice, Sincerity, Self-Control, Altruism, Tolerance, Scientific Vision.

UNIT – II: Value Education towards National and Global Development - National and International Values: Constitutional or national values - Democracy, socialism, secularism, equality, justice, liberty, freedom and fraternity. Social Values - Pity and probity, self-control, universal brotherhood. Professional Values - Knowledge thirst, sincerity in profession, regularity, punctuality and faith. Religious Values - Tolerance, wisdom, character. Aesthetic values - Love and appreciation of literature and fine arts and respect for the same. National Integration and international understanding.

UNIT – III: Impact of Global Development on Ethics and Values - Conflict of cross-cultural influences, mass media, cross-border education, materialistic values, professional challenges and compromise. Modern Challenges of Adolescent Emotions and behavior; Sex and spirituality: Comparison and competition; positive and negative thoughts. Adolescent Emotions, arrogance, anger, sexual instability, selfishness, defiance.

UNIT - IV: Introduction – Law – Functioning of Court – Hierarchy of Courts – seeking Justice – Dragged into the Net – Help thy Neighbor – You snooze, You Lose - Crime & Punishment – Introduction to Criminal Law – Encounter with Criminal Law – Limitation and other restrictions for prosecution – Major offences and punishments - Guardianship and Minority – Civil Marriage – Compulsory Registration of Marriages – Relief through Family Court – Writing a Will.

UNIT - V: Protection of Women under Civil Law – Protection of Women under Criminal law – Protection of Child under Civil and Criminal Law - Protection of Workmen - Consumer Protection – Consumer friendly forums – Defective and Hazardous Good – Deficiency in Service – Unfair and Restrictive trade practices – Quality of Goods – Right to Information Act – Cyber Crimes – E- Commerce.

Textbook:

1. Value Education – Human Rights – Learning Material, Bharathiar University, 2009.
2. Introduction to Human Rights and Duties - Dr.T. S.N.Sastry, University of Pune, 2011
3. Human Rights Education for Begineers - KWIRC , NHRC, 2005.
4. Layman’s Guide to Law, Yetukuri Venkateswara Rao, Asia Law House, 2008.

Value Added Course

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Value Added Course - Fundamental of Office Automation	**2**	**0**	**0**	**2**	**Practical**

Introduction : To know the fundamentals of Microsoft Word, Ms Excel and Ms PowerPoint for their office automation.

Course Outcome:

CO1 : Ability to understand basic level knowledge in Ms Word

CO2 : To gain basic documentation works in Ms Work

CO3 : Ability to working real time documentation process

CO4 : Ability to identify and analyze worksheet in Ms Excel

CO5 : Ability to understand diagnostic procedures and troubleshooting techniques to office automation

UNIT –I : [6 periods]

Ms word : Create a new document - Open, save and print a document - Edit and format text -Change the page layout, background and borders - Insert headers and footers - Insert and edit tables - Insert clip art and pictures to documents - Perform a mail merge - Share and review shared document files . Outline : Word Basics - Work with Text - Format Documents .

UNIT – II : [6 periods]

Ms Excel : Create, open and view a workbook - Save and print workbooks - Enter and edit data - Modify a worksheet and workbook - Work with cell references - Learn to use functions and formulas - Create and edit charts and graphics - Filter and sort table data.

UNIT- III : [6 periods]

Ms power point : Create a new presentation - Modify presentation themes - Add and edit text to slides - Add new slides to a presentation - Insert clipart images and shapes to slides - Insert and modify tables and charts - Add sound and video to a slide presentation - Insert and edit animations and slide transitions - Display a speaker-lead and self-running presentation –

Unit - IV : [6 periods]

Outline : PowerPoint Basics - Create Presentations - Insert and Modify Text - Work with Graphics and Media - Final Preparations -Deliver a Presentation.

Unit - V : [6 periods]

Creating tables in a desktop database : Exploring the access 2013 desktop database interface - designing tables in a desktop database - modifying your tables design.

Text Books:

1. Joyce Cox and Joan Prepernau, " Step by Step , Microsoft Office Work 2007", Microsoft Press, 2007.
2. Curtis D. Frye, "Step by Step , Microsoft Excel 2010", Microsoft Press, 2010.
3. Jeff Conrad, "Microsoft Access 2013 Inside Out", Microsoft Corporation by O'Reilly Media, Inc. 2013.

Reference Books:

1. Pradeep K Sinha and Priti Sinha , "Computer Fundamentals ", BPB Publications, 2004 .