Government Arts College (Autonomous), Kumbakonam
Course Structure under CBCS for Science (2023 – 2024 Onwards)
PG – Computer Science (M.Sc.)

SEM	Subject Code	Course	Credit	Ins. Hours	Marks		Total
					Int	Ext	
I	23P1CS1	CC I: Theory of Computation	5	6	25	75	100
	23P1CS2	CC II: Python Programming	5	6	25	75	100
	23P1CSP1	CP I:LAB-I: Python programming	4	6	40	60	100
	23P1CS3EC	EC I: Mobile computing	3	6	25	75	100
	23P1CS4EC	EC II: Artificial Intelligence and Expert systems	3	6	25	75	100
		Total	**20**	**30**	**Total Marks**		**500**
II	23P2CS5	CC III: Analysis and Design of Algorithms	5	6	25	75	100
	23P2CS6	CC IV: Data science and analytics	5	6	25	75	100
	23P2CSP2	CP II: LAB-II: Big data analytics	4	6	40	60	100
	23P2CS7EC	EC III: Internet of Things	3	4	25	75	100
	23P2CS8EC	EC IV: Network Security and cryptography	3	4	25	75	100
	23P2CS9SEC	SEC I: Soft Computing	2	4	25	75	100
		Total	**22**	**30**	**Total Marks**		**600**
III	23P3CS10	CC V: Advanced Java Programming	5	6	25	75	100
	23P3CS11	CC VI: Advanced Software Engineering	5	6	25	75	100
	23P3CS12	CC VII: Compiler Design	5	6	25	75	100
	23P3CSP3	CP III: LAB-III: Advanced Java programming	4	6	40	60	100
	23P3CS13EC	EC V: Data Engineering and Management	4	3	25	75	100
	23P3CS14SEC	SEC II: Linux and Shell programming	2	3	25	75	100
		Internship / Industrial activity	2	-	-	--	--
		Total	**27**	**30**	**Total Marks**		**600**
IV	23P4CS15	CC VIII: .NET	5	6	25	75	100
	23P4CSP4	CP IV: LAB-IV: .NET LAB	5	6	40	60	100
	23P4CS16EC	EC VI: Social Networking	4	4	25	75	100
	23P4CS17SEC	SEC III: Web Technology	2	4	25	75	100
		Project and Viva- Voce	7	10	20	80	100
		Extension Activity	1	-	-	-	-
		Total	**24**	**30**	**Total Marks**		**500**
		Net Total	**93**	**120**	**Net Total Marks**		**2200**

SUBJECT	TOTAL PAPERS	CREDITS
Core course	8	40
Core Practical	4	17
Electives	6	20
SEC	3	6
Project	1	7
Internship/Industrial activity	0	2
Extension Activity	0	1
	22	**93**

Course code 23P1CS1	CC I	THEORY OF COMPUTATION	L	T	P	C
Core/Elective/Supportive			6			5
Pre-requisite		Basic Mathematic skill				

Course Objectives:

- To distinguish among different normal forms and quantifiers
- To know the concepts of relations and functions
- Introduce core concepts in Automata and Theory of Computation
- Identify different Formal language Classes and their Relationships
- Design Grammars and Recognizers for different formal languages

Expected Course Outcomes:

1	Write an argument using logical notation and determine if the argument is or is not valid	K1,K2
2	To understand the concepts of relations and functions distinguish among normal forms	K2,K3
3	Design deterministic and non-deterministic finite state machines and understant their capabilities and limits	K3,K4
4	Construct the grammar for any given finite automata.	K5
5	Solve computational problems regarding their computability and complexity and prove the basic results of the theory of computation	K5,K6

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

Unit:1	Mathematical Logic	15hours

Mathematical Logic- Logical connectives - **Well formed formulas** – Truth table of well formed formula – Algebra of proposition - **Normal forms of well formed formulas**: Disjunctive normal form - Principal Disjunctive normal form-Conjunctive normal form-Principal conjunctive normal form- Theory of Inference - **Quantifiers:** Universal Quantifiers- Existential Quantifiers.

Unit:2	Relations- Functions	15hours

Relations- Binary relations- Operations on relations – composition of Relation - Properties of Relations – Matrix Representation of a relation - Representation of a relation by a Graphs – **Functions** - Definition and examples - Classification of functions - Composition of functions - Inverse function .

Unit:3	Automata	15hours

History of automata – grammar - Chomsky hierarchy - use of automata characteristics of automata - finite automata - graphical and tabular representation - Transitional system - DFA and NFA – conversion of NFA to DFA - Equivalence of DFA and NFA - Dead state - Finite automata with output - conversion of one machine to another - minimization of finite automata - Two way finite automata

Unit:4	Finite State Machine	13hours

Finite state machine - state equivalence and minimization of machine - incompletely specified machine - merger graph - merger table - finite memory and definite memory - information lossless machine - inverse machine - minimal inverse machine- Arden's theorem – Conversion of finite automata from regular expression

Unit:5	Equivalence of Two Finite Automata	10hours

Equivalence of two finite automata - Equivalence of two regular expression- construction of regular grammar from an RE - constructing FA from regular grammar - Pumping lemma for regular expression - derivation and parse tree - Ambiguity in context free grammar - left recursion and left factoring - linear grammar - normal form – pumping lemma for CFL – Ogden's lemma for CFL.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars –webinars		
	Total Lecture hours	**60hours**

Text Books

1	T.Veerarajan, Discrete mathematics with Graph Theory and Combinatorics, Mc Graw Hill
2	Shyamlendu Kandar, "Introduction to automata theory, formal languages and Computation" Firs Edition, Pearson Education, 2013

Reference Books

1	Kimmo Eriksson & Hillevi Gavel, Discrete Mathematics & Discrete Models, Student litteratur AB, 2015

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

1	https://www.programiz.com
2	https://www.tutorialspoint.com
3	https://onlinecourses.swayam2.ac.in

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

Course code 23P1CS2	CC II	PYTHON PROGRAMMING	L	T	P	C
Core/Elective/Supportive		Core	6			5
Pre-requisite		Basics of any OO Programming Language				

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	15 hours

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

Unit:2	CODE STRUCTURES	15 hours

Code Structures: if, elseif, 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, PACKAGES AND CLASSES	15 hours

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–Inself Defense –Get and Set Attribute Values with Properties –Name Mangling for Privacy – Method Types – Duck Typing – Special Methods –Composition.

Unit:4	DATA TYPES AND WEB	13 hours

Data Types: 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	SYSTEMS AND NETWORKS	15 hours
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 – ZeroMQ –Internet Services – Web Services and APIs – Remote Processing – Big Fat Data and Map Reduce – Working in the Clouds.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars –webinars		
	Total Lecture hours	**75 hours**

Text Books	
1	Bill Lubanovic, "Introducing Python", O'Reilly, First Edition – Second Release, 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

Course code 23P1CSP1	CP I	LAB-I: PYTHON PROGRAMMING	L	T	P	C
Core/Elective/Supportive		Core			6	4
Pre-requisite		Basics of any OO Programming Language				

Course Objectives:

The main objectives of this course are to:

1. Thiscoursepresentsanoverviewofelementarydataitems,lists,dictionaries,setsandtuples
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.

TotalLecturehours	75hours

Text Books

1. Bill Lubanovic, “Introducing Python”, O’Reilly, First Edition-Second Release, 2014.
2. Mark Lutz, “LearningPython”, 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	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

Course code 23P1CS3EC	EC - I	MOBILE COMPUTING	L	T	P	C
Core/Elective/Supportive		Elective	6			3
Pre-requisite		Basics of Mobile Communication				

Course Objectives:

The main objectives of this course are to:

1. Present the overview of Mobile computing, Applications and Architectures.
2. Describe the futuristic computing challenges.
3. Enable the students to learn the concept of mobile computing.

Expected Course Outcomes:

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

1	Understand the need and requirements of mobile communication	K1,K2
2	Focus on mobile computing applications and techniques	K2,K3
3	Demonstrate satellite communication in mobile computing	K4
4	Analyze about wireless local loop architecture	K5,K6
5	Analyze various mobile communication technologies	K6

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

1

Unit:1	INTRODUCTION	12hours

Introduction: Advantages of Digital Information - Introduction to Telephone Systems –Mobile communication: Need for Mobile Communication – Requirements of Mobile Communication – History of Mobile Communication.

Unit:2	MOBILE COMMUNICATION	12hours

Introduction to Cellular Mobile Communication – Mobile Communication Standards –Mobility Management – Frequency Management – Cordless Mobile Communication Systems.

Unit:3	MOBILE COMPUTING	12hours

Mobile Computing: History of data networks – Classification of Mobile data networks - CDPD System – Satellites in Mobile Communication: Satellite classification – Global Satellite Communication – Changeover from one satellite to other – Global Mobile Communication – Interferences in Cellular Mobile Communication.

Unit:4	MOBILE COMMUNICATION SYSTEM	11hours

Important Parameters of Mobile Communication System – Mobile Internet: Working of Mobile IP – Wireless Network Security – Wireless Local Loop Architecture: Components in WLL – Problems in WLL – Modern Wireless Local Loop – Local Multipoint Distribution Service – Wireless Application Protocol.

Unit:5	COMMUNICATION TECHNOLOGY	11hours

WCDMA Technology and Fiber Optic Microcellular Mobile Communication – Ad hoc Network and Bluetooth technology – Intelligent Mobile Communication system – Fourth Generation Mobile Communication systems.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars–webinars		
	Total Lecture hours	**60hours**
Text Books		
1	T.G.Palanivelu, R.Nakkeeran, "Wireless and Mobile Communication", PHI Limited, 2009.	
2	JochenSchiller,"MobileCommunications",SecondEdition,PearsonEducation, 2007.	
Reference Books		
1	AsokeKTalukder,HasanAhmed,RoopaYavagal,"MobileComputing",TMH,2010.	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	https://www.tutorialspoint.com/mobile_computing/index.htm	
2	https://www.javatpoint.com/mobile-computing	
3	https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs13/	

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

Course Code 23P1CS4EC	EC II	ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS	L	T	P	C
Core/Elective/Supportive		Core	6			3
Pre-requisite		Basics of AI & An Introduction about Expert Systems				

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. Provide knowledge on concepts of Representations and Mappings and Predicate Logic.
3. Introduce Expert System and Frame based Methods.
4. Study about Basic characteristics of An Expert System.

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 Expert System.	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 Persons Involved in Expert System Building Organizing Knowledge.	K4,K5
5	Analyze and Design Statistical Reasoning.	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 Programs.

Unit:2	SEARCH TECHNIQUES	12hours

Heuristic Search Techniques: Generate and Test - Hill Climbing- Best-First, Problem Reduction, Constraint Satisfaction, Means-ends Analysis. Knowledge Representation Issues: Representations and Mappings -Approaches to Knowledge Representations -Issues in Knowledge Representations - Frame Problem.

Unit:3	PREDICATE LOGIC	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	STATISTICAL REASONING	12hours
Statistical Reasoning: Probability and Baye's Theorem – Certainty Factors and Rule based Systems – Bayesian Network – Dempster – Shafer Theory.		

Unit:5	EXPERT SYSTEMS	10hours
Expert System – Features of an Expert System – Persons Involved in Expert System Building Organizing Knowledge – Representing Knowledge – Frame based Methods – Basic characteristics of an Expert System – Expert Systems make mistakes – Knowledge Representation using Rules – Knowledge Representation using Semantic Nets.		

Unit:6	ContemporaryIssues	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	George F Luger, "Artificial Intelligence",4th Edition, Pearson Education Publ, 2002.

Reference Books

1	A Guide to Expert Systems, Donald A. Waterman, Pearson Education.

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

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

Course Code 23P2CS5	CC III	ANALYSIS AND DESIGN OF ALGORITHMS	L	T	P	C
Core/Elective/Supportive		Core	6			5
Prerequisite		Basic Data Structures & Algorithms				

Course Objectives:

The Mainobjectives 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. Discuss various methods like Basic Traversal And Search Techniques, divide and conquer method, Dynamic programming, backtracking
4. Understood The Various Design And Analysis Of The algorithms.

Expected Course Outcomes:

On Successful Completion Of The Course, student will be able to:

1	Get knowledge about algorithms and determine their time complexity. Demonstrate specific search and sort algorithms using divide and conquer technique.	K1,K2
2	Gain a good understanding of Greedy Method And Its algorithm.	K2,K3
3	Able to describe graphsusing dynamic programming techniques.	K3,K4
4	Demonstrate the concept of backtracking 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	15 hours

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	TRAVERSAL AND SEARCH TECHNIQUES	15 hours

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	15 hours

The Greedy Method:-General Method–Knapsack Problem–Minimum Cost Spanning Tree– Single Source Shortest Path.

Unit:4	DYNAMIC PROGRAMMING	15 hours

Dynamic Programming-General Method–Multistage Graphs–All Pair Shortest Path–Optimal Binary Search Trees – 0/1 Knapsacks – Traveling Salesman Problem – Flow Shop Scheduling.

Unit:5	BACKTRACKING	13 hours

Backtracking:-General Method–8-Queens Problem–Sum Of Subsets–Graph Coloring– Hamiltonian Cycles – Branch And Bound: - The Method – Traveling Salesperson.

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

	Text Books
1	Ellis Horowitz, “Computer Algorithms”, Galgotia Publications.
2	Alfred V.Aho, John E.Hopcroft, Jeffrey D.Ullman, "Data Structures and Algorithms".
	Reference Books
1	Goodrich, “Data Structures & Algorithms in Java”, Wiley 3rd edition.
2	Skiena, ”The Algorithm Design Manual”, Second Edition, Springer,2008
3	Anany Levith, ”Introduction to the Design and Analysis of Algorithms”, Pearson Education Asia, 2003.
4	Robert Sedgewick, Philippe Flajolet, ”An Introduction to the Analysis of Algorithms”, Addison-Wesley Publishing Company,1996.
	Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
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

Course code 23P2CS6	CC IV	DATA SCIENCE AND ANALYTICS	L	T	P	C
Core/Elective/Supportive		Core	6			5
Pre-requisite		Basics of Data Science & its Applications				

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	Apply and determine appropriate Data Mining techniques using R to real time 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	12 hours

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	BASICS OF DATA ANALYTICS	12 hours

Data Analytics life cycle – review of data analytics – Advanced data Analytics – technology and tools.

Unit:3	DATA ANALYTICS USING R	12 hours

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	12 hours

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	ARTIFICIAL INTELLIGENCE	10 hours

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	**60 hours**

Text Books	
1	IntroducingDataScienceBigDataMachineLearningandmoreusingPythontools2016
2	Data science in big data analytics, Wiley 2015 John Wiley & Sons
Reference Books	
1	A simple introduction to Data Science - Lars Nielson 2015
2	Introducing Data Science Davy Cielen, Arno D.B.Meysman, Mohamed Ali 2016 Manning Publication
3	R Programming for Data Science - Roger D.Peng 2015 Lean Publication
4	DataScience & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
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

Course code 23P2CSP2	CP II	LAB-II: BIG DATA ANALYTICS	L	T	P	C
Core/Elective/Supportive		Core			6	3
Prerequisite		Basics of Machine Learning Algorithms & Python Programming				

Course Objectives:

The main objectives of this course are to:

1. To enable the students to learn the concepts of Data Mining algorithms namely classification, 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 and to handle large volumes of data with the help of distributed parallel computations.

Expected Course Outcomes:

On Successful Completion Of The Course,studentwillbeableto:

1	AbletowriteprogramsusingRforAssociationrules,Clusteringtechniques	K1,K2
2	To Implementdata mining techniqueslike classification, prediction	K2,K3
3	Able To Use Differentvisualization techniques using R	K4,K5
4	Toapplydifferentdataminingalgorithmstosolverealworldapplications	K5,K6

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

LIST OF PROGRAMS	75 hours

1. Interpret data with basic/descriptive statistical operations using pandas in python.
2. Implement pandas dataframe operations like Selection, Filtering, GroupBy and Aggregation by reading external csv file with large volume of data.
3. Perform Visualization of data from pandas dataframe using matplotlib or seaborn library in python.
4. Implement linear regression using built-in dataset and pandas dataframe and sklearn library in python.
5. Implement Naive Bayes Theorem to classify text with built-in news dataset using python.
6. Implement K-Nearest Neighbour Classification using python libraries.
7. Implement K-Means Clustering algorithm using python libraries.
8. Training the perceptron using scikit learn or Tensorflow Framework.

TotalLecturehours	75 hours

Text Books

1	MargaretH.Dunham,“DataMining:IntroductoryandAdvancedTopics”,Pearson education,2003.
2	Stefanie Molin, “Hands on Data Analysis with Pandas”, Packt, 2019.

Reference Books

1	Arun K. Pujari, “Data Mining Techniques”, Universities Press (India) Pvt. Ltd., 2003.
2	Bernd Klein, “Data Analysis: Numpy, Matplotlib and Pandas”, Bodenseo, 2021

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

1	https://www.javatpoint.com/sklearn-tutorial
2	https://nptel.ac.in/courses/106105174
3	https://towardsdatascience.com/why-and-how-to-use-pandas-with-large-data-9594dda2ea4c

MappingwithProgrammingOutcomes										
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

Course code 23P2CS7EC	EC III	INTERNET OF THINGS	L	T	P	C
Core/Elective/Supportive		Elective	4			4
Pre-requisite		Basics of Sensors & its Applications				

Course Objectives:

The main objectives of this course are to:

1. AboutInternetofThingswherevariouscommunicatingentitiesarecontrolledandmanaged 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 Cusing ArduinoIDE	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	PROGRAMMING USING ARDUINO	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	SENSORS AND ACTUATORS	10hours

Sensors and Actuators: Analog and Digital Sensors–Interfacing temperature sensor, ultrasound Sensor and infrared(IR) sensor with Arduino– Interfacing LED and Buzzer with Arduino.

Unit:5	SENSOR DATA ININTERNET	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	ArshdeepBahga,VijayMadisetti,"InternetofThings:AHands-OnApproach",2014. ISBN: 978-0996025515
2	Boris Adryan, Dominik Obermaier, Paul Fremantle, "The Technical Foundations of IoT", Artech Houser Publishers, 2017.
ReferenceBooks	
1	MichaelMargolis,"ArduinoCookbook",O"Reilly,2011
2	MarcoSchwartz, "InternetofThingswithESP8266",PacktPublishing, 2016.
3	DhivyaBala,"ESP8266:StepbyStepTutorialforESP8266IoT,ArduinoNODEMCU Dev. Kit", 2018.
Related Online Contents[MOOC, SWAYAM, NPTEL, Websites etc.]	
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

Course code 23P2CS8EC	EC IV	NETWORK SECURITY AND CRYPTOGRAPHY	L	T	P	C
Core/Elective/Supportive		Core	4			3
Pre-requisite		Basics of Networks & its Security				

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. To gain knowledge on classical encryption techniques and concepts of modula rarithmetic and 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-keyCryptosystem:IntroductiontoNumberTheory-RSAAlgorithm–KeyManagement -Diffie-HellmanKeyexchange–EllipticCurveCryptographyMessageAuthenticationand Hash functions – Hash and Mac Algorithm – Digital Signatures and Authentication Protocol.

Unit:3	NETWORK SECURITY	12hours

NetworkSecurityPractice:AuthenticationApplications–Kerberos–X.509Authentication 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.SystemSecurity - Intruders and Viruses – Firewalls– Password Security.

Unit:5	CASE STUDY	12hours
CaseStudy: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	**ContemporaryIssues**	**2 hours**
Expert lectures,online seminars–webinars		
	Total Lecture hours	**60hours**

	Text Books
1	WilliamStallings,"Cryptography and Network Security", PHI/Pearson Education.
2	Bruce Schneir,"Applied Cryptography",CRC Press.
	ReferenceBooks
1	A.Menezes, P Van Oorschot and S.Vanstone, "Hand Book of Applied Cryptography", CRC Press, 1997
2	AnkitFadia,"NetworkSecurity",MacMillan.
	RelatedOnlineContents[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	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

Course code 23P2CS9SEC	SEC-I	SOFT COMPUTING	L	T	P	C
Core/Elective/Supportive		Core	4			2
Pre-requisite		Basics of Soft Computing& its Applications				

Course Objectives:

The main objectives of this course are to:

1. Develop the skills to gain a basic understanding of neural network theory
2. To enable the students to gain a basic understanding of neural networks.
3. To understand supervised learning algorithms.
4. To understand unsupervised learning algorithms.
5. To impart basic knowledge on Genetic algorithms and their applications.

Expected Course Outcomes:

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

1	The skills to gain a basic understanding of neural network theory	K1,K2
2	Students to gain a basic understanding of neural networks.	K2,K3
3	Understand supervised learning algorithms.	K3,K4
4	Understand unsupervised learning algorithms.	K4,K5
5	Basic knowledge on Genetic algorithms and their applications.	K6

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

Unit:1	INTRODUCTION	12 hours

INTRODUCTION TO SOFT COMPUTING: Artificial Neural Networks- Biological Neurons- Basic Models of Artificial Neural Networks-Connections-Learning-Activation Functions- Important Terminologies of ANNs- Muculloch and Pitts Neuron-Linear Separability- Hebb Network-Flowchart of Training Process-Training Algorithm.

Unit:2	SUPERVISED LEARNING NETWORK	12 hours

SUPERVISED LEARNING NETWORK : Perceptron Networks–Perceptron Learning Rule-Architecture-Flowchart for Training Process-Perceptron Training Algorithms for Single Output Classes-Perceptron Training Algorithm for Multiple Output Classes-Perceptron Network Testing Algorithm - Adaptive Linear Neuron-Delta Rule for Single Output Unit-Flowchart for training algorithm-Training Algorithm – Testing Algorithm

Unit:3	SUPERVISED LEARNING NETWORK	12 hours

SUPERVISED LEARNING NETWORK: Multiple Adaptive Linear Neurons-Architecture-Flowchart of Training Process-Training Algorithm-Back Propagation Network-Architecture-Flowchart for Training Process-Training Algorithm-Learning Factors of Back-Propagation Network-Radial Basis Function Network- Architecture-Flowchart for Training Process-Training Algorithm.

Unit:4	UNSUPERVISED LEARNING NETWORK:	12 hours

UNSUPERVISED LEARNING NETWORK: Associative Memory Networks - Auto Associative Memory Network-Architecture-Flowchart for Training Process-Training Algorithm-Testing Algorithm-Bidirectional Associative Memory- Architecture-Discrete Bidirectional Associative Memory-Iterative Auto Associative Memory Networks - Linear AutoAssociative Memory-Kohonen Self-Organizing Feature Map- Architecture-Flowchart for Training Process-Training Algorithm.

Unit:5	GENETIC ALGORITHM:	10 hours

GENETIC ALGORITHM: Introduction - Biological Background - Traditional Optimization and Search Techniques -Gradient Based Local Optimization Method-Random Search-Stochastic Hill Climbing-Simulated Annealing-Symbolic Artificial Intelligence-Operators in Genetic Algorithm - Encoding-Selection-Crossover-Mutation - Stopping Conditions for Genetic Algorithm Flow-Genetic Programming-Working of Genetic Programming-Characteristics of Genetic Programming-Data Representation.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**60 hours**

	Text Books
1	Principles of Soft Computing, S.N. Sivanandam, S.N.Deepa, Wiley, Second Edition.
	Reference Books
1	Das, A. (2018). Artificial Intelligence and Soft Computing for Beginners
2	Amit, K. (2018). Artificial intelligence and soft computing: behavioral and cognitive modeling of the human brain. CRC press.
3	Rajasekaran, S., &Pai, G. V. (2011). Neural networks, fuzzy logic and genetic algorithm: synthesis and applications (with cd). PHI Learning Pvt. Ltd.
	Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://www.javatpoint.com/what-is-soft-computing
2	https://onlinecourses.nptel.ac.in/noc22_cs54/preview
3	https://www.tutorialspoint.com/difference-between-ai-and-soft-computing#:~:text=Soft%20computing%20uses%20flexible%2C%20non,using%20mathematical%20equations%20and%20algorithms.

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

Course code 23P3CS10	CC V	ADVANCED JAVA PROGRAMMING	L	T	P	C
Core/Elective/Supportive		Core	6			5
Pre-requisite		Basics of Java & its Usage				

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. Learn JDBC, Servlet packages, JQuery, Java Server Pages and JAR file format

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 Collection JDBC and RMI concepts	K2,K4
3	Understand JDBC and RMI concepts e	K3,K5
4	Design interactive applications using Java Servlet, JSP and ORM	K5,K6
5	Handle different event in java internals & networking	K4,K6

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

Unit:1	JAVA FUNDAMENTALS	12hours

Java features – Java Platform – Java Fundamentals – Expressions, Operators, and Control Structures – Classes, Methods – Inheritance - Packages and Interfaces – Boxing, Unboxing – Variable-Length Arguments (Varargs), Exception Handling.

Unit:2	COLLECTIONS AND ADVANCE FEATURES	12hours

Utility Packages- Introduction to collection –Hierarchy of Collection framework – Generics, Array list, LL, HashSet, Treeset, HashMap – Comparators – Java annotations – Premain method.

Unit:3	ADVANCED PROGRAMMING	10hours

Input Output Packages – Inner Classes – Java Database Connectivity - Introduction JDBC Drivers - JDBC connectivity with MySQL/Oracle -Prepared Statement & Result Set – JDBC Stored procedures invocation - Servlets - RMI – Swing Fundamentals - Swing Classes.

Unit:4	OVERVIEW OF DATA RETRIEVAL & ENTERPRISE APPLICATION DEVELOPMENT S	12hours

Tiered Application development - Java Servers, containers –Web Container – Creating Web Application using JSP/Servlets – Web Frameworks Introduction to Spring/ Play Framework – ORM Layer – Introduction to Hibernate.

Unit:5	JAVA INTERNALS AND NETWORKING	12hours

Java jar Files-Introspection – Garbage collection – Architecture and design – GC Cleanup process, Invoking GC, Generation in GC - Networking Basics Java and the Net – InetAddress – TCP/IP Client Sockets – URL –URL Connection – TCP/IP Server Sockets – A Caching Proxy HTTP Server – Datagrams..

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

Text Books	
1	Amritendu De, “Spring 4 and Hibernate 4: Agile Java Design and Development”, McGraw- Hill Education, 2015
2	Herbert Schildt, The Complete Reference – Java 2, Ninth Edition, Tata McGraw Hill, 2014
Reference Books	
1	JimKeogh, ”The Complete Reference J2EE”,TataMc Graw Hill Publishing Company Ltd,2010.
2	David Sawyer Mc Farland,“Java Script And JQuery-The Missing Manual”,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

Course code 23P3CS11	CC VI	ADVANCED SOFTWARE ENGINEERING	L	T	P	C
Core/Elective/Supportive		Core	6			5
Pre-requisite		Basics of Software Engineering &SPM				

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	Analyze on Software Requirement sand Design Concept.Understand about Software project management skills, design and quality management	K2,K3
3	Analyze on Software Testing	K3,K4
4	To know about Software Maintenance and Risk Management .	K4,K5
5	Understand about clean room software engineering and reengineering	K5,K6

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

Unit:1	INTRODUCTION	15hours

Introduction: Application of software engineering. **Life Cycle Models**: Waterfall model - Incremental Process Model: Incremental Model –The RAD model .Evolutionary process Models: Prototyping model-Spiral model.

Unit:2	DESIGN CONCEPTS	15hours

Software Design Engineering: Design Process and Design Quality attributes – Basic Design concepts – Design Model - Pattern Based Software Design. Modeling Component – Level Design: Component Design Principles - Cohesion and Coupling..

Unit:3	SOFTWARE TESTING	15hours

Testing Strategies: Verification and validation – unit testing - black-box testing - white-box testing-Validation Testing – System Testing- Test Strategies for Object Oriented Software – Debugging. **Product Metrics: Software Quality:** McCall's Quality Factors – ISO 9126 Quality factors .Metrics for the Analysis Model : Function based Metrics – Metrics for Specification Quality. Source Code metrics – Software testing metrics.

Unit:4	SOFTWARE MAINTENANCE AND RISK MANAGEMENT	15hours

Quality Management: Quality concept**s –** Software Quality Assurance – Software Reliability. Estimation: Empirical Estimation Models:-The Structure of Estimation models – The COCOMO II Model – The Software Equation – Estimation of Object Oriented Projects – Specialized Estimation Techniques. Risk management: Software risks – Risk identification – Risk projection – Risk refinement and management.

Unit:5	CLEANROOM SOFTWARE ENGINEERING AND REENGINEERING	13hours

Clean room Design: Function specification – Clean room design – Cleanroom Testing. Software reengineering – reverse engineering – Restructuring – forward engineering.

Unit:6	Contemporary Issues	2 hours

Expert lectures, online seminars – webinars

	Total Lecture hours	**75hours**
Text Books		
1	Roger S. Pressman, Software Engineering, Sixth Edition, McGraw-Hill.	
2	Fundamentals of Software Engineering –RajibMall,PHIPublication,3rdEdition.	
Reference Books		
1	SoftwareEngineering–K.K.AggarwalandYogeshSingh,NewAgeInternational Publishers, 3 rd edition.	
2	Fundamentals of Software Engineering -Carlo Ghezzi, M. Jarayeri, D. Manodrioli, PHI Publication.	
Related Online Contents[MOOC,SWAYAM,NPTEL,Websitesetc.]		
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

Course Code 23P3CS12	CC VII	COMPILER DESIGN	L	T	P	C
Core/Elective/ Supportive	Core		6	-	-	5
Pre-requisite	Basic Concept of Compiler Design					

Course Objective	
LO1	Learning fundamental concepts of compilers
LO2	To Learn about symbol tables.
LO3	To learn about Syntax directed definition and Type checking .
LO4	To know about Run-time environment and Intermediate code generation.
LO5	To learn about Code generation

UNIT: 1	INTRODUCTION	No. of Hours
Introduction to compilers – Analysis of source program – Phase of compiler – Cousins of compilers – Grouping of phases – Simple one pass compiler: overview – Syntax definition Lexical analysis: removal of white space and comments – Constants – Recognizing identifiers and keywords – Lexical analysis – Role of a lexical analyzer – Input buffering –Specification of tokens – Recognition tokens.		12
UNIT: 2	**SYMBOL TABLE AND PARSING**	
Symbol tables: Symbol table entries – List data structures for symbol table – Hash tables – Representation of scope information – Syntax Analysis: Role of parser – Context free grammar – Writing a grammar – Top down parsing – Simple bottom up parsing – Shift reducing parsing.		12
UNIT: 3	**SYNTAX DIRECTED DEFINITION AND TYPE CHECKER**	
Syntax directed definition: Construction of syntax trees – Bottom up evaluation of S- Attributed definition – L-Attributed definitions – Top down translation - Type checking: Type systems – Specifications of simple type checker.		12
UNIT: 4	**RUN TIME ENVIRONMENT**	
Run-time environment: Source language issues – Storage organizations – Storage allocation strategies - Intermediate code generation: Intermediate languages – Declarations – Assignment statements.		12
UNIT: 5	**CODE GENERATION**	
Code generation: Issue in design of code generator – The target machine – Runtime storage management – Basic clocks and flow graphs – Code optimization: Introduction – Principle source of code optimization – Optimization of basic blocks		12
	Total	60

Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
CO 1	Understand the fundamentals of a compiler.	PO1
CO 2	Get knowledge about the Symbol tables	PO1, PO2
CO 3	Understand the Syntax directed definition	PO4, PO5
CO 4	Understand the Run-time environment	PO4, PO5, PO6
CO 5	Know the procedures and principles involved in the machine code generation.	PO3, PO6

Text Book

1	Aho, Ullman, “Compilers, Principles And Techniques And Tools”, Pearson Education – 2001 Th Edition.
Reference Books	
1.	Alfred V. Aho, Ravi Sethi and Jeffrey D Ullman, "Compilers, Principles, Techniques and Tools", Addison Wesley Longman (Singapore Pvt. Ltd.), 2011.
2.	David Galles, "Modern Compiler Design", Pearson Education, 2008

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

Course code 23P3CSP3	CP III	LAB-III: ADVANCED JAVA PROGRAMMING	L	T	P	C
Core/Elective/Supportive		Core			6	4
Pre-requisite		Basics in Java Programming				

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 Servlet.
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 payslip using JSP.
6. Write a program using JDBC for creating a table, Inserting, Deleting records and list out there cords.
7. Write a program using Java servlet to handle form data.
8. Write a simple Servlet program to create a table of all the header sit receives along with their associated values.
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",TataMcGrawHillPublishingCompany Ltd,2010.
2	DavidSawyerMcFarland,"JavaScriptAndJQuery-TheMissingManual",Oreilly Publications, 3rd Edition,2011.
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	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

Course code 23P3CS13EC	EC V	DATA ENGINEERING AND MANAGEMENT	L	T	P	C
Core/Elective/Supportive		Elective	3			4
Pre-requisite		Basics of DBMS and CRM				

Course Objectives:

The main objectives of this course are to:

- Understand Data Management concepts
- Get brief knowledge on Data Modelling
- Analyse the techniques used in Distributed Databases
- Assess Distributed database and Business Modeling
- Get familiar with CRM tools

1.

Expected Course Outcomes:

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

1	Comprehend the Data Management concepts and analyse the relationship with the enterprise	K1,K2
2	Analyze Data Modelling concepts and assess its quality	K2,K3
3	Understand and implement business modelling techniques	K4,K5
4	Evaluate the use of Artificial Intelligence and Machine Learning in CRM	K5,K6
5	Develop CRM applications in cloud	K6

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

Unit:1	DATABASE DEVELOPMENT AND MANAGEMENT	12 hours

DATABASE DEVELOPMENT: Database architecture of an information system-Overview of the database development process-Conceptual data modeling-Relational data analysis-Roles of a data model-Physical database design. DATA MANAGEMENT: Problems encountered without data management-Data management responsibilities-Data management activities-Roles within data management-Benefits of data management-Relationship between data management and enterprise.

Unit:2	CORPORATE DATA MODELLING, QUALITY AND ACCESSIBILITY	12 hours

CORPORATE DATA MODELLING: Need for a corporate data model-Nature of a corporate data model-Develop a corporate data model - Corporate data model principles. DATA DEFINITION AND NAMING: Elements of a data definition-Data naming conventions. DATA QUALITY: Issues associated with poor data quality-Causes of poor data quality-Dimensions of data quality-Data model quality-Improving data quality. DATA ACCESSIBILITY: Data security-Data integrity-Data recovery.

Unit:3	DISTRIBUTED DATA AND DATABASES	12 hours

USE OF PACKAGED APPLICATION SOFTWARE: Application software packages-Impact on data management. DISTRIBUTED DATA AND DATABASES: Rationale for distributing data-Perfect distributed database system-Top down fragmentation and partitioning. Bottom up integration-The management of replication. BUSINESS INTELLIGENCE: Data warehousing-Multidimensional model of data-Standard reporting tools-Online analytical processing OLAP-Relational schema for a data warehouse.

Unit:4	CRM	11hours

CRM: Three main pillars of CRM. GETTING TO KNOW YOUR CUSTOMER: 360-degree client view. UTILIZING ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN YOUR CRM STRATEGY: Evolution of AI-Current state of AI-Teaming up AI with people-Applying AI to your CRM solution-ethical

aspects of AI-An example of AI in CRM processes.		
Unit:5	**CLOUD VERSUS ON PREMISE VERSUS HYBRID**	**11 hours**
CLOUD VERSUS ON PREMISE VERSUS HYBRID: Factors influencing vendor selection-Hybrid deployment-what are your options. CRM DIFFERENTIATORS: It's not about the feature list; it's about the ecosystem-Fourth industrial revolution and CRM-AI and smart cloud-To cloud or not to cloud-Leveraging smart cloud into CRM-Big data-Social selling and advertising-Implementation tools-Sustainable CRM platform.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**60 hours**

Text Books	
1	Keith Gordon, "Principles of Data Management Facilitating Information Sharing", BCS Learning, 2013. (Chapters:1-5, 7,8,12,13,14)
2	Max Fatouretchi, "The Art of CRM", Packt Publishing, 2019.(Chapters: 1,2,5,8,9)
ReferenceBooks	
1	Peter Ghavami, "Big Data Management_ Data Governance Principles for Big Data Analytics", De Gruyter, 2020.
2	Francis Buttle, Stan Maklan, Customer Relationship Management Concepts and Technologies, Routledge, 2019.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.javatpoint.com
2	https://nptel.ac.in

MappingwithProgrammingOutcomes

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

Course code 23P3CS14SEC	SEC II	LINUX AND SHELL PROGRAMMING	L	T	P	C
Core/Elective/Supportive		Elective	3			2
Pre-requisite		Basic of Unix				

Course Objectives:

The main objectives of this course are to:

- To teach principles of operating system including File handling utilities, Basic Linux commands, Scripts and filters.
- To familiarize fundamentals of shell (bash), shell programming, pipes, Control structures, arithmetic in shell interrupt processing, functions, debugging shell scripts.
- To impart fundamentals of file concepts kernel support for file, File structure related system calls (file API's).
- To facilitate students in understanding Inter process communication, semaphore and shared memory.
- To explore real-time problem solution skills in Shell programming.

Expected Course Outcomes:

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

1	To understand, apply and analyze the concepts and methodology of Linux shell programming	K1-K6
2	To comprehend, impart and apply fundamentals of control structure and script controls	K1-K6
3	To understand, analyses and evaluate the functions, graphical desktop interface and editors	K1-K6
4	To collaborate, apply and review the concepts and methodology of regular expression and advanced gawk	K1-K6
5	To comprehend, use and illustrate the advance concepts such as alternate shell script.	K1-K6

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

Unit:1	Shell Commands- Script Building	12hours

Basic bash Shell Commands: Interacting with the shell-Traversing Directories-Listing files and directories-Managing files and directories-Viewing file contents. **Basic Script Building:** Using multiple commands-Creating a script file-Displaying messages-Using variables-Redirecting input and output-Pipes-Performing math-Exiting the script.

Unit:2	Structured Commands	12hours

Using Structured Commands: Working with the if-then statement-Nesting ifs-Understanding the test command-Considering compound -Using double brackets and parentheses-Looking at case. **More Structured Commands:** Looping with for statement- Using the while statement - Iterating with the until statement

Unit:3	Handling User Input- Script Control	12hours

Handling User Input: Passing parameters-Understanding Special parameter variables -Being shifty-Working with options-Getting User Input . **Script Control:** Handling signals-Running scripts in the background mode –Running Scripts without hang-ups -Controlling a Job-Being Nice

Unit:4	Creating Functions- Writing Scripts for Graphical Desktops	12hours

Creating Functions: Basic script functions-Returning a value-Using variables in functions-Array variable and functions-Function recursion-Creating a library-Using functions on the command line. **Writing Scripts**

for Graphical Desktops: Creating text menus-Doing Windows –Getting Graphic		
Unit:5	**Introducing sed and gawk – Regular Expressions**	**12hours**
Introducing sed and gawk: Manipulating Text- Getting to know the sed editor-Getting to know the gawk program-Commanding at the sed Editor basics. **Regular Expressions:** Defining regular expressions-Defining BRE Patterns - Extended Regular Expressions.		
	Total Lecture hours	**60 hours**

Text Books	
1	Richard Blum, Christine Bresnahan, "Linux Command Line and Shell Scripting BIBLE", Wiley Publishing, 3rd Edition, 2015.**Chapters:** 3, 11 to14, 16 to 25.
2	Mokhtar Ebrahim, Andrew Mallett, "Mastering Linux Shell Scripting", Packt Publishing, 2nd Edition, 2018
ReferenceBooks	
1	ClifFlynt, SarathLakshman, ShantanuTushar, "Linux Shell Scripting Cookbook ", Packt Publishing, 3rd Edition, 2017
2	Stephen G.Kochan, Patrick Wood, "Shell Programming in Unix, Linux, and OS X", Addison Wesley Professional, 4th Edition, 2016.
3	Robert Love, "Linux System Programming", O'Reilly Media, Inc, 2013
Related Online Contents[MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.learnshell.org/
2	https://www.javatpoint.com/linux-shell
3	https://www.tutorialspoint.com/unix/shell_scripting.htm

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

Course code 23P4CS15	CC VIII	.NET	L	T	P	C
Core/Elective/Supportive		Core	6			5
Pre-requisite		Basics of C#.Net & its Usage				

Course Objectives:

The main objectives of this course are to:

1. Enable the students to learn the basic functions, principles and concepts of .Net programming.
2. Provide knowledge on concepts needed for distributed Application Architecture.
3. Learn .Net Core, Azure

Expected Course Outcomes:

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

1	To get strong understanding of .NET Framework and C# programming.	K1,K2
2	To get advanced programming skills in Visual Studio with C# language.	K2,K4
3	To get advanced methods of manipulating data using Microsoft SQL Server.	K3,K5
4	To get clear idea of how to developing real-time standalone, web applications using .NET Technologies.	K5,K6
5	To get clear understanding and get experience in Microsoft Azure.	K4,K6

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

Unit:1	INTRODUCING C#	12hours

.NET Framework - C# language - Visual Studio 2017 - Writing a C# Program: Visual Studio 2017 Development Environment - Console Applications - Desktop Applications - Variables and Expressions: Basic C# Syntax - Basic C# Console Application Structure - Variables - Expressions - Flow Control: Boolean Logic – Branching – Looping

Unit:2	COLLECTIONS AND ADVANCE FEATURES	12hours

More About Variables: Type Conversion - Complex Variable Types - String Manipulation – Functions: Defining and Using Functions - Variable Scope - The Main Function - Struct Functions - Overloading Functions - Using Delegates - Debugging and Error Handling: Debugging in Visual Studio - Error Handling - Introduction to Object Oriented Programming: Object-Oriented Programming - OOP Techniques - OOP in Desktop Applications

Unit:3	ADVANCED PROGRAMMING ASP.NET	10hours

Defining Classes: Class Definitions in C# - System.Object - Constructors and Destructors - OOP Tools in Visual Studio - Class Library Projects - Interfaces Versus Abstract Classes - Struct Types - Shallow Copying Versus Deep Copying - Defining Class Members: Member Definitions - Additional Class Member Topics - Interface Implementation - Partial Class Definitions - Partial Method Definitions - The Call Hierarchy Window - Basic Cloud Programming: Cloud, Cloud Computing, and the Cloud Optimized Stack - Cloud Patterns and Best Practices - Using Microsoft Azure C# Libraries to Create a Storage Container - Creating an ASP.NET 4.7 Web Site That Uses the Storage Container - Advanced Cloud Programming and Deployment: Creating an ASP.NET Web API - Deploying and Consuming an ASP.NET Web API on Microsoft Azure - Scaling an ASP.NET Web API on Microsoft Azure

Unit:4	.NET STANDARD AND .NET CORE	12hours

.NET Standard and .NET Core: Cross-Platform Basics and Must Know Terms – Need of .NET - Referencing and Targeting Frameworks - .NET Core - Building and Packaging a.NET Standard Library - Building a .NET Core Application with Visual Studio - Porting from .NET Framework to .NET Core - ASP.NET and ASP.NET Core: Overview of Web Applications – Use of ASP.NET - ASP.NET Web Forms

- Creating ASP.NET Core Web Applications – Files: File Classes for Input and Output – Streams - Monitoring the File System - XML and JSON: XML Basics - JSON Basics - XML Schemas - XML Document Object Model - Converting XML to JSON - Searching XML with XPath.

Unit:5	LINQ	**12hours**
LINQ to XML - LINQ Providers - LINQ Query Syntax - LINQ Method Syntax - Ordering Query Results - Understanding the orderby Clause - Querying a Large Data Set -Using Aggregate Operators - Using the Select Distinct Query - Ordering by Multiple Levels -Using Group Queries - Using Joins – Databases: Using Databases - Installing SQL Server - Express - Entity Framework - Code First Database - Finding the Database - Navigating Database Relationships - Handling Migrations - Creating and Querying XML from an Existing Database - Universal Apps: Windows Universal Apps - App Concepts and Design - App Development - Common Elements of Windows Store Apps - Windows Store.		

Mapping with Programming Outcomes

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

Text Books

1	Benjamin Perkins, Jacob Vibe Hammer, Jon D. Reid, “Beginning C#7 Programming with Visual Studio 2017”, Wiley Publishing, 2018. Chapters: 1 to 10, 16 to 23, and 25.

Reference Books

1	Nagel, Christian, “Professional C 7 and .NET Core 2.0”, Wrox Publishing, 2018.
2	Mehboob Ahmed Khan, Ovais, “C# 7 and .NET Core 2.0 High Performance”, Packt Publishing, 2018

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

1	https://dotnet.microsoft.com/en-us/learn
2	https://dotnettutorials.net/
3	https://www.dotnetperls.com/category_c

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

Course code 23P4CSP4	CP IV	LAB-IV: .NET	L	T	P	C
Core/Elective/Supportive		Core			6	5
Pre-requisite		Basics in C#.net Programming				

Course Objectives:

The main objectives of this course are to:

6. To get strong understanding of .NET Framework and C# programming.
7. To get advanced programming skills in C# .NET OOPs Concepts
8. To get advanced methods of manipulating data using Microsoft SQL Server.
9. To get clear idea of how to developing real-time standalone, web applications using ASP .NET.
10. To get clear understanding and get experience in Microsoft Azure.

Expected Course Outcomes:

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

1	Get a strong understanding of .NET Visual Studio platform	K1,K2
2	Become a strong knowledge in C# .NET.	K3,K4
3	Getting real-time application developing using .NET Cloud Technologies.	K4,K5
4	To Create interactive web based applications using ASP.net with Azure	K5,K6

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

LISTOF PROGRAMS	75hours

1. Demonstrate method overloading and method overriding
2. Class and Objects
3. Multilevel Inheritance
4. Interfaces
5. Demonstrate multiple type of Exceptions
6. Azure Storage Container Using the Microsoft Azure Storage Client Library
7. Demonstrate Read and Write a Data using Random Access Files
8. Employee management database using LINQ
9. Student management system using ASP.NET
10. Demonstrates simple Universal App.

Expert lectures, online seminars –webinars

Total Lecture hours	75hours

Text Books

1	SvetlinNakov,VeselinKolev& Co, Fundamentals of Computer Programming with C#,Faber publication,2019.
2	Mathew, Mac Donald, The Complete Reference ASP.NET, Tata McGraw-Hill,2015.

Reference Books

1	Kogent Learning Solutions, C# 2012 Programming Covers .NET 4.5 Black Book, Dreamtechpres,2013.
2	Anne Boehm, Joel Murach, Murach's C# 2015, Mike Murach& Associates Inc.2016.
Related Online Contents [MOOC,SWAYAM,NPTEL,Websitesetc.]	
1	https://dotnet.microsoft.com/en-us/learn
2	https://dotnettutorials.net/
3	https://www.dotnetperls.com/category_c

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

Course code 23P4CS16EC	EC VI	SOCIAL NETWORKING	L	T	P	C
Core/Elective/Supportive		Elective	4			4
Pre-requisite		Basics of Social Media and Web				

Course Objectives:

The main objectives of this course are to:

- Learn about Social media, Social networking and Webcasts
- Understanding and building a Word Press Powered Website
- Analysis the Social Networking & Micro-Blogging.
- Learn and analysis the Widgets & Badges.
- Explore the importance of Website optimization.

Expected Course Outcomes:

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

1	To understand, impart and summarize the concepts of Social media, Social networking and Webcasts	K1,K2
2	To comprehend, design and develop a Word Press Powered Website	K2,K3
3	To understand, implement and perform evaluation of Social Networking and Micro-Blogging	K4,K5
4	To collaborate, implement and analyse the Widgets and Badges in social networking environment	K5,K6
5	To understand, illustrate and perform evaluation of web optimization for social networks	K6

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

Unit:1	Introduction to Social Media	12 hours

Introduction: Social Media Strategy-Important First Decisions -Websites, Blogs - RSS Feeds Mapping - Preparation - Multimedia Items Gathering Content for Blog Posts RSS Feeds & Blogs-RSS Feeds-The Feed Reader-The Feed-Options for Creating an RSS Feed-Planning Feed-Blogs-Options for Starting. Blog and RSS Feed-Feed or Blog Content-Search Engine Optimization (SEO)-Feed Burner-RSS Feed and Blog Directories-An Optimization Plan for Blog or RSS Feed

Unit:2	Building a Word Press Powered Website	12 hours

Building a Word Press Powered Website: Word Press as A CMS - Diversity of Word Press Sites-The Anatomy of a Word Press Site -a Brief Look at the Word Press Dashboard Planning - Site Themes Plug-ins setting up Sidebars Building Pages- Posting Blog Entries. Podcasting, Vidcasting, & Webcasting- Publishing Options for Podcast- Creating and Uploading Podcast Episodes-Publishing Podcast Optimizing Podcast-Webcasting

Unit:3	Social Networking & Micro-Blogging	12 hours

Social Networking & Micro-Blogging: Facebook-The Facebook Profile -Myspace LinkedIn-Twitter-Niche Social Networking Sites-Creating Own Social Network-Promoting Social Networking Presence- Social Bookmarking & Crowd-Sourcing - Social Bookmarking-A Social Bookmarking Strategy- Crowd-Sourced News Sites- Preparation And Tracking Progress Media Communities-Image Sharing Sites-Image Sharing Strategy-Video Sharing Sites-Video Sharing Strategy-Searching And Search Engine Placement-Connecting With Others.

Unit:4	Widgets & Badges	11hours

Widgets & Badges: Highlighting Social Web Presence-Sharing And Syndicating Content Making Site More Interactive-Promoting Products And Making Money-Using Widgets In Word Press-Widget Communities And Directories- Working Widgets Into Strategy Social Media Newsrooms-Building Social Media Newsroom - Populating The Newsroom-Social Media News Releases-Social Media Newsroom Examples. More Social Tools-Social Calendars-Social Pages Wikis-Social Search Portals-Virtual Worlds.

Unit:5	**Website optimization**	**11 hours**
Website optimization: A Website Optimization Plan-Streamlining Web Presence-An Integration Plan-Looking to the Future-Life streaming: The Future of Blogging-Distributed Social Networking-Social Ranking, Relevancy, and ―Defriending-Web 3.0 or The Semantic Web-Mobile Technology- Measuring Your Success-A Qualitative Framework-A Quantitative Framework-Tools to Help You Measure-Come To Your Own Conclusions		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**60 hours**

Text Books

1	Deltina hay ―A Survival Guide To social Media and Web 2.0 Optimization‖, Dalton Publishing, 2009

Reference Books

1	Miriam Salpeter ―Social Networking for Career Success‖ Learning Express, 2011.
2	Miles, Peggy, ―Internet world guide to webcasting‖ Wiley, 2008 Professionals", Wiley Publication, 2015.

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

1	https://www.javatpoint.com
2	https://nptel.ac.in

Mapping with Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	-	S	L	-	S	-	S	S	S
CO2	S	S	S	-	S	L	-	S	-	S	S	S
CO3	S	S	S	-	S	L	-	S	-	S	S	S
CO4	S	S	S	-	S	L	-	S	-	S	S	S
CO5	S	S	S	-	S	L	-	S	-	S	S	S

S- Strong; M-Medium; L-Low

Course code 23P4CS17SEC	SEC III	WEB TECHNOLOGY	L	T	P	C
Core/Elective/Supportive		Elective	4			2
Pre-requisite		Basic of Web design				

Course Objectives:

The main objectives of this course are to:

- Explore the back bone of web page creation by developing .NET skill.
- Enrich knowledge about XHTML control and Cascading Style Sheets.
- Provide in- depth knowledge about Java script.
- Understand the need of usability, evaluation methods for web services.
- Provide in- depth knowledge about PHP, Angular JS, Jquery..

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 Cusing ArduinoIDE	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 TO XHTML AND CSS	12hours

Basic syntax, Standard structure, Basic text-markup, Images, Hypertext Links. Lists, Tables, Forms, Frames, syntactic differences between HTML and XHTML-Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The box model, Background images, The and tags, Conflict resolution.

Unit:2	THE BASICS OF JAVASCRIPT	12hours

Overview of JavaScript, Object orientation and JavaScript, general Syntactic characteristics, Primitives, operations, and expressions, Screen output and keyboard input, Control statements, Object creation and modification, Arrays, Functions, Constructors, Pattern matching using regular expressions, Errors in scripts.

JAVASCRIPT AND XHTML DOCUMENTS: The JavaScript Execution Environment, The Document Object Model, Elements Access in Java Script, Events and Event Handling, Handling Events from Body Elements, Handling Events from Text Box and password Elements, The DOM2 Model

Unit:3	DYNAMIC DOCUMENTS WITH JAVASCRIPT AND XML	12hours

Introduction, Positioning Elements, Moving Elements, Element Visibility, Changing Color and Fonts, Dynamic Content, Stacking Elements, Locating the Mouse Cursor, Reacting to a Mouse Click, Slow Movement of Elements, Dragging and Dropping Elements. Introduction to XML, Syntax of XML, XML Document Structure, Document type definitions, Namespaces, XML schemas, displaying raw XML documents, Displaying XML documents with CSS, XSLT Style Sheets, Web services.

Unit:4	PHP - INTRODUCTION TO PHP	10hours

Overview of PHP - General Syntactic Characteristics - Primitives, Operations, and Expressions - Output - Control Statements - Arrays - Functions - Pattern Matching - Form Handling - Cookies - Session Tracking.

Unit:5	JQuery	12hours
Introduction to JQuery, Syntax, selectors, events, JQuery HTML, JQuery Effects, JQuery CSS. Introduction to Angular JS, Directives, Expressions, Controllers, Filters, Services, Events, Forms, Validations, Examples.		

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

	Total Lecture hours	hours

Text Books

1	Robert W. Sebesta: Programming the World Wide Web, Eighth Edition, Pearson education, 2015. **UNITS:** 1,2,3,4
2	Dayley Brad, Dayley Brendan ,"AngularJS, JavaScript, and jQuery All in One", Sams Teach Yourself 1st Edition, Kindle Edition, 2015. **UNIT**: 5

ReferenceBooks

1	M. Srinivasan: Web Programming Building Internet Applications, 3rd Edition, Wiley India, 2009.
2	Jeffrey C. Jackson: Web Technologies-A Computer Science Perspective, Pearson Education,7th Impression,2012.
3	Chris Bates: Web Technology Theory and Practice, Pearson Education, 2012.

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

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

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

S- Strong; M-Medium; L-Low