PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY (PRIST)

Declared as DEEMED-TO-BE-UNIVERSITY
U/s 3 of UGC Act, 1956

M.Sc. COMPUTER SCIENCE

SCHOOL OF ARTS AND SCIENCE
DEPARTMENT OF COMPUTER SCIENCE

PG CURRICULUM

FULL TIME

[Regulation 2023]

[Candidates admitted from the academic year 2023-2024 onwards]

PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY (PRIST) REGULATIONS ON LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK FOR POSTGRADUATE EDUCATION	
Programme	**M.Sc., Computer Science**
Programme Code	**23PGCSCGE**
Duration	**PG - Two Years**
Programme Outcomes (Pos)	**PO1: Problem Solving Skill** Apply knowledge of Management theories and Human Resource practices to solve business problems through research in Global context. **PO2: Decision Making Skill** Foster analytical and critical thinking abilities for data-based decision-making. **PO3: Ethical Value** Ability to incorporate quality, ethical and legal value-based perspectives to all organizational activities. **PO4: Communication Skill** Ability to develop communication, managerial and interpersonal skills. **PO5: Individual and Team Leadership Skill** Capability to lead themselves and the team to achieve organizational goals. **PO6: Employability Skill** Inculcate contemporary business practices to enhance employability skills in the competitive environment. **PO7: Entrepreneurial Skill** Equip with skills and competencies to become an entrepreneur. **PO8: Contribution to Society** Succeed in career endeavors and contribute significantly to society. **PO 9 Multicultural competence** Possess knowledge of the values and beliefs of multiple cultures and a global perspective. **PO 10: Moral and ethical awareness/reasoning** Ability to embrace moral/ethical values in conducting one's life.
Programme Specific Outcomes (PSOs)	**PSO1 – Placement** To prepare the students who will demonstrate respectful engagement with others' ideas, behaviors, and beliefs and apply diverse frames of reference to decisions and actions. **PSO 2 - Entrepreneur** To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations. **PSO3 – Research and Development** Design and implement HR systems and practices grounded in research that complies with employment laws, leading the organization towards growth and development. **PSO4 – Contribution to Business World**

	To produce employable, ethical and innovative professionals to sustain in the dynamic business world. **PSO 5 – Contribution to the Society** To contribute to the development of the society by collaborating with stakeholders for mutual benefit.

PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY (PRIST)

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SCHOOL OF ARTS AND SCIENCE

DEPARTMENT OF COMPUTER SCIENCE

M.Sc. (CS) COMPUTER SCIENCE

REGULATION 2023 – 2024

COURSE STRUCTURE

SEMESTER – I

Course Code	Course Title – M.Sc.[CS]	L	T	P	C
	THEORY & LAB				
23220AEC11	Analysis & Design of Algorithms	4	2	-	4
23220AEC12	Object Oriented Analysis and Design &C++	4	2	-	4
23220AEC13	Python Programming	5	2	-	5
23220DSC14_	Critical Thinking, Design Thinking and Problem Solving	5	1	-	5
23220SEC15L	Practical I:Algorithm and OOPS Lab	0	0	3	3
23220RMC16	Research Methodology	2	-	-	2
	Total	20	7	3	23

SEMESTER – II

Course Code	Course Title – M.Sc.[CS]	L	T	P	C
	THEORY & LAB				
23220AEC21	Data Mining and Warehousing	5	1	-	4
23220AEC22	Advanced Operating Systems	5	1	-	4
23220AEC23	Advanced Java Programming	4	1	-	4
23220DSC24_	Artificial Intelligence & Machine Learning	4	1	-	4
23220SEC25L	Advanced Java Programming Lab	0	0	3	3
23220SEC26L	Data Mining Lab using R	0	0	3	3
23220BRC27	Participation in Bounded Research	2	0	0	2
23220SEC28	Internship Industrial Activity			0	2
	Total	20	4	6	26

SEMESTER – III

Course Code	Course Title – M.Sc.[CS]	L	T	P	C
	THEORY & LAB				
23220AEC31	Digital Image Processing	5	1	-	5
23220AEC32	Cloud Computing	5	1	-	5
23220AEC33	Network Security and Cryptography	5	1	-	4
23220AEC34	Data Science & Analytics	5	1	-	4
23220SEC35L	Digital Image Processing Lab using MATLAB	0	0	3	3
23220SEC36L	NME: Cloud Computing Lab	0	0	3	3
23220SEC37	Industrial visit	-	-	-	2
	Total	20	4	6	26

SEMESTER – IV

Course Code	Course Title – M.Sc.[CS]	L	T	P	C
	THEORY & LAB				
23220AEC41L	Python Programming Lab	0	1	3	3
23220AEC42	Web Application development & hosting Practical	6	2	0	5
23220PRW43	Project with Viva voce	0	2	10	4
23220SEC44	Skill Enhancement Professional Competency Skill	2	2	0	2
23220SEC45	Internship	-	-	2	2
	Total	8	7	15	16
	Total Credits for the Programme				91

Discipline Specific Electives

Semester	Discipline Specific Elective Courses-I
I	a) 23220DSC14A-Critical Thinking, Design Thinking and Problem Solving b)23220DSC14B-Multimediaandits Applications c)23220DSC14C-Internet of Things
	Discipline Specific Elective Courses-II
II	a)23220DSC24A-Artificial Intelligence & Machine Learning b) 23220DSC24B- Mobile computing c) 23220DSC24C-Web Services

Credit Distribution for PG Programme
Consolidated Semester wise Credit distribution
M.Sc. Computer Science

SEM	AEC	SEC	DSC	RSB Courses	others	Total
I	13	3	5	2	-	23
II	12	8	4	2	-	26
III	18	8	-	-	-	26
IV	5	7	-	-	4	16
Total	**48**	**26**	**9**	**4**	**4**	**91**

I – SEMESTER

Course code	23220AEC11	ANALYSIS & DESIGN OF ALGORITHMS	L	T	P	C
Core/Elective/Supportive		Core	4	2	-	4
Pre-requisite		Basic Data Structures & 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. 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 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	Going to 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 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	15hours

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

Dynamic Programming –General Method–Multi stage Graphs–All Pair ShortestPath–Optimal Binary Search Trees – 0/1 Knapsacks – Traveling Salesman Problem – Flow Shop Scheduling.

Unit:5	BACKTRACKING	13hours
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	**75hours**

Text Books	
1	Ellis Horowitz, “Computer Algorithms”, Galgotia Publications.
2	Alfred VAho, John E.Hopcroft, Jeffrey D.Ullman, "Data Structures and Algorithms".
Reference Books	
1	Goodrich, “Data Structures & Algorithms in Java”, Wiley3rd edition.
2	Skiena,”TheAlgorithmDesignManual”,SecondEdition,Springer,2008
3	Anany Levith,”Introduction to the Design and Analysis of algorithm”, 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, 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

I – SEMESTER

Course code	23220AEC12	**OBJECT ORIENTED ANALYSIS AND DESIGN & C++**	**L**	**T**	**P**	**C**
Core/Elective/Supportive		**Core**	4	2	-	4
Pre-requisite		Basics of C++ and Object Oriented Concepts				

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	Understand the concept of Object –Oriented development and modeling techniques	K1,K2
2	Gain knowledge about the various steps performed during object design	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**

ClassesandObjects–ConstructorsandDestructors–operatorsoverloading–Type Conversion-Inheritance – Pointers and Arrays.

Unit:5	**POLYMORPHISMANDFILES**	**15hours**
MemoryManagementOperators-Polymorphism–Virtualfunctions–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++", Ashok N.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

I – SEMESTER

Course code	23220AEC13	PYTHON PROGRAMMING	L	T	P	C
Core/Elective/Supportive		Core	5	2	-	5
Pre-requisite		Basics of any OOPS 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	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

Data Types: Text Strings–Binary Data. **Storing and Retrieving Data:** File Input/Output–Structured Text Files – Structured Binary Files - Relational Databases – No SQL 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 event–twisted–Reds.

Networks: Patterns – The Publish-Subscribe Model – TCP/IP – Sockets – Zero MQ –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	75hours

Text Books

1	BillLubanovic, "IntroducingPython", 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	23220DSC14A	CRITICAL THINKING, DESIGN THINKING AND PROBLEM SOLVING	L	T	P	C
Core/Elective/Supportive		Elective	5	2	-	5
Pre-requisite		Basics of Logical & Reasoning Skills				

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	Focus on the explicit development to critical thinking and problem solving skills	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, data processing, solution methods, solving problems by searching, recognizing patterns, 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 Butterworth and GeoffThwaites, Thinking skills: Critical Thinking and Problem Solving, Cambridge University Press, 2013.
2	H.S.FoglerandS.E.LeBlanc, Strategies for Creative Problem Solving, 2nd edition, Pearson, Upper Saddle River, NJ, 2008.
Reference Books	
1	A. Whimbey and J. Lochhead, 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 Copress, 2015.
4	David Kelley and Tom Kelley, Creative Confidence, 2013.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
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

Course code	23220DSC14B	MULTIMEDIA AND ITS APPLICATIONS	L	T	P	C
Core/Elective/Supportive		Elective	5	1	-	4
Pre-requisite		Basics of Multimedia				

Course Objectives:

The main objectives of this course are to:

1. To introduce the students the concepts of Multimedia Images &Animation.
2. To introduce Multimedia authoring tools
3. To understand the role of Multimedia in Internet
4. To know about High Definition Television and Desktop Computing–Knowledge based Multimedia systems

Expected Course Outcomes:

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

1	Understand the basic concepts of Multimedia	K1,K2
2	Demonstrate Multimedia authoring tools	K2,K3
3	Analyze the concepts of Sound, Images, Video &Animation	K4
4	Apply and Analyze the role of Multimedia in Internet and real time applications	K4,K5
5	Analyze multimedia applications using HDTV	K5,K6

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

Unit:1	INTRODUCTION	12hours

What is Multimedia?–Introduction to making Multimedia–Macintosh and Windows Production platforms – Basic Software tools.

Unit:2	MULTIMEDIATOOLS	12hours

Making Instant Multimedia–Multimedia authoring tools–Multimedia building blocks–Text– Sound.

Unit:3	ANIMATION	10hours

Images–Animation–Video.

Unit:4	INTERNET	12hours

Multimedia and the Internet–The Internet and how it works–Tools for World Wide Web–Designing for the World Wide Web.

Unit:5	MULTIMEDIASYSTEMS	12hours

High Definition Television and Desktop Computing –Knowledge based Multimedia systems.

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

Text Books	
1	Tay Vaughan, "Multimedia making it work",Fifth Edition,TataMcGrawHill.
2	John F.Koegel Bufford,"Multimedia Systems", Pearson Education.
Reference Books	
1	JudithJeffloate, "Multi Median Practice (Technology and Applications)", PHI, 2003.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://www.tutorialspoint.com/multimedia/index.htm
2	https://www.tutorialspoint.com/basics_of_computer_science/basics_of_computer_science_multimedia.htm
3	https://nptel.ac.in/courses/117/105/117105083/

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

Course code	23220DSC14C	INTERNETOF THINGS	L	T	P	C
Core/Elective/Supportive		Elective	5	1	-	4
Pre-requisite		Basics of Sensors & its Applications				

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

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	**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, "Internet of Things: A Hands – On Approach",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, "Internet of Things with ESP 8266", Packet Publishing, 2016.
3	Dhivya Bala, "ESP8266:StepbyStepTutorialforESP8266IoT, Arduino NO DEMCU 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	23220SEC15L	PRACTICALI:ALGORITHMAND OOPS LAB	L	T	P	C
Core/Elective/Supportive		Core	0	0	3	3
Pre-requisite		Basic Programming of C++language				

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 were of Hanoi using recursion.
2) Write a program to traverse through binary search tree using traversals.
3) Write a program to perform various operations on 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 knapsack 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 the8 queen son 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 open form 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,"DataStructures&AlgorithmsinJava",Wiley3rd edition.	
2	Skiena,"TheAlgorithmDesignManual",SecondEdition,Springer,2008	
Reference Books		
1	Anany Levith, "Introduction to the Design and Analysis of algorithm", Pearson Education Asia, 2003.	
2	RobertSedgewick,PhillipeFlajolet,"AnIntroductiontotheAnalysisofAlgorithms", Addison-Wesley Publishing Company,1996.	
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	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

23220RMC16	**Research Methodology**	**2**	**-**	**-**	**2**

AIM:

To give an exposure to development of research questions and the various statistical methods suitable to address them through available literature, with basic computational operators.

OBJECTIVES:

- To understand the approaches towards and constraints in good research.
- To identify various statistical tools used in research methodology
- To appreciate and compose the manuscript for publication
- To train in MATLAB platform for basic computational Programing and analysis.

OUTCOME:

Ability to develop research questions and the various research strategies and compile research results in terms of journal manual scripts.

PREREQUISITIES:

Research methodology course in UG level or equivalent knowledge.

UNIT-I Introduction to research methodology

Objectives of research – type of research – Significance of research. Research methodology – Research and scientific method – Criteria of good research – Problems encountered by research in India.

UNIT-II Data base and Literature Survey

Articles – Thesis – Journals – Patents – Primary sources of journals and patens – Secondary sources – Listing of titles – Abstracts –Chemical Abstract Service – Reviews – Monographs – Literature search.

UNIT-III Data Analysis:

Precision and accuracy – Reliability – Determinate and random errors – Distribution of random errors –normal distribution curve – Statistical treatment of finite samples – T test and F test (ANOVA) co – Variance (ANCOVA) correlation and multiple regression.

UNIT-IV Thesis and paper writing:

Conventions in writing – General format – Page and chapter format – Use of quotations and footnotes – Preparations of tables and figures – Reference and Appendices.

UNIT-V Application on MATLAB:

Numerical Integration – Numerical integration, ordinary differential equations, partial differential equations, and boundary value problems - Fourier analysis – Fourier transforms, convolution.

References:

1. C.R. Kothari, Research Methodology, New Age International publishers. New Delhi, 2224.
2. R.A Day and A.L. Underwood, Quantitative analysis, Prentice Hall, 1999.
3. R. Gopalan, This is writing, Vijay Nicole Imprints Private Ltd., 2225.
4. A Guide to MATLAB: For Beginners and experienced Users by Brian R. Hunt (Editor), Ronald L. Lipsman, J. Rosenberg
5. Introduction to MATLAB for Engineers by William J. Palm III.

II – SEMESTER

Course code	23220AEC21	DATA MINING AND WAREHOUSING	L	T	P	C
Core/Elective/Supportive		Core	5	1	-	4
Pre-requisite		Basics of RDBMS & Algorithms				

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 data mining 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 warehousing contents	K2,K3
3	Compare and evaluate different data mining techniques like classification, prediction, Clustering and association rule mining	K4,K5
4	Design data ware house 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	BASICS AND TECHNIQUES	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	CLUSTERING AND ASSOCIATION	12hours

Clustering: Introduction–Similarity and Distance Measures–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	DATA WAREHOUSING AND MODELING	11hours

Data warehousing: introduction-characteristics of a data warehouse–data arts–other aspects

Of data mart .Online analytical processing: introduction –OLTP & OLAP systems Data modeling – star schema for multidimensional view –data modeling – multi factor schema or snow flake schema – OLAP TOOLS – State of the market – OLAP TOOLS and the internet.		
Unit:5	**APPLICATIONS OF DATA 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	ArunK.Pujari," Data Mining Techniques", Universities Press(India)Pvt. Ltd.2003.
2	AlexBerson, StephenJ.Smith, "Data Warehousing, Data Mining and OLAP",TMCH, 2001.
3	JiaweiHan & Micheline Kamber, "Data Mining Concepts &Techniques", 2001, Academic press.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
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

II – SEMESTER

Course code	23220AEC22	ADVANCED OPERATING SYSTEMS	L	T	P	C
Core/Elective/Supportive		Core	5	1	-	4
Pre-requisite		Basics of OS & its functioning				

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	Master various process management concepts including scheduling, 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

Operating Systems for Hand held Systems: Requirements–Handheld Operating Systems–Palm OS-Symbol an Operating System-Android–Architecture of android– 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 Silberschatz;; 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 Bhatt, An introduction to operating systems, concept and practice, PHI, Third edition, 2010.
3	Daniel.P.Bovet & Marco Cesati,"Understanding the Linux kernel",3rd edition,O"Reilly,2005
4	NeilSmyth, "iPhone iOS4 Development Essentials–Xcode", Fourth Edition, 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

II – SEMESTER

Course code	23220AEC23	**ADVANCED JAVA PROGRAMMING**	**L**	**T**	**P**	**C**
Core/Elective/Supportive		**Core**	4	1	-	4
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 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 interactive applications using Java Servlet, JSP and JDBC	K5,K6

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

Unit:1	**BASICS OF JAVA**	**12hours**

Java Basics Review: Components and event handling–Threading concepts–Networking features – Media techniques

Unit:2	**REMOTE METHOD 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–database access-Interacting-database 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	**ADVANCED TECHNIQUES**	**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	Jamie Jaworski, “Java Unleashed”, SAMS Tech media Publications, 1999.
2	Campione, Walrath and Huml, “The Java Tutorial”, Addison Wesley, 1999.
Reference Books	
1	JimKeogh,”The Complete Reference J2EE”, Tata McGraw Hill Publishing Company Ltd, 2010.
2	David Sawyer McFarland, “JavaScript 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, 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	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	23220DSC24A	ARTIFICIAL INTELLIGENCE & MACHINE LEARNING	L	T	P	C
Core/Elective/Supportive		Core	4	1	-	4
Pre-requisite		Basics of AI & an Introduction about ML				

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 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 area 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	SEARCH TECHNIQUES	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	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	MACHINE LEARNING	12hours

Understanding Machine Learning: What Is Machine Learning?-Defining Big Data-Big Data in Context with Machine Learning-The Importance of the Hybrid Cloud –Leveraging the Power of Machine Learning-The Roles of Statistics and Data Mining with Machine Learning-Putting Machine Learning in Context-Approaches to Machine Learning.		
Unit:5	**APPLICATIONS OF MACHINE 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 Richand Kevin Knight, “Artificial Intelligence", Tata McGraw Hill Publishers company Pvt Ltd, Second Edition, 1991.
2	George FLuger,” Artificial Intelligence", 4thEdition, 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, 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	23220DSC24B	MOBILECOMPUTING	L	T	P	C
Core/Elective/Supportive		Elective	4	1	-	4
Core/Elective/Supportive		Elective	4	1	-	4
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

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	MOBILECOMMUNICATIONSYSTEM	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, "Mobile Communications", Second Edition, Pearson Education, 2007.
Reference Books	
1	AsokeKTalukder,HasanAhmed,RoopaYavagal,"Mobile Computing",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	23220DSC24C	WEB SERVICES	L	T	P	C
Core/Elective/Supportive		Elective	4	1	-	4
Pre-requisite		Basics of Distributed Computing				

Course Objectives:

The main objectives of this course are to:

1. Present the Web Services , Building real world Enterprise applications using Web Services with Technologies XML, SOAP , WSDL , UDDI
2. Get overview of Distributed Computing ,XML, and its technologies
3. Update with QoS and its features
4. Develop Standards and future of Web Services

Expected Course Outcomes:

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

1	Understand web services and its related technologies	K1,K2
2	Understand XML concepts	K2,K3
3	Analyze on SOAP and UDDI model	K4,K5
4	Demonstrate the road map for the standard sand future of web services	K5
5	Analyze QoS enabled applications in web services	K5,K6

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

Unit:1	INTRODUCTION	12hours

Introduction to web services – Overview of Distributed Computing- Evolution and importance of web services-Industry standards, Technologies and concepts underlying web services-Web services and enterprises-web services standards organization-web services platforms.

Unit:2	XML FUNDAMENTALS	12hours

XMLFundamentals–XMLdocuments-XMLNamespaces-XMLSchema–ProcessingXML.

Unit:3	SOAP MODEL	12hours

SOAP: The SOAP model- SOAP messages-SOAP encoding- WSDL: WSDL structure- interface definitions-bindings-services-Using SOAP and WSDL-UDDI: About UDDI- UDDI registry Specification- Core data structures-Accessing UDDI

Unit:4	TECHNOLOGIES AND STANDARDS	12hours

Advanced web services technologies and standards: Conversations overview-web services conversation language-WSCL interface components. Workflow: business process management-workflows and workflow management systems Security: Basics-data handling and forwarding- data storage-errors-Web services security issues.

Unit:5	QUALITY OF SERVICE	10hours
Quality of Service: Importance of QoS for web services-QoS metrics-holes-design patterns-QoS enabled web services-QoS enabled applications. Web services management-web services standards and future trends.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars –webinars		
	Total Lecture hours	**60hours**

	Text Books
1	Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services: An Architects Guide", Prentice Hall, Nov 2003.
2	Keith Ballinger, "NET Web services: Architecture and Implementation with .Net", Pearson Education, First Edition, Feb 2003.
	Reference Books
1	Ramesh Nagappan, "Developing Java Web Services: Architecting and developing secure Web Services Using Java", John Wiley and Sons, first Edition Feb 2003.
2	EricAMarks and MarkJWerrell, "Executive Guide to Web services", John Wiley and sons, March 2003.
3	Anne Thomas Manes, "Web Services: A managers Guide", Addison Wesley, June 2003.
	Related Online Contents [MOOC, SWAYAM, NPTEL ,Websites etc.]
1	https://www.tutorialspoint.com/webservices/index.htm
2	https://www.javatpoint.com/web-services-tutorial
3	https://www.btechguru.com/training--programming--xml--web-services--web-services-part-1-video-lecture--11801--24--147.html

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

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

Course code	23220SEC25L	PRACTICAL IV:ADVANCED JAVA PROGRAMMING LAB	L	T	P	C
Core/Elective/Supportive		Core	0	0	3	3
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 ast 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 the records.
7. Write a program using Java servlet to handle form data.
8. Write a simple Servlet program to create a table of all the headers it receives a long with their associated values.
9. Write a programing 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. Program to send a text message to another system and receive the text message from the system (use socket programming).

Expert lectures, online seminars –webinars

Total Lecture hours	75hours

Text Books	
1	JamieJaworski, “JavaUnleashed”, SAMS Tec media Publications,1999.
2	Campione, Walrath and Huml, “The Java Tutorial”, Addison Wesley,1999.
Reference Books	
1	JimKeogh,”TheCompleteReferenceJ2EE”, Tata McGraw Hill Publishing Company Ltd,2010.
2	David Sawyer McFarland,“JavaScript And JQuery – The Missing Manual”,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

Course code	23220SEC26L	PRACTICALIII:DATAMINING USING R	L	T	P	C
Core/Elective/Supportive		Core	0	0	3	3
Pre-requisite		Basics of DM Algorithms & R 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

Expected Course Outcomes:

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

1	Able to write programs using R for Association rules, Clustering techniques	K1,K2
2	To implement data mining techniques like classification, prediction	K2,K3
3	Able to use different visualizations techniques using R	K4,K5
4	To apply different data mining algorithms to solve real world applications	K5,K6

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

LISTOF PROGRAMS	75hours

1. Implement a priority algorithm to extract association rule of data mining.
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	MargaretH.Dunham,"DataMining:IntroductoryandAdvancedTopics",Pearson education,2003.
2	C.S.R. Prabhu, "Data Warehousing Concepts, Techniques, Products and Applications", PHI, Second Edition

Reference Books

1	ArunK.Pujari, "Data Mining Techniques", Universities Press (India) Pvt. Ltd., 2003.
2	AlexBerson Stephen J.Smith, "Data Warehousing, Data Mining and OLAP", TMCH, 2001.

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

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

III SEMESTER

Course code	23220AEC31	**DIGITAL IMAGE PROCESSING**	**L**	**T**	**P**	**C**
Core/Elective/Supportive		**Core**	5	1	-	5
Pre-requisite		Basics of 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 fundament also 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	Apply the concepts of filtering and segmentation for digital image retrieval	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	**IMAGE ENHANCEMENT**	**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	**IMAGE RESTORATION**	**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	**IMAGE COMPRESSION**	**11hours**

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

Unit:5	**IMAGE SEGMENTATION**	**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, 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, "Digital Image Processing a practical introducing using Java", Pearson Education, 2004.

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

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

Course code	23220AEC32	CLOUD COMPUTING	L	T	P	C
Core/Elective/Supportive		Core	5	1	-	5
Pre-requisite		Basics of Cloud & its Applications				

Course Objectives:

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	CLOUD COMPUTING	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	CLOUD SERVICES	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	OUTSIDE THE CLOUD	12hours

OUTSIDE THE CLOUD Evaluating web mail services, Evaluating instant messaging, Evaluating web conference tools, creating groups on social networks, Evaluating online

Groupware, collaborating via blogs and wikis.		
Unit:5	**STORING AND 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, Websites etc.]	
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

Course code	23220AEC33	NETWORK SECURITY AND CRYPTOGRAPHY	L	T	P	C
Core/Elective/Supportive		Core	5	1	-	4
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 modular arithmetic 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

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

Unit:4	**WEB SECURITY**	**10hours**
WebSecurity-SecureSocketLayer–SecureElectronicTransaction.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	**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	BruceSchneir, “Applied Cryptography”, CRC Press.
Reference Books	
1	A.Menezes, P Van Oorschot and Vanstone, “Hand Book of Applied Cryptography”, CRC Press, 1997
2	Ankit Fadia,”Network Security”, Macmillan.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
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

Course code	23220AEC34	DATA SCIENCE & ANALYTICS	L	T	P	C
Core/Elective/Supportive		Core	5	1	-	4
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 languages, 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 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	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	BASICS OF DATA ANALYTICS	12hours

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

Unit:3	DATA ANALYTICS USING R	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	As introduction Data Science – LarsNielson2015
2	Introducing Data Science Davy Cielen, Arno D.B.Meysman, Mohamed Ali 2016 Manning Publication
3	R Programming for Data Science-RogerD. Peng 2015LeanPublication
4	DataScience&BigDataAnalytics:Discovering,Analyzing,VisualizingandPresenting 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	23220SEC35L	PRACTICAL V:DIGITAL IMAGE PROCESSING Using MATLAB	L	T	P	C
Core/Elective/Supportive		Core	0	0	3	3
Pre-requisite		Basic Programming of Image Processing & an intro to MAT LAB				

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 MAT LAB

Expected Course Outcomes:

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

1	To write programs in MAT LAB 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 Sobels operators)
6. Implement image compression.
7. Image Subtraction
8. Boundary Extraction using morphology.
9. Image Segmentation

Total Lecture hours	60hours

Text Books	
1	RafaelC.Gonzalez, Richard E.Woods,“ Digital Image Processing”, Second Edition,
	PHI/Pearson Education.
2	B.Chanda,D.DuttaMajumder,“Digital Image Processing and Analysis”,PHI, 2003.
Reference Books	
1	NickEfford, “Digital Image Processing a practical introducing using Java”, Pearson Education, 2004.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
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

Course code	23220SEC36L	PRACTICAL VI: CLOUD COMPUTING LAB	L	T	P	C
Core/Elective/Supportive		Core	0	0	3	3
Pre-requisite		Basic Programming using Cloud				

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 and 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

LIST OF PROGRAMS	60hours

1. Working with Google Drive to make spreadsheet and notes.
2. Launch a Linux Virtual machine.
3. Toho statistic website
4. Exploring Google cloud for the following a)Storage b)Sharing of data c)manage your 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 No SQL 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, Websites etc.]	
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

IV – SEMESTER

Course code	23220AEC41L	PRACTICAL II:PYTHON PROGRAMMING LAB	L	T	P	C
Core/Elective/Supportive		Core	0	1	3	3
Pre-requisite		Basics of any OOP Programming Language				

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 webpages using forms.

Total Lecture hours	75hours

Text Books

1	BillLubanovic, “Introducing Python”, O’Reilly, First Edition-Second Release, 2014.
2	MarkLutz, “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	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	23220AEC42	PRACTICAL VII : WEB APPLICATION DEVELOPMENT AND HOSTING	L	T	P	C
Core/Elective/Supportive		Core	6	2	0	5
Pre-requisite		Basic Programming using HTML tags				

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 Framesets, hyperlinks and different formatting features of HTML tags
3. Enable the students to use Forms & other controls in a webpage
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 web pages	K1,K2
2	Capable of using hyperlinks, frames, images, tables,..... in a webpage	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

LIST OF PROGRAMS	30 hours

1. Develop 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 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 any at format using several components.
6. Develop a HTML document to display a Registration Form for an inter-collegiate function.
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 numbers n1and n2 using HTML format and display the Prime

Numbers between n1 and n2 using PHP.	
Total Lecture hours	**30 hours**
Text Books	
1	IvanBayross, “Web Enabled Commercial Applications Development Using HTML, JavaScript, DHTML and PHP”, BPB Publications, 4th Revised Edition, 2010.
Reference Books	
2	A.K.Sainiand SumintTuli, “Mastering XML”, First Edition, New Delhi, 2002.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
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

23220PRW43	**Project with Viva voce**	0	2	10	4

Each student will develop and implement individually developed application software based on any of the latest technologies.

23220SEC44	**Skill Enhancement Professional Competency Skill**	2	2	0	2

Pre-requisite

Professional competencies are abilities bringing together soft and hard skills. These abilities enable an employee to competently manage tasks assigned to them as part of their role.

Course Objectives:

- Improved Job Performance. ...
- Increased Employee Satisfaction and Retention. ...
- Enhanced Innovation. ...
- Improved Organizational Agility. ...
- Communication. ...
- Time Management. ...

Expected Course Outcomes:

Expected learning outcomes define the totality of information, knowledge, understanding, attitudes, values, skills, competencies, or behaviors a learner should master upon the successful completion of the curriculum.

Unit- I: Office

What is a Business Enterprise? What is an Office? Who are Office Staff? What are the most Common Forms of Business Organization? What are the Advantages of Office Work? What are the Categories of Office Career and Job Classifications under Each Category? What are the Specific Skill Requirements for Office Jobs? Duties and Responsibilities of Office Staff.

Unit-II: Records Management

Objectives of Record Keeping; what is Filing? What are the Different Kinds of Filing System? Steps in Filing; Indexing; Selecting the Appropriate Filing System; How to handle Incoming & Outgoing Mails

Unit –III: Document/Report Writing Key points to write a document: The 5w-h plan for writing; Steps in writing workplace documents; Important things to remember when editing seven layout mistakes to avoid; Quick tips for report Writing; Basics of Meetings.

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Unit-IV: Supervisory Skills

What are the Skills of the Supervisor and How to Acquire Them? Functions of Supervisor Communication Meaning; Process; Communicating Tools; Types, Barriers Leadership & Motivation Meaning and Concept; Importance of Leadership; Qualities of a Leader; Relationship & Differences.

Unit-V: Leadership and Motivation

Organizational Leadership; Leadership Ethics - Traits of an Ethical Leader; Leadership Styles - Important Leadership Styles- Situational Leadership – Emotional Intelligence of Leader; Which Leadership Style to Follow? Influence of Situational Leadership Styles on Subordinate Development;

References:–

1. Office Management
By Ankita Bhatia
Dr. R. K. Chopra
2. Office Management
By Dr. P. Rizwan Ahmed
3. Office Management
By R S N Pillai