M.Sc. Computer Science

Syllabus

(For students admitted from 2023-2024 onwards)

Department of Computer Science
Bishop Heber College (Autonomous),

Nationally Re-accredited at the 'A' by NAAC with a CGPA of 3.58 out of 4

Recognized by UGC as "College of Excellence"

Tiruchirappalli 620017

Programme : M.Sc. Computer Science - 2023 onwards

Sem.	Part	Course	Course Title	Course Code	Hours / week	Credits	Marks		
							CIA	ESE	Total
I	Part A	Core Paper I	Object Oriented Analysis and Design and C++	P23CS101	7	5	25	75	100
		Core Paper II	Python Programming	P23CS102	7	5	25	75	100
		Core Practical I	Algorithm and OOPS Lab	P23CS1P1	3	2	40	60	100
		Core Practical II	Python Programing Lab	P23CS1P2	3	2	40	60	100
		Elective I	Advanced Software Engineering	P23CS1:A	5	3	25	75	100
		Elective II	Analysis and Design of Algorithms	P23CS1:B	5	3	25	75	100
					30	20			
II	Part A	Core Paper III	Data Mining and Warehousing	P23CS203	6	5	25	75	100
		Core Paper IV	Advanced Java Programming	P23CS204	6	5	25	75	100
		Core Practical III	Data Mining Lab using R	P23CS2P3	3	2	40	60	100
		Core Practical IV	Advanced Java Programing	P23CS2P4	3	2	40	60	100
		Elective III	Artificial Intelligence and Machine Learning	P23CS2:A	4	3	25	75	100
		Elective IV	Advanced Operating Systems	P23CS2:B	4	3	25	75	100
	Part B	NMEC I	Digital Marketing	P23CS2E1	4	2	25	75	100
					30	22			
III	Part A	Core Paper V	Digital Image Processing	P23CS305	6	5	25	75	100
		Core Paper VI	Cloud Computing	P23CS306	6	5	25	75	100
		Core Paper VII	Network Security and Cryptography	P23CS307	6	5	25	75	100
		Core Practical V	Digital Image Processing Lab using MATLAB	P23CS3P5	3	2	40	60	100
		Core Practical VI	Cloud Computing Lab	P23CS3P6	3	2	40	60	100
		Elective V	Data Science and Analytics	P23CS3:A	3	3	25	75	100
	Part B	NMEC II	Cyber Forensics	P23CS3E2	3	2	25	75	100
		Internship	Internship/ Industrial Activity	P23CS3I1	--	2	100	--	100
					30	26			
IV	Part A	Core Paper VIII	Internet of Things	P23CS408	6	5	25	75	100
		Core Practical VII	Web Application Development and Hosting Practical	P23CS4P7	6	5	40	60	100
		Core Project	Core Project with Viva-Voce	P23CS4PJ	8	7	60	240	300
		Elective VI	Robotic Process Automation for Business	P23CS4:A	4	3	25	75	100
		SEC	Critical Thinking, Design Thinking and problem solving	P23CS4S1	4	2			
		Extension Activity	Extension Activity	P23ETA41	--	1	--	--	--
	Part B	VLO	The Big Picture	P23VLO41	2	2	100	--	100
			Flying High	P23VLO42					
					30	25			
				Total Credits :		91			

Object Oriented Analysis and Design and C++

Course Objectives:
The main objectives of this course are to:

1. Present the object model, classes and objects, object orientation, machine view and model management view.
2. Enables the students to learn the basic functions, principles and concepts of object oriented analysis and design.
3. Enable the students to understand c++ language with respect to ooad

Expected Course Outcomes:
On the successful completion of the course, student will be able to:

1	Understandtheconceptof Object-Orienteddevelopmentandmodelingtechniques	K1,K2
2	Gain knowledge about the various steps performed during objected sign	K2,K3
3	Abstract object-based views for generic software systems	K3
4	Link OOAD with C++ language	K4,K5
5	Apply the basic concept of OOPs and familiarize to write C++ program	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

Unit:1	OBJECTMODEL	15hours

The Object Model: The Evolution of the Object Model – Elements of the Object Model – Applying the Object Model. Classes and Objects: The Nature of an Object – Relationship among Objects**.**

Unit:2	CLASSESANDOBJECTS	15hours

Classes and Object: Nature of Class – Relationship Among classes – The Interplay of classes and Objects. Classification: The importance of Proper Classification –identifying classes and objects –Key Abstractions and Mechanism.

Unit:3	C++INTRODUCTION	15hours

Introduction to C++ Input and output statements in C++ Declarations-control structures– Functions in C++.

Unit:4	INHERITANCEANDOVERLOADING	13hours

Classes and Objects–Constructors and Destructors–operators over loading–Type Conversion-Inheritance – Pointers and Arrays.

Unit:5	POLYMORPHISMANDFILES	15hours

Memory Management Operators-Polymorphism–Virtual functions–Files–Exception Handling – String Handling -Templates.

Unit:6	Contemporary Issues	2 hours
Expert lectures, online seminars –webinars		

		Total Lecture hours	75hours

Text Books	
1	"Object Oriented Analysis and Design with Applications", Grady Booch, Second Edition, Pearson Education.
2	"Object-Oriented Programming with ANSI &Turbo C++", AshokN. Kamthane, First Indian Print -2003, Pearson Education.

Reference Books	
1	Balagurusamy "Object Oriented Programming with C++",TMH, Second Edition,2003.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://onlinecourses.nptel.ac.in/noc19_cs48/preview
2	https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs19/
3	https://www.tutorialspoint.com/object_oriented_analysis_design/ooad_object_oriented_analysis.htm

Mapping with Programming Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	M	S	M	S	S
CO2	S	S	S	M	S	M	S	M	S	S
CO3	S	S	S	M	S	M	S	M	S	S
CO4	S	S	S	M	S	M	S	M	S	S
CO5	S	S	S	M	S	M	S	M	S	S

*S-Strong; M-Medium; L-Low

Python Programming

Course Objectives:
The main objectives of this course are to:

1. Presents an introduction to Python, creation of web applications, network applications and working in the clouds
2. Use functions for structuring Python programs
3. Understand different Data Structures of Python
4. Represent compound data using Python lists, tuples and dictionaries

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the basic concepts of Python Programming	K1,K2
2	Understand File operations, Classes and Objects	K2,K3
3	Acquire Object Oriented Skills in Python	K3,K4
4	Develop web applications using Python	K5
5	Develop Client Server Networking applications	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

Unit:1	INTRODUCTION	15hours

Python: Introduction–Numbers–Strings–Variables–Lists–Tuples–Dictionaries–Sets– Comparison.

Unit:2	CODESTRUCTURES	15hours

Code Structures: if, else if, and else – Repeat with while – Iterate with for – Comprehensions – Functions – Generators – Decorators – Namespaces and Scope – Handle Errors with try and except – User Exceptions.

Unit:3	MODULES,PACKAGESANDCLASSES	15hours

Modules, Packages, and Programs: Standalone Programs – Command-Line Arguments – Modules and the import Statement – The Python Standard Library. **Objects and Classes:** Define a Class with class – Inheritance – Override a Method – Add a Method – Get Help from Parent with super–In self Defense –Get and Set Attribute Values with Properties –Name Mangling for Privacy – Method Types – Duck Typing – Special Methods –Composition.

Unit:4	DATATYPESANDWEB	13hours

Datatypes: Text Strings–Binary Data. **Storing and Retrieving Data:** File Input/Output– Structured Text Files – Structured Binary Files - Relational Databases – NoSQL Data Stores.

Web: Web Clients –Web Servers–Web Services and Automation

Unit:5	SYSTEMSANDNETWORKS	15hours

Systems: Files–Directories–Programs and Processes – Calendars and Clocks.

Concurrency: Queues– Processes–Threads–Green Threads and gevent–twisted–Redis.

Networks: Patterns – The Publish-Subscribe Model – TCP/IP – Sockets – Zero MQ –Internet Services – Web Services and APIs – Remote Processing – Big Fat Data and MapReduce – Working in the Clouds.

Unit:6	Contemporary Issues	2 hours
Expert lectures, online seminars –webinars		
	Total Lecture hours	75hours

Text Books

1	BillLubanovic, "IntroducingPython",O'Reilly,FirstEdition-SecondRelease,2014.
2	Mark Lutz, "Learning Python", O'Reilly, Fifth Edition, 2013.

Reference Books

1	David M. Beazley, "Python Essential Reference", Developer's Library, Fourth Edition, 2009.
2	Sheetal Taneja, Naveen Kumar, "Python Programming-A Modular Approach", Pearson Publications.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://www.programiz.com/python-programming/
2	https://www.tutorialspoint.com/python/index.htm
3	https://onlinecourses.swayam2.ac.in/aic20_sp33/preview

Mapping with Programming -+

Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	M	M	S	M
CO2	S	S	S	S	S	S	S	M	S	M
CO3	S	S	S	S	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	S	M
CO5	S	S	S	S	S	S	S	M	S	M

*S-Strong; M-Medium; L-Low

Algorithm and OOPS Lab

Course Objectives:
The main objectives of this course are to:

1. This course covers the basic data structures like Stack, Queue, Tree, and List.
2. This course enables the students to learn the applications of the data structures using various techniques
3. It also enable the students to understand C++ language with respect to OOAD concepts
4. Application of OOPS concepts.

Expected Course Outcomes:	
On the successful completion of the course, student will be able to:	
1	Understand the concepts of object oriented with respect to C++	K1,K2
2	Able to understand and implement OOPS concepts	K3,K4
3	Implementation of data structures like Stack, Queue, Tree, List using C++	K4,K5
4	Application of the data structures for Sorting, Searching using different techniques.	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

LISTOF PROGRAMS	75hours

1) Write a program to solve the tower of Hanoi using recursion.
2) Write a program to traverse through binary search tree using traversals.
3) Write a program to perform various operation son stack using linked list.
4) Write a program to perform various operation in circular queue.
5) Write a program to sort an array of an elements using quick sort.
6) Write a program to solve number of elements in ascending order using heap sort.
7) Write a program to solve the knap sack problem using greedy method
8) Write a program to search for an element in a tree using divide& conquer strategy.
9) Write a program to place the 8 queens on an8X8matrixso that no two queens Attack.
10) Write a C++program to perform Virtual Function
11) Write a C++ program to perform Parameterized constructor
12) Write a C++ program to perform Friend Function
13) Write a C++program to perform Function Overloading
14) Write a C++program to perform Single Inheritance
15) Write a C++program to perform Employee Details using files.

Expert lectures, online seminars –webinars

	Total Lecture hours	75hours

Text Books	
1	Goodrich, "Data Structures & Algorithms in Java", Wiley 3rd edition.
2	Skiena,"The Algorithm Design Manual",SecondEdition,Springer,2008
Reference Books	

1	Anany Levith,"Introduction to the Design and Analysis of algorithm", Pearson Education Asia, 2003.
2	Robert Sedgewick, Phillipe Flajolet,"An Introduction to the Analysis of Algorithms", Addison-Wesley Publishing Company,1996.

Related Online Contents [MOOC, SWAYAM,NPTEL,Websitesetc.]

1	https://onlinecourses.nptel.ac.in/noc19_cs48/preview
2	https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs19/
3	https://www.tutorialspoint.com/object_oriented_analysis_design/ooad_object_oriented_analysis.htm

Mapping with Programming Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	S	S	S	M	M	S	S
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Python Programing Lab

Course Objectives:
The main objectives of this course are to:
1. This course presents an overview of elementary data items, lists, dictionaries, sets and tuples 2. To understand and write simple Python programs 3. To Understand the OOPS concepts of Python 4. To develop web applications using Python

Expected Course Outcomes:	
On the successful completion of the course, student will be able to:	
1	Able to write programs in Python using OOPS concepts	K1,K2
2	To understand the concepts of File operations and Modules in Python	K2,K3
3	Implementation of lists, dictionaries ,sets and tuples as programs	K3,K4
4	To develop web applications using Python	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

LISTOF PROGRAMS	75hours
Implement the following in Python: 1. Programs using elementary data items, lists, dictionaries and tuples 2. Programs using conditional branches, 3. Programs using loops. 4. Programs using functions 5. Programs using exception handling 6. Programs using inheritance 7. Programs using polymorphism 8. Programs to implement file operations. 9. Programs using modules. 10. Programs for creating dynamic and interactive web pages using forms.	

Total Lecture hours	75hours

Text Books	
1	Bill Luba novic, "Introducing Python",O'Reilly,FirstEdition-SecondRelease,2014.
2	Mark Lutz, "Learning Python", O' Reilly, Fifth Edition, 2013.

Reference Books	
1	David M. Beazley, "Python Essential Reference", Developer's Library, Fourth Edition,2009.
2	Sheetal Taneja, Naveen Kumar, "Python Programming-A Modular Approach", Pearson Publications.

Related Online Contents [MOOC,SWAYAM, NPTEL,Websitesetc.]
1	https://www.programiz.com/python-programming/

2	https://www.tutorialspoint.com/python/index.htm
3	https://onlinecourses.swayam2.ac.in/aic20_sp33/preview

Mapping with Programming Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	M	M	S	S
CO2	S	S	S	S	S	S	S	M	S	M
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Advanced Software Engineering

Course Objectives:
The main objectives of this course are to:

1. Introduce to Software Engineering, Design, Testing and Maintenance.
2. Enable the students to learn the concepts of Software Engineering.
3. Learn about Software Project Management, Software Design & Testing.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand about Software Engineering process	K1,K2
2	Understand about Software project managements kills, design and quality management	K2,K3
3	Analyze on Software Requirements and Specification	K3,K4
4	Analyze on Software Testing, Maintenance and Software Re-Engineering	K4,K5
5	Design and conduct various types and levels of software quality for a software project	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

Unit:1	INTRODUCTION	15hours

Introduction: The Problem Domain – Software Engineering Challenges - Software Engineering Approach – Software Processes: Software Process – Characteristics of a Software Process – Software Development Process Models – Other software processes.

Unit:2	SOFTWAREREQUIREMENTS	15hours

Software Requirements Analysis and Specification : Requirement engineering – Type of Requirements – Feasibility Studies – Requirements Elicitation – Requirement Analysis – Requirement Documentation – Requirement Validation – Requirement Management – SRS - Formal System Specification – Axiomatic Specification – Algebraic Specification - Case study: Student Result management system. Software Quality Management –Software Quality, Software Quality Management System, ISO 9000, SEI CMM.

Unit:3	PROJECT MANAGEMENT	15hours

Software Project Management: Responsibilities of a software project manager – Project planning – Metrics for Project size estimation – Project Estimation Techniques – Empirical Estimation Techniques – COCOMO – Halstead's software science – Staffing level estimation – Scheduling– Organization and Team Structures – Staffing – Risk management – Software Configuration Management – Miscellaneous Plan.

Unit:4	SOFTWAREDESIGN	15hours

Software Design: Outcome of a Design process – Characteristics of a good software design – Cohesion and coupling - Strategy of Design – Function Oriented Design – Object Oriented Design - Detailed Design - IEEE Recommended Practice for Software Design Descriptions.

Unit:5	SOFTWARETESTING	13hours

Software Testing: A Strategic approach to software testing – Terminologies – Functional testing– Structural testing – Levels of testing – Validation testing - Regression testing – Art of Debugging–Testingtools-Metrics-ReliabilityEstimation.SoftwareMaintenance -Maintenance Process - Reverse Engineering – Software Re-engineering - Configuration Management Activities.

Unit:6	Contemporary Issues	2 hours
Expert lectures, online seminars –webinars		

		Total Lecture hours	75hours

Text Books	
1	An Integrated Approach to Software Engineering–Pankaj Jalote, Narosa Publishing House, Delhi, 3rd Edition.
2	Fundament also Software Engineering –RajibMall, PHI Publication,3rd Edition.

Reference Books	
1	Software Engineering–K.K.Aggarwaland Yogesh Singh, New Age International Publishers, 3rd edition.
2	A Practitioners Approach-Software Engineering,-R.S.Pressman, McGraw Hill.
3	Fundamentals of Software Engineering - Carlo Ghezzi, M. Jarayeri, D. Manodrioli, PHI Publication.

Related Online Contents[MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.javatpoint.com/software-engineering-tutorial
2	https://onlinecourses.swayam2.ac.in/cec20_cs07/preview
3	https://onlinecourses.nptel.ac.in/noc19_cs69/preview

Mapping with Programming Outcomes										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	M	M	M	M
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Analysis and Design of Algorithms

Course Objectives:

The main objectives of this course are to:

1. Enable the students to learn the Elementary Data Structures and algorithms.
2. Presents an introduction to the algorithms, their analysis and design
3. DiscussvariousmethodslikeBasicTraversalAndSearchTechniques,divideandconquer method, Dynamic programming, backtracking
4. Understood the various design and analysis of the algorithms.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Get knowledge about algorithms and determines their time complexity. Demonstrate specific search and sort algorithms using divide and conquer technique.	K1,K2
2	Gain good understanding of Greedy method and its algorithm.	K2,K3
3	Able to describe about graphs using dynamic programming technique.	K3,K4
4	Demonstrate the concept of back tracking & branch and bound technique.	K5,K6
5	Explore the traversal and searching technique and apply it for trees and graphs.	K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

Unit:1	INTRODUCTION	15hours

Introduction: - Algorithm Definition and Specification – Space complexity-Time Complexity-Asymptotic Notations - Elementary Data Structure: Stacks and Queues – Binary Tree - Binary Search Tree - Heap – Heapsort- Graph.

Unit:2	TRAVERSALANDSEARCHTECHNIQUES	15hours

Basic Traversal And Search Techniques: Techniques for Binary Trees-Techniques for Graphs - Divide and Conquer: - General Method – Binary Search – Merge Sort – Quick Sort.

Unit:3	GREEDY METHOD	15hours

TheGreedyMethod:-GeneralMethod–KnapsackProblem–MinimumCostSpanningTree– Single Source Shortest Path.

Unit:4	DYNAMICPROGRAMMING	15hours

DynamicProgramming-GeneralMethod–MultistageGraphs–AllPairShortestPath–Optimal Binary Search Trees – 0/1 Knapsacks – Traveling Salesman Problem – Flow Shop Scheduling.

Unit:5	BACKTRACKING	13hours

Backtracking:-GeneralMethod–8-QueensProblem–SumOfSubsets–GraphColoring– Hamiltonian Cycles – Branch And Bound: - The Method – Traveling Salesperson.

Unit:6	Contemporary Issues	2 hours

Expert lectures, online seminars– webinars

		Total Lecture hours	**75hours**

Text Books	
1	Ellis Horowitz, "Computer Algorithms",Galgotia Publications.
2	Alfred V.Aho, JohnE. Hopcroft, Jeffrey D.Ullman, "Data Structures and Algorithms".
Reference Books	
1	Goodrich,"DataStructures&AlgorithmsinJava",Wiley3rd edition.
2	Skiena,"TheAlgorithmDesignManual",SecondEdition,Springer,2008
3	AnanyLevith,"IntroductiontotheDesignandAnalysisofalgorithm",Pearson Education Asia, 2003.
4	Robert Sedgewick, Phillipe Flajolet,"An Introduction to the Analysis of Algorithms", Addison-Wesley Publishing Company,1996.
Related Online Contents [MOOC,SWAYAM,NPTEL,Websitesetc.]	
1	https://nptel.ac.in/courses/106/106/106106131/
2	https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm
3	https://www.javatpoint.com/daa-tutorial

Mapping with Programming Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	M	S	L	M	L	S	M
CO2	S	S	S	S	S	M	S	M	S	M
CO3	S	S	S	S	S	M	S	M	S	M
CO4	S	S	S	S	S	M	S	M	S	M
CO5	S	S	S	S	S	M	S	M	S	M

*S-Strong; M-Medium; L-Low

Data Mining and Warehousing

Course Objectives:
The main objectives of this course are to:
1. Enable the students to learn the concepts of Mining tasks, classification, clustering and Data Warehousing.   2. Develop skills of using recent datamining software for solving practical problems.   3. Develop and apply critical thinking, problem-solving, and decision-making skills.

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Understand the basic data mining techniques and algorithms	K1,K2
2	Understand the Association rules, Clustering techniques and Data ware housing contents	K2,K3
3	Compare andevaluatedifferentdataminingtechniqueslikeclassification,prediction, Clustering and association rule mining	K4,K5
4	Design data warehouse with dimensional modeling and apply OLAP operations	K5,K6
5	Identify appropriate data mining algorithms to solve real world problems	K6
K1-Remember;**K2**-Understand;**K3**-Apply; **K4**-Analyze;**K5**-Evaluate; **K6**-Create		

Unit:1	BASICSANDTECHNIQUES	12hours

Basic data mining tasks – data mining versus knowledge discovery in databases – data mining issues – data mining metrics – social implications of data mining – data mining from a database perspective.

Data mining techniques: Introduction – a statistical perspective on data mining – similarity measures – decision trees – neural networks – genetic algorithms.

Unit:2	ALGORITHMS	12hours

Classification: Introduction –Statistical –based algorithms -distance–based algorithms-decision tree-basedalgorithms-neuralnetwork–basedalgorithms–rule-basedalgorithms–combining Techniques.

Unit:3	CLUSTERINGANDASSOCIATION	12hours

Clustering:Introduction–SimilarityandDistanceMeasures–Outliers–Hierarchical Algorithms
-    Partitional Algorithms.

Association rules: Introduction - large item sets - basic algorithms – parallel & distributed algorithms – comparing approaches- incremental rules – advanced association rules techniques – measuring the quality of rules.

Unit:4	DATAWAREHOUSINGANDMODELING	11hours

Datawarehousing:introduction-characteristicsofadatawarehouse–datamarts–otheraspects

Of DataMart. Online analytical processing: introduction –OLTP &OLAP systems

Data modeling –star schema for multidimensional view –data modeling – multi fact star schema or snow flake schema – OLAP TOOLS – State of the market – OLAP TOOLS and the internet.

Unit:5	APPLICATIONSOFDATA WAREHOUSE	11 hours

Developing a data WAREHOUSE: why and how to build a data warehouse –data warehouse architectural strategies and organization issues - design consideration – data content – metadata distribution of data – tools for data warehousing – performance considerations – crucial decisions in designing a data warehouse.

Applications of data warehousing and data mining in government: Introduction - national data warehouses – other areas for data warehousing and data mining.

Unit:6	Contemporary Issues	2 hours
Expert lectures, online seminars –webinars		

		Total Lecture hours	60hours

Text Books

1	Margaret H.Dunham, "Data Mining: Introductory and Advanced Topics", Pearson education,2003.
2	C.S.R. Prabhu, "Data Warehousing Concepts, Techniques, Products and Applications", PHI, Second Edition.

Reference Books

1	Arun K.Pujari, "Data Mining Techniques", Universities Press(India)Pvt. Ltd.,2003.
2	Alex Berson, Stephen J.Smith, "Data Warehousing, Data Mining and OLAP",TMCH, 2001.
3	Jiawei Han & Micheline "Data Mining Concepts &Techniques", 2001, Kamber, Academic press.

Related Online Contents [MOOC,SWAYAM,NPTEL,Websitesetc.]

1	https://www.javatpoint.com/data-warehouse
2	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs12/
3	https://www.btechguru.com/training--it--database-management-systems--file-structures--introduction-to-data-warehousing-and-olap-2-video-lecture--12054--26--151.html

Mapping with Programming Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	S	M	M	M	M
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Advanced Java Programming

| **Course Objectives:** |
| The main objectives of this course are to: |

1. Enable the students to learn the basic functions, principles and concepts of advanced java programming.
2. Provide knowledge on concepts needed for distributed Application Architecture.
3. LearnJDBC,Servletpackages,JQuery,JavaServerPagesandJARfileformat

Expected Course Outcomes:	
On the successful completion of the course, student will be able to:	
1	Understand the advanced concepts of Java Programming	K1,K2
2	Understand JDBC and RMI concepts	K2,K3
3	Apply and analyze Java in Database	K3,K4
4	Handle different event in java using the delegation event model, event listener and class	K5
5	Design inter active applications using Java Servlet, JSP and JDBC	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply; **K4**-Analyze;**K5**-Evaluate; **K6**-Create

Unit:1	**BASICSOFJAVA**	**12hours**

JavaBasicsReview:Componentsandeventhandling–Threadingconcepts–Networkingfeatures – Media techniques

Unit:2	**REMOTEMETHOD INVOCATION**	**12hours**

Remote Method Invocation-Distributed Application Architecture- Creating stubs and skeletons-Defining Remote objects- Remote Object Activation-Object Serialization-Java Spaces

Unit:3	**DATABASE**	**10hours**

Java in Databases-JDBC principles– data base access-Interacting-data base search–Creating multimedia databases – Database support in web applications

Unit:4	**SERVLETS**	**12hours**

Java Servlets: Java Servlet and CGI programming- A simple java Servlet-Anatomy of a java Servlet-Reading data from a client-Reading http request header-sending data to a client and writing the http response header-working with cookies
Java Server Pages: JSP Overview-Installation-JSP tags-Components of a JSP page-Expressions-Script lets-Directives-Declarations-A complete example

Unit:5	**ADVANCEDTECHNIQUES**	**12hours**

JAR file format creation–Internationalization–Swing Programming–Advanced java

techniques			
Unit:6	**Contemporary Issues**		**2 hours**
Expert lectures, online seminars –webinars			
	Total Lecture hours		**60hours**

	Text Books
1	JamieJaworski, "JavaUnleashed",SAMSTechmediaPublications,1999.
2	Campione, Walrath and Huml, "TheJavaTutorial",AddisonWesley,1999.
	Reference Books
1	Jim Keogh, "The Complete Reference J2EE", Tata McGraw Hill Publishing CompanyLtd,2010.
2	DavidSawyerMcFarland, "JavaScriptAndJQuery-TheMissingManual",Oreilly Publications, 3rd Edition,2011.
3	Deitel and Deitel, "Java How to Program", Third Edition, PHI/Pearson Education Asia.
	Related Online Contents[MOOC,SWAYAM,NPTEL,Websitesetc.]
1	https://www.javatpoint.com/servlet-tutorial
2	https://www.tutorialspoint.com/java/index.htm
3	https://onlinecourses.nptel.ac.in/noc19_cs84/preview

Mapping with Programming Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	S	S	S	M	M	M	S
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Data Mining Lab using R

Course Objectives:
The main objectives of this course are to:

1. ToenablethestudentstolearntheconceptsofDataMiningalgorithmsnamelyclassification, clustering, regression….
2. To understand & write programs using the DM algorithms
3. To apply statistical interpretations for the solutions
4. Able to use visualizations techniques for interpretations

Expected Course Outcomes:	
On the successful completion of the course, student will be able to:	
1	AbletowriteprogramsusingRforAssociationrules,Clusteringtechniques	K1,K2
2	To implement datamining techniques like classification, prediction	K2,K3
3	Able to use different visualizations techniques using R	K4,K5
4	Toapplydifferentdataminingalgorithmstosolverealworldapplications	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

LISTOF PROGRAMS	**75hours**

1. Implement Apriori algorithm to extract association rule of datamining.

2. Implement k-means clustering technique.

3. Implement any one Hierarchal Clustering.

4. Implement Classification algorithm.

5. Implement Decision Tree.

6. Linear Regression.

7. Data Visualization.

Total Lecture hours	**75hours**

Text Books	
1	Margaret H. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson education,2003.
2	C.S.R. Prabhu, "Data Warehousing Concepts, Techniques, Products and Applications", PHI, Second Edition

Reference Books	
1	Arun K. Pujari, "Data Mining Techniques", Universities Press(India)Pvt. Ltd.,2003.
2	Alex Berson, Stephen J. Smith, "Data Warehousing, Data Mining and OLAP",TMCH, 2001.

Related Online Contents [MOOC, SWAYAM,NPTEL,Websitesetc.]	
1	https://www.javatpoint.com/data-warehouse
2	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs12/
3	https://www.btechguru.com/training--it--database-management-systems--file-structures--introduction-to-data-warehousing-and-olap-2-video-lecture--12054--26--151.html

Mapping with Programming Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	M	M	S	S
CO2	S	S	S	S	S	S	S	M	S	M
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Advanced Java Programing Lab

Course Objectives:
The main objectives of this course are to: 1. To enable the students to implement the simple programs using JSP, JAR 2. To provide knowledge on using Servlets, Applets 3. To introduce JDBC and navigation of records 4. To understand RMI& its implementation 5. To introduce to Socket programming

Expected Course Outcomes:	
On the successful completion of the course, student will be able to:	
1	Understand to the implement concepts of Java using HTML forms, JSP&JAR	K1,K2
2	Must be capable of implementing JDBC and RMI concepts	K3,K4
3	Able to write Applets with Event handling mechanism	K4,K5
4	To Create interactive web based applications using servlets and jsp	K5,K6
K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create	

LISTOF PROGRAMS	75hours
1. Display a welcome message using Servlet. 2. Design a Purchase Order form using Html form and ervlet. 3. Develop a program for calculating the percentage of marks of a student using JSP. 4. Design a Purchase Order form using Html form and JSP. 5. Prepare a Employee pay slip using JSP. 6. Write a program using JDBC for creating table, Inserting, Deleting records and list out the records. 7. Write a program using Java servlet to handle form data. 8. WriteasimpleServletprogramtocreateatableofalltheheadersitreceivesalongwiththeirassociate dvalues. 9. Write a program in JSP by using session object. 10. Write a program to build a simple Client Server application using RMI. 11. Create an applet for a calculator application. 12. Programtosendatextmessagetoanothersystemandreceivethetextmessagefromthe system (use socket programming).	
Expert lectures, online seminars –webinars	

Total Lecture hours	**75hours**

	Text Books
1	JamieJaworski,"JavaUnleashed",SAMSTechmediaPublications,1999.
2	Campione, Walrath and Huml,"TheJavaTutorial",AddisonWesley,1999.
	Reference Books
1	JimKeogh,"TheCompleteReferenceJ2EE",Tata McGraw Hill Publishing Company Ltd,2010.
2	DavidSawyerMcFarland,"JavaScriptAndJQuery-TheMissingManual",Oreilly Publications, 3rd Edition,2011.
	Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://www.javatpoint.com/servlet-tutorial
2	https://www.tutorialspoint.com/java/index.htm
3	https://onlinecourses.nptel.ac.in/noc19_cs84/preview

Mapping with Programming Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	M	M	S	M
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Artificial Intelligence & Machine Learning

Course Objectives:

The main objectives of this course are to:

1. Enable the students to learn the basic functions of AI, Heuristic Search Techniques.
2. ProvideknowledgeonconceptsofRepresentationsandMappingsandPredicate Logic.
3. Introduce Machine Learning with respect Data Mining, Big Data and Cloud.
4. Study about Applications & Impact of ML.

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Demonstrate AI problems and techniques	K1,K2
2	Understand machine learning concepts	K2,K3
3	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning	K3,K4
4	Analyze the impact of machine learning on applications	K4,K5
5	Analyze and design are al world problem for implementation and understand the dynamic behavior of a system	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

Unit:1	INTRODUCTION	12hours

Introduction: AI Problems - Al techniques - Criteria for success. Problems, Problem Spaces, Search: State space search - Production Systems - Problem Characteristics - Issues in design of Search.

Unit:2	SEARCHTECHNIQUES	12hours

Heuristic Search techniques: Generate and Test - Hill Climbing- Best-First, Problem Reduction, Constraint Satisfaction, Means-end analysis. Knowledge representation issues: Representations and mappings -Approaches to Knowledge representations -Issues in Knowledge representations - Frame Problem.

Unit:3	PREDICATELOGIC	12hours

Using Predicate logic: Representing simple facts in logic - Representing Instance and Isa relationships - Computable functions and predicates - Resolution - Natural deduction. Representing knowledge using rules: Procedural Vs Declarative knowledge- Logic programming -Forward Vs Backward reasoning -Matching-Control knowledge.

Unit:4	MACHINELEARNING	12hours

UnderstandingMachineLearning:WhatIsMachineLearning?-DefiningBigData-BigDatain ContextwithMachineLearning-TheImportanceoftheHybridCloud-LeveragingthePowerof Machine Learning-The Roles of Statistics and Data Mining with Machine Learning-Putting Machine Learning in Context-Approaches to Machine Learning.

Unit:5	APPLICATIONSOFMACHINE LEARNING	10hours

Looking Inside Machine Learning: The Impact of Machine Learning on Applications-Data Preparation-The Machine Learning Cycle.

Unit:6	Contemporary Issues	2 hours

Expert lectures, online seminars –webinars

	Total Lecture hours	60hours

Text Books

1	Elaine Rich and Kevin Knight, "Artificial Intelligence" ,Tata McGraw Hill Publishers company Pvt Ltd, Second Edition, 1991.
2	GeorgeFLuger,"ArtificialIntelligence",4th Edition, Pearson Education Publ,2002.

Reference Books

1	Machine Learning For Dummies®, IBM Limited Edition by Judith Hurwitz, Daniel Kirsch.

Related Online Contents [MOOC, SWAYAM, NPTEL, and Websitesetc.]

1	https://www.ibm.com/downloads/cas/GB8ZMQZ3
2	https://www.javatpoint.com/artificial-intelligence-tutorial
3	https://nptel.ac.in/courses/106/105/106105077/

Mapping with Programming Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	M	S
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Advanced Operating Systems

Course Objectives:

The main objectives of this course are to:

1. Enable the students to learn the different types of operating systems and their functioning.
2. Gain knowledge on Distributed Operating Systems
3. Gain insight into the components and management aspects of real time and mobile operating systems.
4. Learn case studies in Linux Operating Systems

Expected Course Outcomes:	
On the successful completion of the course, student will be able to:	
1	Understand the design issues associated with operating systems	K1,K2
2	Mastervariousprocessmanagementconceptsincludingscheduling,deadlocks and distributed file systems	K3,K4
3	Prepare Real Time Task Scheduling	K4,K5
4	Analyze Operating Systems for Handheld Systems	K5
5	Analyze Operating Systems like LINUX and iOS	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

Unit:1	**BASICSOFOPERATINGSYSTEMS**	**12hours**

Basics of Operating Systems: What is an Operating System? – Main frame Systems –Desktop Systems – Multiprocessor Systems – Distributed Systems – Clustered Systems –Real-Time Systems – Handheld Systems – Feature Migration – Computing Environments -Process Scheduling – Cooperating Processes – Inter Process Communication- Deadlocks –Prevention – Avoidance – Detection – Recovery.

Unit:2	**DISTRIBUTEDOPERATINGSYSTEMS**	**12hours**

Distributed Operating Systems: Issues – Communication Primitives – Lamport's Logical Clocks – Deadlock handling strategies – Issues in deadlock detection and resolution-distributed file systems –design issues – Case studies – The Sun Network File System-Coda.

Unit:3	**REALTIMEOPERATINGSYSTEM**	**10hours**

Real time Operating Systems : Introduction – Applications of Real Time Systems – Basic Model of Real Time System – Characteristics – Safety and Reliability - Real Time Task Scheduling

Unit:4	**HANDHELDSYSTEM**	**12hours**

OperatingSystemsforHandheldSystems:Requirements–TechnologyOverview–Handheld OperatingSystems–PalmOS-SymbianOperatingSystem-Android–Architectureofandroid–

Securing handheld systems

Unit:5	**CASE STUDIES**	**12hours**

Case Studies : Linux System: Introduction – Memory Management – Process Scheduling – Scheduling Policy - Managing I/O devices – Accessing Files- iOS : Architecture and SDK Framework - Media Layer - Services Layer - Core OS Layer - File System.

Unit:6	Contemporary Issues	2 hours

Expert lectures, online seminars–webinars

	Total Lecture hours	60hours

Text Books

1	Abraham Silbers chatz; PeterBaerGalvin; GregGagne,"Operating System Concepts", Seventh Edition, John Wiley & Sons, 2004.
2	Mukesh Singhal and Niranjan G. Shivaratri, "Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems", Tata McGraw-Hill, 2001.

Reference Books

1	Rajib Mall, "Real-Time Systems: Theory and Practice", Pearson Education India, 2006.
2	Pramod Chandra P.Bhatt, An introduction to operating systems, concept and practice, PHI, Third edition, 2010.
3	Daniel.P.Bovet&MarcoCesati,"UnderstandingtheLinuxkernel",3rdedition,O"Reilly,2005
4	NeilSmyth,"iPhoneiOS4DevelopmentEssentials–Xcode",FourthEdition,Payload media, 2011.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://onlinecourses.nptel.ac.in/noc20_cs04/preview
2	https://www.udacity.com/course/advanced-operating-systems--ud189
3	https://minnie.tuhs.org/CompArch/Resources/os-notes.pdf

Mapping with Programming Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	S	M	M	M	M
CO2	S	M	S	S	S	S	S	M	S	M
CO3	S	M	S	S	S	S	S	M	S	M
CO4	S	M	S	S	S	S	S	M	S	M
CO5	S	M	S	S	S	S	S	M	S	M

*S-Strong; M-Medium; L-Low

Digital Marketing

Course Objectives:

This course attempts to help students to understand both functional and management roles required to plan and execute effective Digital Marketing campaigns.

Learning Outcome:

On having completed this course student should be able to:

CLO 1: Outline the basics of digital marketing and digital marketing plan.

CLO 2: Utilize the concepts of display ads and e-mail marketing in digital campaigns.

CLO 3: Choose the appropriate social media for achieving the objectives of the campaign.

CLO 4: Appraise the SEO and SEM efforts of any business organization.

CLO 5: Explain Mobile Marketing and Web Analytics pertaining to any business.

CLO 6: Design and run a digital marketing campaign for a client.

UNIT I: Introduction to Digital Marketing

Digital Marketing: Origin of digital marketing - Traditional Vs Digital Marketing - Internet Users in India - Grehan's 4Ps of digital marketing - The consumer decision journey - The P-O-E-M Framework - The digital landscape - Digital Marketing Plan. Ethical Challenges - Frauds on the Web, Data and Identity Theft, Issue of Privacy. Information Technology Act, 2000.

UNIT II: Advertising and e-mail Marketing

Concept of Display Advertising: Types of display Ads - Buying Models - Display Plan - Targeting – Contextual targeting- Placement Targeting-Remarketing- Interest categories- Geographic Language Tagging - What makes a good Ad? Programmatic digital advertising - Analytics tools – view ability, on target reach, Ad fraud, Brand Health. E-mail Marketing – Building a List- Content Strategies – e-mail newsletter – Automating e-mail marketing- Analytics.

UNIT III: Social Media Marketing

How to build a successful social media strategy? Facebook Marketing - Facebook for Business - Anatomy of an Ad campaign – Adverts - Facebook Insights LinkedIn Marketing – LinkedIn Strategy- Sales lead generation – Content Strategy – LinkedIn Analytics – Targeting – Ad Campaign Twitter Marketing – Getting started with Twitter – Building a content strategy – Twitter Ads – Twitter Analytics Instagram Marketing – Objectives – Content Strategy – Style guidelines – Hashtags – Videos -Sponsored Ads – Apps – Generate leads.

UNIT IV: Search Engine Advertising and Search Engine Optimization

Why pay for Search Advertising? Understanding Ad Placement - Understanding Ad ranks - Creating the first Ad campaign - Enhancing the Ad campaigns; Performance reports. Google AdSense. Search Engine Optimisation – How search engine works? SEO Phases; On page Optimisation; Off page Optimisation - Social Media Reach – Maintenance

UNIT V: Mobile Marketing and Web Analytics

Mobile Advertising – Mobile Marketing toolkit – Mobile Marketing Features – Mobile Analytics Web Analytics – Key Metrics – Making web analytics actionable – Types of tracking codes

Text Books:

1. Seema Gupta. (2018). Digital Marketing (1st Ed). Tata Mc Graw Hill.

Reference Books:

1. Ryan, D. & Jones, C. (2012). Understanding digital marketing: Marketing strategies for engaging the digital generation. Kogan Page.

Digital Image Processing

Course Objectives:
The main objectives of this course are to:
1. Learn basic image processing techniques for solving real problems.   2. Gain knowledge in image transformation and Image enhancement techniques.   3. Learn Image compression and Segmentation procedures.

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1	Understand the fundamentals of Digital Image Processing	K1,K2
2	Understand the mathematical foundations for digital image representation, image acquisition, image transformation, and image enhancement	K2,K3
3	Apply, Design and Implement and get solutions for digital image processing problems	K3,K4
4	Applytheconceptsoffilteringandsegmentationfordigitalimageretrieval	K4,K5
5	Explore the concepts of Multi-resolution process and recognize the objects in an efficient manner	K5,K6
K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create		

Unit:1	INTRODUCTION	12hours

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:2	IMAGEENHANCEMENT	12hours

Image Enhancement in the spatial domain: - Background – some basic Gray level Transformations – Histogram Processing – Enhancement using Arithmetic / Logic operations – Basics of spatial filtering – Smoothing spatial filters – Sharpening spatial filters – Combining spatial enhancement methods.

Unit:3	IMAGERESTORATION	12hours

Image Restoration: A model of the Image Degradation / Restoration Process – Noise models – Restoration is the process of noise only – Spatial Filtering – Periodic Noise reduction by frequency domain filtering – Linear, Portion – Invariant Degradations – Estimating the degradation function – Inverse filtering – Minimum mean square Error Filtering – Constrained least squares filtering – Geometric mean filter – Geometric Transformations.

Unit:4	IMAGECOMPRESSION	11hours

Image Compression: Fundamentals–Image compression models–Elements of Information Theory – Error Free compression – Lossy compression – Image compression standards.

Unit:5	IMAGESEGMENTATION	11hours

Image Segmentation: Detection and Discontinuities – Edge Linking and Boundary deduction – Thresholding – Region-Based segmentation – Segmentation by Morphological watersheds – The use of motion in segmentation.

Unit:6	Contemporary Issues	2 hours

Expert lectures, online seminars –webinars

		Total Lecture hours	**60hours**

Text Books

1	RafaelC.Gonzalez,RichardE.Woods,"DigitalImageProcessing",SecondEdition,PHI/Pearson Education.
2	B.Chanda, D.Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2003.

Reference Books

1	NickEfford,"DigitalImageProcessingapracticalintroducingusingJava",Pearson Education, 2004.

Related Online Contents [MOOC, SWAYAM, NPTEL,Websitesetc.]

1	https://nptel.ac.in/courses/117/105/117105135/
2	https://www.tutorialspoint.com/dip/index.htm
3	https://www.javatpoint.com/digital-image-processing-tutorial

Mapping with Programming Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	M	S	M	M	S
CO2	S	S	S	S	S	M	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Cloud Computing

The main objectives of this course are to:

1. Gain knowledge on cloud computing, cloud services, architectures and applications.
2. Enable the students to learn the basics of cloud computing with real time usage
3. How to store and share, in and from cloud?

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the concepts of Cloud and its services	K1,K2
2	Collaborate Cloud for Event &Project Management	K3,K4
3	Analyze on cloud in –Word Processing, Spread Sheets, Mail, Calendar, Database	K4,K5
4	Analyze cloud in social networks	K5,K6
5	Explore cloud storage and sharing	K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

Unit:1	**INTRODUCTION**	**12hours**

INTRODUCTION Cloud Computing Introduction, From, Collaboration to cloud, Working of cloud computing, pros and cons, benefits, developing cloud computing services, Cloud service development, discovering cloud services.

Unit:2	**CLOUDCOMPUTING**	**12hours**

CLOUD COMPUTING FOR EVERYONE Centralizing email communications, cloud computing for community, collaborating on schedules, collaborating on group projects and events, cloud computing for corporation, mapping, schedules, managing projects, presenting on road.

Unit:3	**CLOUDSERVICES**	**12hours**

USING CLOUD SERVICES Collaborating on calendars, Schedules and task management, exploring on line scheduling and planning, collaborating on event management, collaborating on contact management, collaborating on project management, collaborating on word processing, spreadsheets, and databases.

Unit:4	**OUTSIDETHECLOUD**	**12hours**

OUTSIDETHECLOUDEvaluatingwebmailservices,Evaluatinginstantmessaging, Evaluatingwebconferencetools,creatinggroupsonsocialnetworks,Evaluatingonline

Groupware, collaborating via blogs and wikis.

Unit:5	**STORINGAND SHARING**	**10hours**

STORING AND SHARING Understanding cloud storage, evaluating on line file storage, exploring on line book marking services, exploring on line photo editing applications, exploring photo sharing communities, controlling it with web based desktops.

Unit:6	Contemporary Issues	2 hours
Expert lectures, online seminars –webinars		
	Total Lecture hours	**60hours**

Text Books	
1	Michael Miller, "Cloud Computing", Pearson Education, New Delhi, 2009.
Reference Books	
1	Anthony T. Velte, "Cloud Computing: A Practical Approach", 1st Edition, Tata McGraw Hill Education Private Limited, 2009.
Related Online Contents[MOOC, SWAYAM, NPTEL, Websitesetc.]	
1	https://nptel.ac.in/courses/106/105/106105167/
2	https://www.tutorialspoint.com/cloud_computing/index.htm
3	https://www.javatpoint.com/cloud-computing-tutorial

Mapping with Programming Outcomes									
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	L	S	M	S	M	S	M	M	M	S
CO2	M	S	M	S	S	S	M	M	M	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	M	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Network Security and Cryptography

Course Objectives:

The main objectives of this course are to:

1. Enable students to learn the Introduction to Cryptography, Web Security and Case studies in Cryptography.
2. Togainknowledgeonclassicalencryptiontechniquesandconceptsofmodulararithmeticand number theory.
3. To explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms.
4. To explore the design issues and working principles of various authentication Applications and various secure communication standards including Kerberos, IPsec, and SSL/TLS and email.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the process of the cryptographic algorithms	K1,K2
2	Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication	K2,K3
3	Apply and analyze appropriate security techniques to solve network security problem	K3,K4
4	Explore suitable cryptographic algorithms	K4,K5
5	Analyze different digital signature algorithms to achieve authentication and design secure applications	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

Unit:1	INTRODUCTION	12hours

Introduction to Cryptography – Security Attacks – Security Services –Security Algorithm- Stream cipher and Block cipher - Symmetric and Asymmetric-key Cryptosystem Symmetric Key Algorithms: Introduction – DES – Triple DES – AES – IDEA – Blowfish – RC5.

Unit:2	CRYPTOSYSTEM	12hours

Public-key Crypto system: Introduction to Number Theory-RSA Algorithm–Key Management -Diffie-Hellman Key exchange–Elliptic Curve Cryptography Message Authentication and Hash functions – Hash and Mac Algorithm – Digital Signatures and Authentication Protocol.

Unit:3	NETWORK SECURITY	12hours

Network Security Practice: Authentication Applications–Kerberos–X.509 Authentication services and Encryption Techniques. E-mail Security – PGP – S / MIME – IP Security.

Unit:4	WEB SECURITY	10hours

Web Security- Secure Socket Layer–Secure Electronic Transaction. System Security- Intruders and Viruses – Firewalls– Password Security.

Unit:5	CASE STUDY	12hours

Case Study: Implementation of Cryptographic Algorithms–RSA–DSA–ECC(C/JAVA Programming). Network Forensic – Security Audit - Other Security Mechanism: Introduction to: Stenography – Quantum Cryptography – Water Marking - DNA Cryptography		

Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars–webinars		

	Total Lecture hours	**60hours**

Text Books	
1	William Stallings, "Cryptography and Network Security", PHI/Pearson Education.
2	Bruce Schneir, "Applied Cryptography", CRC Press.
Reference Books	
1	A.Menezes, P Van Oorschot and S.Vanstone, "Hand Book of Applied Cryptography", CRC Press, 1997
2	Ankit Fadia,"Network Security", Macmillan.

Related Online Contents [MOOC,SWAYAM,NPTEL,Websitesetc.]
1	https://nptel.ac.in/courses/106/105/106105031/
2	http://www.nptelvideos.in/2012/11/cryptography-and-network-security.html
3	https://www.tutorialspoint.com/cryptography/index.htm

Mapping with Programming Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	M	L	S	M	S	M	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Digital Image Processing Lab using MATLAB

Course Objectives:
The main objectives of this course are to:
1. To understand the basics of Digital Image Processing fundamentals, image enhancement and image restoration techniques
2. To enable the students to learn the fundamentals of image compression and segmentation
3. To understand Image Restoration & Filtering Techniques
4. Implementation of the above using MATLAB

Expected Course Outcomes:	
On the successful completion of the course, student will be able to:	
1 To write programs in MATLAB for image processing using the techniques	K1,K2
2 To able to implement Image Enhancements & Restoration techniques	K2,K3
3 Capable of using Compression techniques in an Image	K3,K4
4 Must be able to manipulate the image and Segment it	K5,K6
K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create	

LISTOF PROGRAMS	**60hours**
1. Implement Image enhancement Technique.	
2. Histogram Equalization	
3. Image Restoration.	
4. Implement Image Filtering.	
5. Edge detection using Operators(Roberts, Prewitts and Sobel soperators)	
6. Implement image compression.	
7. Image Subtraction	
8. Boundary Extraction using morphology.	
9. Image Segmentation	
Total Lecture hours	**60hours**

Text Books	
1	Rafael Gonzalez, Richard E.Woods, "Digital Image Processing", Second Edition,
	PHI/Pearson Education.
2	B.Chanda,D.Dutta Majumder,"Digital Image Processing and Analysis", PHI, 2003.
Reference Books	
1	NickEfford, "DigitalImageProcessingapracticalintroducingusingJava",Pearson Education, 2004.

Related Online Contents [MOOC,SWAYAM,NPTEL,Websitesetc.]
1   https://nptel.ac.in/courses/117/105/117105135/

2	https://www.tutorialspoint.com/dip/index.htm
3	https://www.javatpoint.com/digital-image-processing-tutorial

Mapping with Programming Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	M	M	S	S
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Cloud Computing Lab

Course Objectives:

The main objectives of this course are to:

1. This course covers the basic data structures like Stack, Queue, Tree, List.

2. This course enables the students to learn the applications of the data structures using various techniques

3. It also enable the students to understand C++language with respect to OOAD concepts

4. Application of OOPS concepts

Expected Course Outcomes:	

On the successful completion of the course, student will be able to:

1	Understand the concepts of object oriented with respect to C++	K1,K2
2	Able to understand and implement OOPS concepts	K3,K4
3	Implementation of data structures like Stack, Queue, Tree, List using C++	K4,K5
4	Application of the data structures for Sorting, Searching using different techniques.	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

LISTOF PROGRAMS	60hours

1. Working with Google Drive to make spread sheet and notes.

2. Launch a Linux Virtual Machine.

3. To host astatic website

4. ExploringGooglecloudforthefollowinga)Storageb)Sharingofdatac)manageyour calendar, to-do lists, d) a document editing tool

5. Working and installation of Google App Engine

6. Working and installation of Microsoft Azure

7. To Connect Amazon RedshiftwithS3bucket

8. To Create and Query a NoSQL Table

Expert lectures, online seminars–webinars

	Total Lecture hours	60hours

Text Books	
1	Michael Miller, "Cloud Computing", Pearson Education, New Delhi, 2009.

Reference Books	
1	Anthony T. Velte, "Cloud Computing: A Practical Approach", 1st Edition, Tata McGraw Hill Education Private Limited, 2009.

Related Online Contents[MOOC,SWAYAM,NPTEL,Websitesetc.]	
1	https://nptel.ac.in/courses/106/105/106105167/
2	https://www.tutorialspoint.com/cloud_computing/index.htm
3	https://www.javatpoint.com/cloud-computing-tutorial

Mapping with Programming Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	M	M	S	S
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Data Science & Analytics

Course Objectives:

The main objectives of this course are to:

1. Introduce the students to data science, big data & its ecosystem.
2. Learn data analytics &its life cycle.
3. To explore the programming language R, with respect to the data mining algorithms.
4. Relate the relationship between artificial intelligence, machine learning and data science.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the concept of data science and its techniques	K1,K2
2	Review data analytics	K2,K3
3	ApplyanddetermineappropriateDataMiningtechniquesusingRtorealtime applications	K3,K4
4	Analyze on clustering algorithms	K4,K5
5	Analyze on regression methods in AI	K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5** -Evaluate; **K6**-Create

Unit:1	INTRODUCTION	12hours

Introduction of Data Science: data science and big data–facets of data-data science process-Ecosystem- The Data Science process – six steps- Machine Learning.

Unit:2	BASICSOFDATA ANALYTICS	12hours

DataAnalyticslifecycle-reviewofdataanalytics-AdvanceddataAnalytics-technologyand tools.

Unit:3	DATAANALYTICSUSINGR	12hours

Basic Data Analytics using R : R Graphical User Interfaces – Data Import and Export – Attribute and Data Types –Descriptive Statistics – Exploratory Data Analysis –Visualization Before Analysis – Dirty Data – Visualizing a Single Variable – Examining Multiple Variables – Data Exploration Versus Presentation.

Unit:4	CLUSTERING	12hours

Overview of Clustering : K-means – Use Cases – Overview of the Method – Perform a K-means Analysis using R –Classification – Decision Trees – Overview of a Decision Tree – Decision Tree Algorithms – Evaluating a Decision Tree – Decision Tree in R – Bayes' Theorem – Naïve Bayes Classifier – Smoothing – Naïve Bayes in R.

Unit:5	ARTIFICIALINTELLIGENCE	10hours

Artificial intelligence: Machine Learning and deep learning in data science-Clustering, association rules. Linear regression-logistic regression-Additional regression methods.

Unit:6	Contemporary Issues	2 hours

Expert lectures, online seminars –webinars

		Total Lecture hours	60hours

Text Books

1	Introducing-Data-Science-Big-Data-Machine-Learning-and-more-using-Python-tools-2016. Pdf
2	Data science in big data analytics-Wiley2015JohnWiley&Sons

Reference Books

1	AsimpleintroductiontoDataScience-LarsNielson2015
2	Introducing Data Science Davy Cielen, Arno D.B.Meysman, Mohamed Ali 2016 Manning Publication
3	R Programming for Data Science-Roger D.Peng 2015LeanPublication
4	DataScience&BigDataAnalytics:Discovering,Analyzing,VisualizingandPresenting Data

Related Online Contents [MOOC,SWAYAM,NPTEL,Websitesetc.]

1	https://www.tutorialspoint.com/python_data_science/index.htm
2	https://www.javatpoint.com/data-science
3	https://nptel.ac.in/courses/106/106/106106179/

Mapping with Programming Outcomes									
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	S	S	S	S	M	M	S
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	M	S	S

*S-Strong;M-Medium;L-Low

Internet of Things

Course Objectives:
The main objectives of this course are to:

1. About Internet of Things where various communicating entities are controlled and managed for decision making in the application domain.
2. Enable students to learn the Architecture of IoT and IoT Technologies
3. Developing IoT applications and Security in IoT, Basic Electronics for IoT, Arduino IDE, Sensors and Actuators Programming NODEMCU using Arduino IDE.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand about IoT, its Architecture and its Applications	K1,K2
2	Understand basic electronics used in IoT & its role	K2,K3
3	Develop applications with C using Arduino IDE	K4
4	Analyze about sensors and actuators	K5,K6
5	Design IoT in real time applications using today's internet & wireless technologies	K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

Unit:1	INTRODUCTION	12hours

Introduction to IoT: Evolution of IoT – Definition & Characteristics of IoT - Architecture of IoT– Technologies for IoT – Developing IoT Applications – Applications of IoT – Industrial IoT – Security in IoT

Unit:2	BASIC ELECTRONICS FOR IoT	12hours

Basic Electronics for IoT: Electric Charge, Resistance, Current and Voltage – Binary Calculations – Logic Chips – Microcontrollers – Multipurpose Computers – Electronic Signals – A/D and D/A Conversion – Pulse Width Modulation.

Unit:3	PROGRAMMINGUSINGARDUINO	12hours

Programming Fundamentals with C using Arduino IDE: Installing and Setting up the Arduino IDE – Basic Syntax – Data Types/ Variables/ Constant – Operators – Conditional Statements and Loops – Using Arduino C Library Functions for Serial, delay and other invoking Functions – Strings and Mathematics Library Functions.

Unit:4	SENSORSANDACTUATORS	10hours

SensorsandActuators:AnalogandDigitalSensors–Interfacingtemperaturesensor,ultrasound

Sensor and infrared (IR) sensor with Arduino– Interfacing LED and Buzzer with Arduino.

Unit:5	SENSORDATAININTERNET	12hours

Sending Sensor Data Over Internet: Introduction to ESP8266 NODEMCU WiFi Module – Programming NODEMCU using Arduino IDE – Using WiFi and NODEMCU to transmit data from temperature sensor to Open Source IoT cloud platform (Thing Speak).

Unit:6	Contemporary Issues	2 hours

Expert lectures, online seminars –webinars

		Total Lecture hours	hours

Text Books

1	Arshdeep Bahga, Vijay Madisetti,"InternetofThings:AHands-OnApproach",2014. ISBN: 978-0996025515
2	Boris Adryan, Dominik Obermaier, Paul Fremantle, "The Technical Foundations of IoT", Artech Houser Publishers, 2017.

Reference Books

1	MichaelMargolis,"ArduinoCookbook",O"Reilly,2011
2	Marco Schwartz, "InternetofThingswithESP8266",Packt Publishing, 2016.
3	DhivyaBala,"ESP8266:StepbyStepTutorialforESP8266IoT,ArduinoNODEMCU Dev. Kit", 2018.

Related Online Contents [MOOC, SWAYAM, NPTEL,Websitesetc.]

1	https://onlinecourses.nptel.ac.in/noc20_cs66/preview
2	https://www.javatpoint.com/iot-internet-of-things
3	https://www.tutorialspoint.com/internet_of_things/index.htm

Mapping with Programming Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	M	S	M	S	M	M	S	M
CO2	M	S	M	S	M	S	M	S	S	S
CO3	S	S	S	S	M	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low;

SEMESTER: IV	HOURS/WEEK : 6
COURSE CODE: P23CS4P7	CREDITS : 5

Web Application Development & Hosting Practical

Course Objectives:

The main objectives of this course are to:

1. Able to design a webpage using HTML tags

2. To enable the students to use Frame sets, hyperlinks and different formatting features of HTML tags

3. Enable the students to use Forms & other control sin a web page

4. To create interactive applications using PHP

Expected Course Outcomes:	

On the successful completion of the course, student will be able to:

1	Understand & implement the basic HTML tags to create static webpages	K1,K2
2	Capable of using hyperlinks, frames, images, tables,..... in a web page	K2,K3
3	Able to write dynamic web applications using HTML forms	K4,K5
4	Must be able to write dynamic web applications in PHP & HTML tags using XAMPP.	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

LISTOF PROGRAMS	30hours

1. Develop a website for your college using advanced tags of HTML.

2. Write names of several countries in a paragraph and store it as an HTML document, world.html. Each country name must be a hot text. When you click India (for example), it must open india.html and it should provide a brief introduction about India.

3. Develop a HTML document to i)display Text with Bullets / Numbers - Using Lists ii) to display the Table Format Data

4. Develop a Complete Web Page using Frames and Framesets which gives the Information about a Hospital using HTML.

5. Write a HTML document to print your Bio-Data in a neat format using several components.

6. Develop a HTMLdocumenttodisplayaRegistrationFormforaninter-collegiatefunction.

7. Using HTML form accept Customer details like Name, City, Pin code, Phone number and Email address and validate the data and display appropriate messages for violations using PHP

(Eg. Name is Mandatory field; Pin code must be 6 digits, etc.).

8. Write a program to accept two number sn1 and n2 using HTML form and display the Prime

numbersbetweenn1 andn2using PHP.		
	Total Lecture hours	**30hours**

	Text Books
1	Ivan Bayross,"Web Enabled Commercial Applications Development Using HTML, JavaScript, DHTML and PHP", BPB Publications, 4th Revised Edition, 2010.
	Reference Books
2	A.K. Sainiand Sumint Tuli,"Mastering XML",First Edition, NewDelhi, 2002.

Related Online Contents[MOOC,SWAYAM,NPTEL,Websitesetc.]

1	https://www.tutorialspoint.com/xml/index.htm
2	https://www.tutorialspoint.com/internet_technologies/websites_development.htm
3	https://www.youtube.com/watch?v=PlxWf493en4

Mapping with Programming Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	S	S	S	M	M	S	S
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Robotic Process Automation for Business

Course Objectives:
The main objectives of this course are to:

1. Learn the concepts of RPA, its benefits, types and models.
2. Gain the knowledge in application of RPA in Business Scenarios.
3. Identify measures and skills required for RPA

Expected Course Outcomes:	
On the successful completion of the course ,student will be able to:	
1	Demonstrate the benefits and ethics of RPA	K1,K2
2	Understand the Automation cycle and its techniques	K2
3	Draw inferences and information processing of RPA	K3,K4
4	Implement & Apply RPA in Business Scenarios	K5
5	Analyze on Robots & leveraging automation	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

Unit:1	**INTRODUCTION**	**12hours**

Introduction to RPA –Over view of RPA –Benefits of RPA in a business environment -Industries & domains fit for RPA - Identification of process for automation - Types of Robots - Ethics of RPA & Best Practices - Automation and RPA Concepts - Different business models for implementing RPA –Centre of Excellence –Types and their applications –Building an RPA team -Approach for implementing RPA initiatives.

Unit:2	**AUTOMATION**	**12hours**

RoleofaBusinessManagerinAutomationinitiatives-SkillsrequiredbyaBusinessManagerfor successful automation - The importance of a Business Manager in automation - Analyzing different business processes - Process Mapping frameworks - Role of a Business Manager in successful implementation – Part 1 - Understanding the Automation cycle – First 3 automation stages and activities performed by different people.

Unit:3	**AUTOMATIONIMPLEMENTATION**	**12hours**

Evaluating the Automation Implementation Detailed description of last 3 stages and activities performed by different people - Role of a Business Manager in successful completion – Part 2 - Activities to be performed post-implementation - Guidelines for tracking the implementation success - Metrics/Parameters to be considered for gauging success - Choosing the right licensing option - Sending emails - Publishing and Running Workflows.

Unit:4	**ROBOT**	**12hours**

Ability to process information through scopes/systems - Understand the skill of information processing and its use in business - Leveraging automation - Creating a Robot - New Processes. Establish causality by variable behavior - Understand the skill of drawing inference or establishing causality by tracking the behavior of a variable as it varies across time/referenced variable - Leveraging automation for this skill - Robot & new process creation.

Unit:5	ROBOTSKILL	10hours

Inference from snapshots of curated terms – Omni-source data curation - Multisource trend tracking - Understand the skill of drawing inference from the behavior of curated terms by taking snapshots across systems in reference to time/variable(s) - Leveraging automation for this skill – Robot creation and new process creation for this skill.

Unit:6	Contemporary Issues	2 hours
	Expert lectures, online seminars –webinars	

	Total Lecture hours	60hours

Text Books

1	Alok Mani Tripathi" Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool" Packt Publishing Limited March 2018.
2	TomTaulli "The Robotic Process Automation Handbook" A press, February2020.

Reference Books

1	Steve Kaelble "Robotic Process Automation" John Wiley & Sons, Ltd., 2018

Related Online Contents[MOOC,SWAYAM,NPTEL,Websitesetc.]

1	https://www.tutorialspoint.com/uipath/uipath_robotic_process_automation_introduction.htm
2	https://www.javatpoint.com/rpa
3	https://onlinecourses.nptel.ac.in/noc19_me74/preview

Course Designed By:

Mapping with Programming Outcomes										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	S	S
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low;

CRITICAL THINKING, DESIGN THINKING AND PROBLEM SOLVING

Course Objectives:
The main objectives of this course are to:
1. Learn critical thinking and its related concepts
2. Learn design thinking and its related concepts
3. Develop Thinking patterns, Problem solving & Reasoning

Expected Course Outcomes:	
On the successful completion of the course, student will be able to:	
1	Understand the concepts of Critical thinking and its related technology	K1,K2
2	Focusontheexplicitdevelopmentofcriticalthinkingandproblemsolvingskills	K2,K3
3	Apply design thinking in problems	K3,K4
4	Make a decision and take actions based on analysis	K4,K5
5	Analyze the concepts of Thinking patterns, Problem solving & Reasoning in real time applications	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply; **K4**-Analyze;**K5**-Evaluate; **K6**-Create

Unit:1	**CRITICALTHINKING**	**12hours**
Critical Thinking: Definition, Conclusions and Decisions, Beliefs and Claims, Evidence –finding, evaluation, Inferences, Facts – opinion, probable truth, probably false, Venn diagram. Applied critical thinking: Inference, Explanation, Evidence, Credibility, Two Case Studies, critical thinking and science, critical evaluation, self-assessment.		

Unit:2	**DESIGNTHINKING**	**12hours**
Design Thinking: Introduction, Need of Design Thinking, problem to question - design thinking process, Traditional Problem Solving versus Design Thinking, phases of Design Thinking, problem exploration, Stake holder assessment, design thinking for manufacturers, smart Idea to implementation.		

Unit:3	**CASESTUDY**	**12hours**
Thinking to confidence, fear management, duty Vs passion, Team management, Tools for Thinking, prototype design, Relevance of Design and Design Thinking in engineering, human centered design, case study: apply design thinking in problem.		

Unit:4	**PROBLEMSOLVING**	**10hours**
Problem solving: problem definition, problem solving methods, selecting and using information, dataprocessing,solutionmethods,solvingproblemsbysearching,recognizingpatterns,spatial		

Reasoning, necessity and sufficiency, choosing and using models, making choices and decisions.

Unit:5	REASONING	12hours
Reasoning: Deductive and hypothetical reasoning, computational problem solving; generating, implementing, and evaluating solutions, interpersonal problem solving. Advanced problem solving: Combining skills – using imagination, developing models, Carrying out investigations, Data analysis and inference. Graphical methods of solution, Probability, tree diagrams and decision trees		

Unit:6	Contemporary Issues	2 hours
Expert lectures, online seminars –webinars		
	Total Lecture hours	60hours

Text Books

1	John Butter worth and GeoffTh Waites, Thinking skills: Critical Thinking and Problem Solving, Cambridge University Press, 2013.
2	H.S.Fogler and S.E.LeBlanc, Strategies forCreativeProblemSolving,2nd edition, Pearson, Upper Saddle River, NJ, 2008.

Reference Books

1	A. Whimbey and J. Loch head, Problem Solving & Comprehension, 6th edition, Lawrence Erlbaum, Mahwah, NJ, 1999.
2	M. Levine, Effective Problem Solving, 2nd edition, Prentice Hall, Upper Saddle River, NJ, 1994.
3	Michael Baker, The Basic of Critical Thinking, The Critical Thinking Co press, 2015.
4	David Kelley and Tom Kelley, Creative Confidence, 2013.

Related Online Contents [MOOC, SWAYAM,NPTEL,Websitesetc.]

1	https://www.tutorialspoint.com/critical_thinking/index.htm
2	https://www.tutorialspoint.com/design_thinking/design_thinking_quick_guide.htm
3	https://nptel.ac.in/courses/109/104/109104109/

Mapping with Programming Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	M	S	S	S
CO2	S	S	M	S	S	S	M	S	S	S
CO3	S	S	M	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low;