AVS

COLLEGE OF ARTS & SCIENCE

(AUTONOMOUS)

Attur Main Road, Ramalingapuram, Salem - 106.

(Recognized under section 2(f) & 12(B) of UGC Act 1956 and

Accredited by NAAC with 'A' Grade)

(Co - Educational Institution | Affiliated to Periyar University, Salem

ISO 9001 -2015 Certified Institution)

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Syllabus for

M.Sc. COMPUTER SCIENCE

CHOICE BASED CREDIT SYSTEM –

LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK

(CBCS – LOCF)

(Applicable to the Candidates admitted from 2023-24 onwards)

VISION

- To attain excellence in the field of education by creating competent scholars with a touch of human values.

MISSION

- To accomplish eminence in the academic domain.
- To provide updated infrastructure.
- To educate value based education.
- To impart skills through efficient training programs.
- To cultivate culture and tradition with discipline and determination.

REGULATIONS

1. Eligibility for Admission:

A candidate who has passed in B.Sc. Computer Science / B.C.A / B.Sc Computer Technology / B.Sc Information Science / B.Sc Information Technology / B.Sc Data Analytics / B.Sc Data Science / B.Sc Artificial Intelligence and Data Science / B.Sc Cyber Security / B.Sc Internet of Things degree of this University or any of the degree of any other University accepted by the syndicate as equivalent there to subject to such conditions as may be prescribed therefore shall be permitted to appear and qualify for the M.Sc Computer Science degree examination of this University after a course of study of two academic years.

2. Duration:

The programme for the degree of Master of Science in Computer Science shall consist of two Academic years divided into four semesters.

3. Eligibility for award of degree:

Candidates who obtain 75% and above in the aggregate shall be deemed to have passed the examination in **First Class with Distinction** provided they pass all the

Examinations prescribed for the programme at the first appearance. Candidates, other than the above, who secure not less than 60% of the aggregate marks in the whole examinations, shall be declared to have passed the examination in **First Class**. The remaining successful candidates shall be declared to have passed in **Second Class**.

Candidates who pass all the examinations prescribed for the programme in first instance and within a period of two academic years from the year of admission are only eligible for **University Ranking.**

4. Course of Study:

Two-year postgraduate degree course that deals with the main areas of specialization: system development, natural computation, mathematical foundation, software engineering, and artificial intelligence.

5. Scheme of Examination:

The examination shall be of three hours duration for each course at the end of each semester. The candidate failing in any subject(s) will be permitted to appear in the subsequent examination.

He/she practical / project should be an individual work. The University examination for practical / project work will be conducted by the internal and external examiners jointly at the end of each semester

6. Passing Rules:

The candidate shall be declared to have passed in the Theory / Practical / Project Work examination, if the candidate secures not less than 50% marks in EA and also in total of the prescribed marks. However, submission of a record note book is a must.

Programme Outcomes (POs) On successful completion of the **M.Sc Computer Science**	
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
PO9	**Multicultural competence** Possess knowledge of the values and beliefs of multiple cultures and a global perspective.
PO10	**Moral and ethical awareness/reasoning** Ability to embrace moral/ethical values in conducting one's life.

Program Specific Outcomes (PSOs) After the successful completion of **M.Sc Computer Science** programme the students are expected to	
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.
PSO2	**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 comply 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.
PSO5	**Contribution to the Society** To contribute to the development of the society by collaborating with stakeholders for mutual benefit.

Programme Educational Objectives (PEOs) The **M.Sc Computer Science** programme describes accomplishments that graduates is expected to attain within five to seven years after graduation.	
PEO1	Graduates are prepared to be employed in IT industries by providing expected domain Knowledge.
PEO2	Graduates are provided with practical training, hands-on to meet the industrial needs.
PEO3	Graduates are motivated in career and entrepreneurial skill development to become global leaders.
PEO4	Graduates are trained to demonstrate creativity, develop innovative ideas and. to work in teams to accomplish a common goal.
PEO5	Graduates are trained to address social issues and guided to approach problems with Solutions.

CREDIT DISTRIBUTION FOR 2 YEARS M.Sc COMPUTER SCIENCE PROGRAMME

Part	Course Type	Credits per Course	No. of Papers	Total Credits
Part I	Core Courses	5	5	25
	Core Courses	4	5	20
Part II	Elective Courses	4	1	04
	Elective Courses	3	2	06
Part III	Supportive Courses	2	1	2
	Core –Practical	5	1	5
		4	2	8
		3	3	9
		2	1	2
	Elective - Practical	-	-	-
			Total	**81**
Part IV				
	Internship	2	1	2
	Mini-Project	-	-	--
	Project	7	1	7
	Fundamentals of Human Rights	1	1	1
	Extension activity	1	1	1
			Total	**11**
Part V	Credit Seminar	-	-	-
Part VI	Online Courses	-	-	-
			Total Credits	**92**

CONSOLIDATED SEMESTER WISE AND COMPONENT WISE CREDIT DISTRIBUTION FOR 2 YEARS M.Sc. COMPUTER SCIENCE PROGRAMME

Parts	Semester I	Semester II	Semester III	Semester IV	Total Credits
Part I	**14**	**12**	**19**	**-**	**45**
Part II	**4**	**3**	**3**	**-**	**10**
Part III	**6**	**8**	**5**	**7**	**26**
Part IV	**-**	**1**	**2**	**8**	**11**
Total	**24**	**24**	**29**	**15**	**92**

*Part I, II and Part III components will be separately taken into account for CGPA calculation and classification for the under graduate programmes and the other components IV and V have to completed during the duration of the programmes as per the norms, to be eligible for obtaining the UG degree.

METHOD OF EVALUATION

Evaluation	Components		Marks
Internal Evaluation	Continuous Internal Assessment Test	15	25 Marks
	Assignments	3	
	Class Participation	2	
	Distribution of marks for Attendance (in percentage) 96 – 100-5 Marks 91 – 95-4 Marks 86 – 90-3 Marks 81 – 85-2 Marks	5	
External Evaluation	End Semester Examination		75 Marks
Total			**100 Marks**

Note-1.UG Programmes- A candidate must score minimum 10 marks in Internal and 30 marks in External Evaluation.

2. PG Programmes- A candidate must score minimum 13 marks in Internal and 38 marks in External Evaluation.

CONTINUOUS INTERNAL ASSESSMENT

level	Cognitive Domain	Description
K1	**Remember**	• The lowest level of questions require student store call information from the course content • Knowledge questions usually require students to identify information in the textbook.
K2	**Understand**	• Understanding off acts and ideas by comprehending organizing, comparing, translating, interpolating and interpreting in their own words. • The questions go beyond simple recall and require students to combine data together
K3	**Apply**	• Students have to solve problems by using/applying a concept learned in the classroom. • Students must use their knowledge to determined exact response
K4	**Analyze**	• Analyzing the question is one that asks the students to break down something in to its component parts. • Analyzing require students to identify reasons causes or motives and reach conclusions or generalizations.
K5	**Evaluate**	• Evaluation requires an individual to make judgment on something. • Questions to be asked to judge the value of an idea a character, a work of art, or a solution to a problem. • Students are engaged in decision-making and problem–solving. • Evaluation questions do not have single right answers.
K6	**Create**	• The questions of this category challenge students to get engaged in creative and original thinking. • Developing original idea and problem solving skills

Question Paper Blue Print for Continuous Internal Assessment - I & II

Duration-2 Hours							Maximum-50 marks
Section	K level						Marks
	K1	K2	K3	K4	K5	K6	
A (no choice)	10						10 X 1 =10
B (no choice)		1	1				2 X 5 =10
C (either or choice)				3			3 x 10 = 30
Total							50 marks

Note-K4 and K5 levels will be assessed in the Model Examination whereas K5 and K6 Levels will be assessed in the End Semester Examinations.

Question Paper Blue Print for Continuous Internal Assessment - I

Time-2 Hours Total Marks-50 Marks Minimum Pass-20 Marks

Unit	Section - A	Section - B	Section - C
I	Q.N. 1, 2, 3, 4, 5	Q.N. 11	Q.N. 13 A, 13 B
I or II	-	-	Q.N. 14 A, 14 B
II	Q.N. 6, 7, 8, 9, 10	Q.N. 12	Q.N. 15 A, 15 B

SECTION – A (10 X 1 = 10 Marks)

ANSWER ALL THE QUESTIONS

SECTION – B (2 X 5 = 10 Marks)

ANSWER ALL THE QUESTIONS

SECTION – C (3 X 10 = 30 Marks)

ANSWER ALL THE QUESTIONS (Either or Choice)

Question Paper Blue Print for Continuous Internal Assessment - II

Time-2 Hours Total Marks-50 Marks Minimum Pass-20 Marks

Unit	Section - A	Section - B	Section - C
III	Q.N. 1, 2, 3, 4, 5	Q.N. 11	Q.N. 13 A, 13 B
III or IV	-	-	Q.N. 14 A, 14 B
IV	Q.N. 6, 7, 8, 9, 10	Q.N. 12	Q.N. 15 A, 15 B

SECTION – A (10 X 1 = 10 Marks)

ANSWER ALL THE QUESTIONS

SECTION – B (2 X 5 = 10 Marks)

ANSWER ALL THE QUESTIONS

SECTION – C (3 X 10 = 30 Marks)

ANSWER ALL THE QUESTIONS (Either or Choice)

Question Paper Blue Print for Model Examination & End Semester Examination

Duration-3 Hours		Maximum-75 marks						
Section		K level						Marks
		K1	K2	K3	K4	K5	K6	
A (no choice, three questions from each unit)		15						15 X 1 =15
B (choice, one question from each unit)			1	1				2 X 5 =10
C (either or choice & two questions from each unit)	*Courses with K4 as the highest cognitive level*				4	1		5 x 10 = 50
	Course with K5 as the highest cognitive level wherein three K4 questions and two K5 questions are compulsory.				3	2		
	Course with K6 as the highest cognitive level wherein two questions each on K4, K5 and one question on K6 are compulsory.				2	2	1	
Total								75 marks

Question Paper Blue Print for Model Examination & End Semester Examination

Time-2 Hours Total Marks-75 Marks Minimum Pass-30 Marks

Unit	Section - A	Section - B	Section - C
I	Q.N. 1, 2, 3	Q.N. 16	Q.N. 21 A, 21 B
II	Q.N. 4, 5, 6	Q.N. 17	Q.N. 22 A, 22 B
III	Q.N. 7, 8, 9	Q.N. 18	Q.N. 23 A, 23 B
IV	Q.N. 10, 11, 12	Q.N. 19	Q.N. 24 A, 24 B
V	Q.N. 13, 14, 15	Q.N. 20	Q.N. 25 A, 25 B

SECTION – A (15 X 1 = 15 Marks)

ANSWER ALL THE QUESTIONS

SECTION – B (2 X 5 = 10 Marks)

ANSWER ANY TWO QUESTIONS

SECTION – C (5 X 10 = 50 Marks)

ANSWER ALL THE QUESTIONS (Either or Choice)

Question Paper Blue Print for Model Practical Examination & End Semester Examination (Practical)

Time-3 Hours Total Marks-100 Marks Minimum Pass-50 Marks

Practical Marks	Maximum Mark	Minimum Mark
Internal	40	16
External	60	24
Total	100	40

Evaluation for End Semester Examinations (Practical)

Record	10 marks
Problem Understanding	10 marks
Implementation	10 marks
Viva-voce	10 marks
Debugging and Modification	10 marks
Result with units	10 marks
TOTAL	**60 MARKS**

*Submission of record with due certification is a must for external practical examinations.

**A student should complete all requires experiments to get 10 marks for the record.

Scheme of Examination for M.Sc. Computer Science

First Year – Semester - I

Part	Course Code	Course Title	Ins. Hrs	Credit	CIA	ESE	Total
I	23PCSC01	Core – I Analysis &Design of Algorithms	5	5	25	75	100
	23PCSC02	Core - II Object Oriented Analysis and Design & C++	5	5	25	75	100
	23PCSC03	Core - III Python Programming	5	4	25	75	100
II	23PCSE01	Elective - I Advanced Software Engineering	3	4	40	60	100
III	23PCSCP01	Practical - I Algorithm and OOPS Lab	4	3	25	75	100
	23PCSCP02	Practical - II Python programming Lab	3	3	40	60	100
Total			**25**	**24**			

First Year – Semester - II

Part	Course Code	Course Title	Ins. Hrs	Credit	CIA	ESE	Total
I	23PCSC04	Core - IV Data Mining and Warehousing	4	4	25	75	100
	23PCSC05	Core - V Advanced Operating Systems	4	4	25	75	100
	23PCSC06	Core - VI Advanced Java Programming	4	4	25	75	100
II	23PCSE05	Elective - II Internet of Things	4	3	25	75	100
III	23PCSCP03	Practical - III Data Mining Lab using R	3	4	40	60	100
	23PCSCP04	Practical - IV Advanced Java Programming Lab	4	4	40	60	100
IV	23PSOCCC01	Fundamentals of Human Rights	2	1	25	75	100
Total			**25**	**24**			

Second Year – Semester - III

Part	Course Code	Course Title	Ins. Hrs	Credit	CIA	ESE	Total
I	23PCSC07	Core - VII Digital Image Processing	4	5	25	75	100
	23PCSC08	Core - VIII Cloud Computing	4	5	25	75	100
	23PCSC09	Core - IX Network Security and Cryptography	4	5	25	75	100
	23PCSC10	Core - X Data Science & Analytics	4	4	25	75	100
II	23PCSE09	Elective – III Web Services	2	3	25	75	100
III	23PCSCP05	Practical – V Digital Image Processing Lab Using MATLAB	3	3	40	60	100
	23PCSCP06	Practical - VI Cloud Computing Lab	3	2	40	60	100
IV	23PCSI01	Internship Industrial Activity	1	2	25	75	100
Total			**25**	**29**			

Second Year – Semester - IV

Part	Course Code	Course Title	Ins. Hrs	Credit	CIA	ESE	Total
III	23PCSCP07	Practical – VII Web Application development & hosting Practical	5	5	40	60	100
	23PCSSECP_	Skill Enhancement Course- Professional Competency Skill	5	2	40	60	100
IV	23PCSCPR01	Project work and Viva-voce	10	7	50	150	200
	23PCSEX01	Extension Activity	5	1	-	-	-
Total			**25**	**15**			

****Ins. Hrs** – Instructional Hours**, CIA-** Continuous Internal Assessment**, ESE-** End Semester Examination

Semester - I	Course Code - 23PCSC01	Hours/Week - 5	Credit - 5
COURSE TITLE : CORE – I ANALYSIS & DESIGN OF ALGORITHMS			

Course Overview:

1. knowledge about algorithms and determines their time complexity. Demonstrate ific search and sort algorithms using divide and conquertechnique.
2. Gain good understanding of Greedy method and its algorithm.
3. Able to describe about graphs using dynamic programming technique.
4. Demonstrate the concept of backtracking & branch and bound technique.

Learning Objectives:

1. To give clear idea on algorithmic design paradigms like Divide-and-Conquer,
2. Demonstrate a familiarity with major algorithms and data structures.
3. Performance analysis of Algorithms using asymptotic and empirical approaches
4. To Introduce various designing techniques and methods, for algorithms Greedy, Branch and Bound etc.
5. Demonstrate a familiarity with major algorithms and data structures.

Unit - I	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 – Heap sort- Graph.

Unit - II	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 - III	Greedy Method	15 Hours

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

Unit - IV	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 - V	Backtracking	13 Hours

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

Text Book(s):

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 algorithm”, Pearson EducationAsia, 2003.
4. Robert Sedgewick, Phillipe Flajolet, ”An Introduction to the Analysis of Algorithms”, Addison-Wesley Publishing Company, 1996.

Web Resources:

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

Teaching Methodology: Videos, Audios, PPT, Role Play, Quiz, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning.

Learning Outcomes:

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

COs	Statements	Bloom's Level
1.	Enable the students to learn the Elementary Data Structures And algorithms.	K1,K2
2.	Gain good understanding of Greedy method and its algorithm.	K2,K3
3.	Able to describe about graphs using dynamic programming technique.	K3,K4
4.	Demonstrate the concept of 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

Mapping(COs vs POs)									
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	S	M	S	M	S	L	M	L	S
CO2	S	S	S	S	S	M	S	M	S
CO3	S	S	S	S	S	M	S	M	S
CO4	S	S	S	S	S	M	S	M	S
CO5	S	S	S	S	S	M	S	M	S

S-Strong-3, M-Medium-2, L-Low-

Semester - I	Course Code - 23PCSC02	Hours/Week - 5	Credit - 5
COURSE TITLE : CORE - II OBJECT ORIENTED ANALYSIS AND DESIGN & C++			

Course Overview:

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
4. Present the object model, classes and objects, object orientation, machine view and model management view.

Learning Objectives:

1. To learn the basis of OO Analysis and design
2. To have clear idea about traditional and modern SW development Methodologies

   And oops concepts.
3. Discuss the overview of Object oriented methodologies
4. To introduce the concept of Object-oriented system development lifecycle
5. To identify objects, relationships, services and attributes

Unit - I	Object Model	15 Hours

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 - II	Classes and Objects	15 Hours

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 - III	C++ Introduction	15 Hours

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

Unit - IV	Inheritance and Overloading	13 Hours

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

Unit - V	Polymorphism and Files	15 Hours

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

Text Book(s):

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, FirstIndian Print -2003, Pearson Education.

Reference Books:

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

Web Resources:

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

Teaching Methodology: Videos, Audios, PPT, Role Play, Quiz, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning.

Learning Outcomes: Upon successful completion of this course, the student will be able to:		
COs	**Statements**	**Bloom's Level**
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		

Mapping(COs vs POs)									
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	S	S	S	M	S	M	S	M	S
CO2	S	S	S	M	S	M	S	M	S
CO3	S	S	S	M	S	M	S	M	S
CO4	S	S	S	M	S	M	S	M	S
CO5	S	S	S	M	S	M	S	M	S

S-Strong-3, M-Medium-2, L-Low-1

Semester - I	Course Code - 23PCSC03	Hours/Week - 5	Credit - 4
COURSE TITLE : CORE - III PYTHON PROGRAMMING			

Course Overview:

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

Learning Objectives:

1. To understand why Python is a useful scripting language for developers.
2. To learn how to design and program Python applications.
3. To define the structure and components of a Python program.
4. To learn how to build and package Python modules for reusability.
5. To learn how to use exception handling in Python applications for error handling.

Unit - I	Introduction	15 Hours

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

Unit - II	Code Structures	15 Hours

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 - III	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 – In self Defense – Get and Set Attribute Values with Properties – Name Mangling for Privacy – Method Types – Duck Typing – Special Methods –Composition**.**

Unit - IV	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 – No SQL Data Stores. Web-Web Clients – Web Servers – Web Services and Automation

Unit - V	Systems and Networks	15 Hours

Systems-Files –Directories – Programs and Processes – Calendars and Clocks. Concurrency-Queues – Processes – Threads – Green Threads and event – twisted – Redis. Networks-Patterns – The Publish-Subscribe Model – TCP/IP – Sockets – Zero MQ –Internet Services – Web Services and APIs – Remote Processing – Big Fat Data and Map Reduce – Working in the Clouds.

Text Book(s):

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 Edition, 2009.
2. Sheetal Taneja, Naveen Kumar, Approach”, Pearson Publications.

Web Resources:

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

Teaching Methodology: Videos, Audios, PPT, Role Play, Quiz, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning.

Learning Outcomes:

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

COs	Statements	Bloom’s Level
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

Mapping(COs vs POs)									
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	S	S	S	M	S	M	S	M	S
CO2	S	S	S	M	S	M	S	M	S
CO3	S	S	S	M	S	M	S	M	S
CO4	S	S	S	M	S	M	S	M	S
CO5	S	S	S	M	S	M	S	M	S

S-Strong-3, M-Medium-2, L-Low-1

Semester - I	**Course Code - 23PCSCP01**	**Hours/Week - 4**	**Credit - 3**
COURSE TITLE : PRACTICAL - I ALGORITHM AND OOPS LAB			

Course Overview:

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

Learning Objectives:

1. Strengthen higher level cognitive Skills of analysis, creation and evaluation.
2. Strengthen ability to design and evaluate ADTs, nonlinear temporary and persistent Data structures and also related algorithms.
3. Introduce students to some domain specific data structures and related algorithms in Various domains.
4. To strengthen problem solving ability by using the characteristics of an object-oriented approach.
5. To design applications using object oriented features

1) Write a program to solve the tower of Hanoi using recursion.
2) Write a program to traverse through binary search tree using traversals.
3) Write a program to perform various operations on stack using linked list.
4) Write a program to perform various operations 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 the 8 queens on an 8X8 matrix so that no two queens Attack.
10) Write a C++ program to perform Virtual Function
11) Write a C++ program to perform Parameterized constructor
12) Write a C++ program to perform Friend Function
13) Write a C++ program to perform Function Overloading
14) Write a C++ program to perform Single Inheritance
15) Write a C++ program to perform Employee Details using files.

Expert lectures, online seminars – webinars

Text Book(s):

1. Goodrich, "Data Structures & Algorithms in Java", Wiley 3rd edition.
2. Skiena, "The Algorithm Design Manual", Second Edition, Springer , 2008

Reference Books:

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

Web Resources:

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

Teaching Methodology: Videos, Audios, PPT, Role Play, Quiz, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning.

Learning Outcomes:

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

COs	Statements	Bloom's Level
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

Mapping (COs vs POs)

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

S-Strong-3, M-Medium-2, L-Low-1

Semester - I	Course Code - 23PCSCP02	Hours/Week - 4	Credit - 3
COURSE TITLE : PRACTICAL - II PYTHON PROGRAMMING LAB			

Course Overview:

1. Able to write programs in Python using OOPS concepts
2. To understand the concepts of File operations and Modules in Python
3. Implementation of lists, dictionaries, sets and tuples as programs
4. To develop web applications using Python

Learning Objectives:

1. To learn how to design and program Python applications.
2. To learn how to use lists, tuples, and dictionaries in Python programs.
3. To learn how to write loops and decision statements in Python.
4. To learn how to write functions and pass arguments in Python.
5. To learn how to read and write files in Python.

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.

Text Book(s):

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 Edition,2009.

2. Sheetal Taneja, Naveen Kumar, Approach", Pearson Publications.

Web Resources:

1.https://www.programiz.com/python-programming/

2.https://www.tutorialspoint.com/python/index.htm

3.https://onlinecourses.swayam2.ac.in/aic20_sp33/preview

Teaching Methodology: Videos, Audios, PPT, Role Play, Quiz, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning.

Learning Outcomes:

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

COs	Statements	Bloom's Level
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

Mapping (COs vs POs)									
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	**S**	**S**	**M**	**S**	**S**	**S**	**M**	**M**	**S**
CO2	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**M**	**S**
CO3	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**M**	**S**
CO4	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**M**	**S**

S-Strong-3, M-Medium-2, L-Low-1

Semester - I	Course Code - 23PCSE01	Hours/Week - 4	Credit - 4
COURSE TITLE : ELECTIVE - I ADVANCED SOFTWARE ENGINEERING			

Course Overview:

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.

Learning Objectives:

1. To develop software applications for improving quality, budget, and time efficiency.
2. Be able to demonstrate an understanding of advanced knowledge of the practice of software engineering.
3. Vision to analysis, design, validation and deployment.
4. Be able to tackle complex engineering problems and tasks
5. Using contemporary engineering principles, methodologies and tools.
6. Software Engineering ensures that the software that has to be built should be Consistent, correct, also on budget, on time, and within the required requirements

Unit - I	Introduction	15 Hours

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

Unit - II	Software Requirements	15 Hours

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

Unit - III	Project Management	15 Hours

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

Unit - IV	Software Design	13 Hours

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

Unit - V	Software Testing	15 Hours

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

Text Book(s):

1. An Integrated Approach to Software Engineering – Pankaj Jalote, Narosa Publishing House, Delhi, 3rd Edition.
2. Fundamentals of Software Engineering – Rajib Mall, PHI Publication, 3rd Edition.

Reference Books:

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

Web Resources:

1. https://www.javatpoint.com/software-engineering-tutorial
2. https://onlinecourses.swayam2.ac.in/cec20_cs07/preview
3. https://online courses.nptel.ac.in/noc19_cs69/preview

Teaching Methodology: Videos, Audios, PPT, Role Play, Quiz, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning.

Learning Outcomes:
Upon successful completion of this course, the student will be able to:

COs	Statements	Bloom's Level
1.	Understand about Software Engineering process	K1,K2
2.	Understand about Software project management skills, design and Quality management	K2,K3
3.	Analyze on Software Requirements and Specification	K3,K4

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

Mapping (COs vs POs)									
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	S	S	M	S	S	S	M	M	M
CO2	S	S	S	S	S	S	S	M	S
CO3	S	S	S	S	S	S	S	M	S
CO4	S	S	S	S	S	S	S	M	S
CO5	S	S	S	S	S	S	S	M	S

S-Strong-3, M-Medium-2, L-Low-1

Semester - II	Course Code - 23PCSC04	Hours/Week - 4	Credit - 4
COURSE TITLE : CORE - IV DATA MINING AND WAREHOUSING			

Course Overview:

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.

Learning Objectives:

1. Ability to understand the role of data mining in knowledge discovery process.
2. To familiarize with various data mining functionalities and how it can be applied To various real-world problems.
3. To learn about finding data characteristics and evaluating the outcome of data mining process.
4. To familiarize with various machine learning algorithms used in data mining.
5. Understand and implement classical models and algorithms in data warehouses and Data mining.

Unit - I	Basics and Techniques	15 Hours

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 - II	Algorithms	15 Hours

Classification-Introduction – Statistical – based algorithms - distance – based algorithms-decision tree - based algorithms - neural network – based algorithms –rule - based algorithms – combining techniques.

Unit - III	Clustering and Association	15 Hours

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 - IV	Data Warehousing and Modeling	13 Hours

Data warehousing-introduction - characteristics of a data warehouse – data marts – other aspects of data mart. Online analytical processing-introduction - OLTP & OLAP systems
Data modeling –star schema for multidimensional view –data modeling – multifactstar schema or snow flake schema – OLAP TOOLS – State of the market – OLAP TOOLS and the internet.

Unit - V	Applications of Data Warehouse	15 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. Services and APIs – Remote Processing – Big Fat Data and Map Reduce – Working in the Clouds.

Text Book(s):

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

Reference Books:

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

Web Resources:

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

Teaching Methodology: Videos, Audios, PPT, Role Play, Quiz, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning

Learning Outcomes:

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

COs	Statements	Bloom's Level
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 warehouse with dimensional modeling and apply OLAP operations	K5,K6
5.	Identify appropriate data mining algorithms to solve real world problems	K6

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

Mapping (COs vs POs)									
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	**S**	**M**	**S**	**S**	**S**	**S**	**M**	**M**	**M**
CO2	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**M**	**S**
CO3	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**M**	**S**
CO4	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**M**	**S**
CO5	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**M**	**S**

S-Strong-3, M-Medium-2, L-Low-1

Semester - II	Course Code - 23PCSC05	Hours/Week - 4	Credit - 4

COURSE TITLE : CORE - V ADVANCED OPERATING SYSTEMS

Course Overview:

1. Understand the design issues associated with operating systems
2. Master various process management concepts including scheduling, deadlocks and distributed file systems
3. Prepare Real Time Task Scheduling
4. Analyze Operating Systems for Handheld Systems
5. Analyze Operating Systems like LINUX and iOS

Learning Objectives:

1. A deeper understanding of computer systems and system programming.
2. Students are acquainted with the parallel programming using POSIX threads, Usage of synchronization primitives, virtual memory and file system.
3. The goal is to acquaint students with the principles and concepts that are used as a basis of modern operating system kernels.
4. To understand the use of process synchronization and mutual exclusion.
5. Be competent with principles and approaches for deadlock detection and avoidance, And fault-tolerance and avoidance in distributed systems

Unit - I	Basics of Operating Systems	15 Hours

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 - II	Distributed Operating Systems	15 Hours

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 - III	Real time Operating System	13 Hours

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 - IV	Handheld System	15 Hours

Operating Systems for Handheld Systems-Requirements – Technology Overview –Handheld Operating Systems – Palm OS - Symbian Operating System- Android –Architecture of android – Securing handheld systems

Unit - V	Case Studies	15 Hours

Case Studies-Linux System-Introduction – Memory Management and its types – Process Scheduling – Scheduling Policy – Accessing Files.

iOS - Architecture and SDK Framework - Media Layer - Services Layer - Core OS Layer.

Text Book(s):

1. Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, “Operating System Concepts”, Seventh Edition, John Wiley & Sons, 2004.
2. MukeshSinghal and Niranjan G. Shivaratri, “Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems”, Tata McGraw-Hill, 2001.

Reference Books:

1. Rajib Mall, “Real-Time Systems-Theory and Practice”, Pearson Education India, 2006.
2. Pramod Chandra P. Bhatt, An introduction to operating systems, concept and practice, PHI, Third edition, 2010.
3. Daniel. P. Bovet & Marco Cesati, “Understanding the Linux kernel”,3rdedition,O‟Reilly, 2005
4. Neil Smyth, “iPhone iOS 4 Development Essentials – Xcode”, Fourth Edition, Payload media, 2011.

Web Resources:

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

Teaching Methodology: Videos, Audios, PPT, Role Play, Quiz, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning

Learning Outcomes:

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

COs	Statements	Bloom's Level
1.	Enable the students to learn the different types of operating systems And their functioning.	K1,K2
2.	Gain knowledge on Distributed Operating Systems	K3,K4
3.	Gain insight into the components and management aspects of Real time and mobile operating systems.	K4,K5
4.	Learn case studies in Linux Operating Systems	K5

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

Mapping (COs vs POs)									
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	**S**	**S**	**M**	**S**	**S**	**S**	**M**	**M**	**S**
CO2	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**M**	**S**
CO3	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**M**	**S**
CO4	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**M**	**S**
CO5	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**M**	**S**

S-Strong-3, M-Medium-2, L-Low-1

Semester - II	Course Code - 23PCSC06	Hours/Week - 4	Credit - 4

COURSE TITLE : CORE – VI ADVANCED JAVA PROGRAMMING

Course Overview:

1. Understand the advanced concepts of Java Programming
2. Understand JDBC and RMI concepts
3. Apply and analyze Java in Database
4. Handle different event in java using the delegation event model, event listener and class
5. Design interactive applications using Java Servlet , JSP and JDBC

Learning Objectives:

1. To identify Java language components and how they work together in applications.
2. The course covers Graphical User Interface (GUI) networking, and database Student Will be able to use advanced technology in Java such as
3. Manipulation. Internationalization, and Remote method Invocation Student will be Able to develop web application using Java Servlet and Java
4. Student will learn how to work with JavaBeans.
5. Server Pages technology.

Unit - I	Basics of Java	12 Hours

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

Unit - II	Remote Method Invocation	12 Hours

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

Unit - III	Database	10 Hours

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

Unit - IV	Servlets	12 Hours

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-Scriptlets-Directives-Declarations-A complete example.

Unit - V	Advanced Techniques	12 Hours

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

Text Book(s):

1. Jamie Jaworski, "Java Unleashed", SAMS Techmedia Publications, 1999.
2. Campione, Walrath and Huml, "The Java Tutorial", Addison Wesley, 1999.

Reference Books:

1. Jim Keogh," The Complete Reference J2EE", Tata McGrawHill Publishing Company Ltd, 2010.
2. David Sawyer McFarland, "JavaScript and J Query- The Missing Manual", Oreilly Publications, 3rd Edition, 2011.
3. Deitel and Deitel, "Java How to Program", Third Edition, PHI/Pearson Education Asia.

Web Resources:

1. https://www.javatpoint.com/servlet-tutorial
2. https://www.tutorialspoint.com/java/index.htm
3. https://onlinecourses.nptel.ac.in/noc19_cs84/preview

Teaching Methodology: Videos, Audios, PPT, Role Play, Quiz, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning

Learning Outcomes: Upon successful completion of this course, the student will be able to:		
COs	**Statements**	**Bloom's Level**
1.	Enable the students to learn the basic functions, principles and concepts of advanced java programming	K1,K2
2.	Provide knowledge on concepts needed for distributed Application Architecture.	K2,K3
3.	Learn JDBC, Servlet packages, J Query, Java Server Pages and JAR file format	K3,K4
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create		

Mapping(COs vs POs)									
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	**S**	**S**	**M**	**S**	**S**	**S**	**M**	**M**	**S**
CO2	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**M**	**S**
CO3	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**M**	**S**
CO4	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**M**	**S**
CO5	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**M**	**S**

S-Strong-3, M-Medium-2, L-Low-1

Semester - II	Course Code - 23PCSE05	Hours/Week - 4	Credit - 3
COURSE TITLE : ELECTIVE – II INTERNET OF THINGS			

Course Overview:

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.

Learning Objectives:

1. Understand the definition and significance of the Internet of Things
2. Discuss the architecture, operation, and business benefits of an IoT solution
3. Examine the potential business opportunities that IoT can uncover
4. Explore the relationship between IoT, cloud computing, and big data
5. Identify how IoT differs from traditional data collection systems

Unit - I	Introduction	12 Hours

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 - II	Basic Electronics for IoT	12 Hours

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 - III	Programming Using Arduino	12 Hours

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 - IV	Sensors and Actuators	10 Hours

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 - V	Sensor Data in Internet	12 Hours

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

Text Book(s):

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. Michael Margolis, “Arduino Cookbook”, O‟Reilly, 2011
2. Marco Schwartz, “Internet of Things with ESP8266”, Packet Publishing, 2016.
3. Dhivya Bala, “ESP8266-Step by Step Tutorial for ESP8266 IoT, Arduino NODEMCU Dev. Kit”, 2018.

Web Resources:

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

Teaching Methodology: Videos, Audios, PPT, Role Play, Quiz, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning

Learning Outcomes:

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

COs	Statements	Bloom's Level
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

Mapping (COs vs POs)									
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	**M**	**M**	**M**	**S**	**M**	**S**	**M**	**M**	**S**
CO2	**M**	**S**	**M**	**S**	**M**	**S**	**M**	**S**	**S**
CO3	**S**	**S**	**S**	**S**	**M**	**S**	**M**	**S**	**S**
CO4	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**
CO5	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**

S-Strong-3, M-Medium-2, L-Low-1

Semester - II	Course Code - 23PCSCP03	Hours/Week - 3	Credit - 4
COURSE TITLE : PRACTICAL - III DATA MINING LAB USING R			

Course Overview:

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

Learning Objectives:

1. Apply data wrangling techniques to manipulate and prepare data for analysis.
2. Use exploratory data analysis and visualization to provide descriptive insights of data.
3. Apply common unsupervised learning algorithms to find common groupings of observations and features in a given dataset.
4. Describe and apply a sound analytic modeling process.
5. Apply, compare, and contrast various predictive modeling techniques.
5. Have the resources and understanding to?

1. Implement Apriori 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.

Text Book(s):

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

Reference Books:

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

Web Resources:

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

Teaching Methodology: Videos, Audios, PPT, Role Play, Quiz, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning

Learning Outcomes:

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

COs	Statements	Bloom's Level
1.	To enable the students to learn the concepts of Data Mining algorithms namely classification, clustering, regression.	K1,K2
2.	To understand & write programs using the DM algorithms	K2,K3
3.	To apply statistical interpretations for the solutions	K4,K5
4.	Able to use visualizations techniques for interpretations	K5,K6
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create		

Mapping (COs vs POs)									
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	**S**	**S**	**M**	**S**	**S**	**S**	**M**	**M**	**S**
CO2	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**M**	**S**
CO3	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**M**	**S**
CO4	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**M**	**S**

S-Strong-3, M-Medium-2, L-Low-1

Semester - II	**Course Code - 23PCSCP04**	**Hours/Week - 4**	**Credit - 4**
COURSE TITLE : PRACTICAL - IV ADVANCED JAVA PROGRAMMING LAB			

Course Overview:

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

Learning Objectives:

1. To understand how to use Java APIs for program developments.
2. To understand how to design GUI Components with Java swing API
3. To learn how to create mobile and web applications
4. To identify java language components and how they work together in applications
5. To design and program stand alone Java applications.

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 an Employee pay slip using JSP.

6. Write a program using JDBC for creating a table, Inserting, Deleting records and list out 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 along with 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 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).

Text Book(s):

1. Jamie Jaworski, "Java Unleashed", SAMS Tec media Publications, 1999.
2. Campione, Walrath and Huml, "The Java Tutorial", Addison Wesley, 1999.

Reference Books:

1. Jim Keogh," The Complete Reference J2EE", Tata McGrawHill Publishing Company Ltd, 2010.
2. David Sawyer McFarland, "JavaScript And JQuery- The Missing Manual", Oreilly Publications, 3rd Edition, 2011.

Web Resources:

1. https://www.javatpoint.com/servlet-tutorial
2. https://www.tutorialspoint.com/java/index.htm
3. https://onlinecourses.nptel.ac.in/noc19_cs84/preview

Teaching Methodology: Videos, Audios, PPT, Role Play, Quiz, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning

Learning Outcomes: Upon successful completion of this course, the student will be able to:		
COs	**Statements**	**Bloom's Level**
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 jip	K5,K6
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create		

Mapping (COs vs POs)									
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	S	S	M	S	S	S	M	M	S
CO2	S	S	S	S	S	S	S	M	S
CO3	S	S	S	S	S	S	S	M	S
CO4	S	S	S	S	S	S	S	M	S

S-Strong-3, M-Medium-2, L-Low-1

Semester - II	Course Code - 23PSOCCC01	Hours/Week - 2	Credit - 1

COURSE TITLE : FUNDAMENTAL OF HUMAN RIGHTS

Course Overview:

1. To develop an understanding of human rights in global and national perspective.
2. To understand the issues concerned with human rights
3. To understand the application of human rights in India.

Learning Objectives:

1. Identify violation to the rights to equality and freedom in the society around them.
2. Justify the need for reasonable restrictions on the rights provided/guaranteed
3. Use freedom of expression to advocate for ensuring rights are given to people around them
4. To know about fundamental freedom for all without any discrimination of race religion.
5. To ensure that they respect the basic rights of their citizens

Unit - I	Introduction	12 Hours

Meaning and Definitions of Human Rights – Characteristics and Importance of HumanRights – Evolution of Human Rights – Formation, Structure and Functions of the UNO - Universal Declaration of Human Rights – International Covenants – Violations of Human Rights in the Contemporary Era.

Unit - II	Human Rights In India	12 Hours

Development of Human Rights in India – Constituent Assembly and Indian Constitution – Fundamental Rights and its Classification – Directive Principles of State Policy – Fundamental Duties.

Unit - III	Rights Of Marginalized And Other Disadvantaged People	12 Hours

Rights of Women – Rights of Children – Rights of Differently Abled – Rights of Elderly - Rights of Scheduled Castes – Rights of Scheduled Tribes – Rights of Minorities – Rights of Prisoners – Rights of Persons Living with HIVAIDS – Rights of LGBT.

Unit - IV	Human Rights Movements	10 Hours

Peasant Movements (Tebhaga and Telangana) – Scheduled Caste Movements (Mahar and Ad-Dharmi)– Scheduled Tribes Movements (Santhal and Munda) – Environmental Movements (Chipko and Narmada BachaoAndolan)– Social Reform Movements (Vaikom and Self Respect).

Unit - V	Redressal Mechanisms	12 Hours

Protection of Human Rights Act, 1993 (Amendment 2019) – Structure and Functions of National and State Human Rights Commissions – National Commission for SCs – National Commission for STs – National Commission for Women – National Commission for Minorities – Characteristics and Objectives of Human Rights Education.

Reference Books:

1. Sudarshanam Gankidi, Human Rights in India-Prospective and Retrospective, Rawat Publications, Jaipur, 2019.
2. SatvinderJuss, Human Rights in India, Routledge, New Delhi, 2020.
3. Namita Gupta, Social Justice and Human Rights in India, Rawat Publications, Jaipur,2021.

Teaching Methodology: Videos, Audios, PPT, Role Play, Quiz, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning

Learning Outcomes:

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

COs	Statements	Bloom's Level
1.	Able to understand the human rights philosophy.	K2
2.	Able to recognize the importance of human rights.	K1
3.	Able to understand the various issues concerned with human Rights violation and tools for its protection.	K2

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

Mapping (COs vs POs)									
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	S	S	M	S	S	S	M	M	S
CO2	S	S	S	S	S	S	S	M	S
CO3	S	S	S	S	S	S	S	M	S
CO4	S	S	S	S	S	S	S	M	S

S-Strong-3, M-Medium-2, L-Low-1

Semester - III	Course Code - 23PCSC07	Hours/Week - 4	Credit - 5
COURSE TITLE : CORE - VII DIGITAL IMAGE PROCESSING			

Course Overview:

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.
4. Learn basic image processing techniques for solving real problems.
5. Design IoT in real time applications using today's internet & wirelesstechnologies

Learning Objectives:

1. To study the image fundamental and mathematical transforms necessary for Image processing.
2. To study the image restoration procedures
3. To study the image compression procedures
4. To familiarize students with image restoration techniques.
5. To learn about morphological processing techniques.

Unit - I	Introduction	12 Hours

Introduction - What is Digital image processing – the origin of DIP – Examples of fields that use DIP – Fundamentals steps in DIP – Components of an image processing system. Digital Image Fundamentals-Elements of Visual perception – Light and the electromagnetic spectrum – Image sensing and acquisition – Image sampling and Quantization – Some Basic relationship between Pixels – Linear & Nonlinear operations.

Unit - II	Image Enhancement	12 Hours

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 - III	Image Restoration	12 Hours

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 - IV	Image Compression	10 Hours

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

Unit - V	Image Representation and Recognition	12 Hours

Boundary representation – Chain Code – Polygonal approximation, signature, boundary Segments – Boundary description – Shape number – Fourier Descriptor, moments- Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching. Expert lectures, online seminars – webinars.

Text Book(s):

1. Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, Second Edition, PHI/Pearson Education.
2. B. Chanda, D. Data Majumder, “Digital Image Processing and Analysis”, PHI, 2003.

Reference Books:

1. Nick Effort, "Digital Image Processing a practical introducing using Java", Pearson Education, 2004.

Web Resources:

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

Teaching Methodology: Videos, Audios, PPT, Role Play, Quiz, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning.

Learning Outcomes:

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

COs	Statements	Bloom's Level
1.	Understand the fundamentals of Digital Image Processing	K1,K2
2.	Understand the mathematical foundations for digital image representation, image acquisition, image transformation, and image enhancement	K2,K3
3.	Apply, Design and Implement and get solutions for digital image Processing problems	K3,K4
4.	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

Mapping (COs vs POs)									
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	M	M	M	S	M	S	M	M	S
CO2	M	S	M	S	M	S	M	S	S
CO3	S	S	S	S	M	S	M	S	S
CO4	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S

S – Strong - 3, M – Medium - 2, L – Low – 1

Semester - III	Course Code - 23PCSC08	Hours/Week - 4	Credit - 5

COURSE TITLE : CORE - VIII CLOUD COMPUTING

Course Overview:

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?

Learning Objectives:

1. Students learn use of cloud services provided by multiple vendors.
2. Identify the technical foundation of cloud system architecture.
3. Analyze the problems and solutions to cloud applications problems.
4. Apply principle of best practice in cloud applications design and management.
5. Identify and define technical challenges for cloud applications and access their importance.

Unit - I	Introduction	12 Hours

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 - II	Cloud Computing	12 Hours

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 - III	Cloud Services	12 Hours

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 - IV	Outside the Cloud	10 Hours

OUTSIDE THE CLOUD Evaluating web mail services, Evaluating instant messaging, Evaluating web conference tools, creating groups on social networks, Evaluating on line groupware, collaborating via blogs and wikis.

Unit - V	Cloud Computing Security Architecture	12 Hours

Cloud Computing Security Architecture-Architectural Considerations, General Issues, Trusted Cloud Computing, Secure Execution environments and Communications, Micro architectures, Identity Management and Access Control, Autonomic Security.

Text Book(s):

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

Reference Books:

1. Anthony T. Velte, "Cloud Computing-A Practical Approach", 1st Edition, Tata McGrawHill Education Private Limited, 2009.

Web Resources:

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

Teaching Methodology: Videos, Audios, PPT, Role Play, Quiz, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning.

Learning Outcomes:

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

COs	Statements	Bloom's Level
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

Mapping (COs vs POs)									
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	M	M	M	S	M	S	M	M	S
CO2	M	S	M	S	M	S	M	S	S
CO3	S	S	S	S	M	S	M	S	S
CO4	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S

S-Strong-3, M-Medium-2, L-Low-1

Semester - III	**Course Code - 23PCSC09**	**Hours/Week - 4**	**Credit - 5**
COURSE TITLE : CORE – IX NETWORK SECURITY AND CRYPTOGRAPHY			

Course Overview:

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 andnumber 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.

Learning Objectives:

1. To be able to secure a message over insecure channel by various means
2. To learn about how to maintain integrity and availability of a date
3. To understand various protocols for network security to protect against the threats in the network
4. To learn digital signature and their use in various protocols for network security.
5. Understand and analyze public key cryptography, RSA and other public key cryptography.

Unit - I	Introduction	12 Hours

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 - II	Crypto System	12 Hours

Public-key Cryptosystem-Introduction to Number Theory - RSA Algorithm – Key Management-Diffie-Hell man Key exchange – Elliptic Curve Cryptography Message Authentication and Hash functions – Hash and Mac Algorithm – Digital Signatures and Authentication Protocol..

Unit - III	Network Security	12 Hours

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

Unit - IV	Web Security	10 Hours

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

Unit - V	E-Mail Security And Case Studies On Cryptography And Security	12 Hours

E-Mail Security-Pretty Good Privacy, S/MIME IP Security-IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations, Internet Key Exchange. Case Studies on Cryptography and security-Secure Multiparty Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, and Cross site Scripting Vulnerability.

Text Book(s):

1. William Stallings, “Cryptography and Network Security”, PHI/Pearson Education.
2. Bruce Schneir, “Applied Cryptography”, CRC Press.

Reference Books:

1. A. Menezes, P Van Oorschot and S. Vanstone, “Hand Book of Applied Cryptography”, CRC Press, 1997
2. AnkitFadia, ”Network Security”, MacMillan.

Web Resources:

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

Teaching Methodology: Videos, Audios, PPT, Role Play, Quiz, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning

Learning Outcomes:

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

COs	Statements	Bloom's Level
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 anddesign secure applications	K5,K6

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

Mapping (COs vs POs)									
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	S	M	S	M	L	S	M	S	M
CO2	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S

S – Strong - 3, M – Medium - 2, L – Low – 1

Semester - III	Course Code - 23PCSC10	Hours/Week - 4	Credit - 4

COURSE TITLE : CORE – X DATA SCIENCE & ANALYTICS

Course Overview:

1. Introduce the students to data science, big data & its eco system.
2. Learn data analytics & its life cycle.
3. To explore the programming language R, with respect to the data mining algorithms.

Learning Objectives:

1. To learn about Ecosystem and machine learning.
2. Understand the concept of advanced data analytics technology and tools.
3. Understand and use of various graphics in R for data visualization.
4. To evaluate the Web mail services.
5. Identify management and autonomic security.

Unit - I	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 - II	Basics of Data Analytics	12 Hours

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

Unit - III	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 - IV	Outside the Cloud	10 Hours

OUTSIDE THE CLOUD Evaluating web mail services, Evaluating instant messaging, Evaluating web conference tools, creating groups on social networks, Evaluating on line groupware, collaborating via blogs and wikis.

Unit - V	Cloud Computing Security Architecture	12 Hours

Cloud Computing Security Architecture-Architectural Considerations, General Issues, Trusted Cloud Computing, Secure Execution environments and Communications, Micro architectures, Identity Management and Access Control, Autonomic Security.

Text Book(s):

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.
2. A simple introduction to Data Science - Lars Nielson 2015
3. Introducing Data Science Davy Cielen, Arno D.B. Meysman, Mohamed Ali 2016 Manning Publication
4. R Programming for Data Science - Roger D. Peng 2015 Lean Publication
5. Data Science & Big Data Analytics-Discovering, Analyzing , Visualizing and Presenting Data

Web Resources:

1. https://www.tutorialspoint.com/python_data_science/index.htm
2. https://www.javatpoint.com/data-science

Teaching Methodology: Videos, Audios, PPT, Role Play, Quiz, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning.

Learning Outcomes:

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

COs	Statements	Bloom's Level
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 anddesign secure applications	K5,K6

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

Mapping (COs vs POs)									
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	S	S	S	S	S	S	S	M	M
CO2	S	S	S	S	S	S	S	M	S
CO3	S	S	S	S	S	S	S	M	S
CO4	S	S	S	S	S	S	S	M	S
CO5	S	S	S	S	S	S	S	M	S

S – Strong - 3, M – Medium - 2, L – Low - 1

Semester - III	**Course Code - 23PCSE09**	**Hours/Week - 3**	**Credit - 3**
COURSE TITLE : ELECTIVE – III WEB SERVICES			

Course Overview:

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

Learning Objectives:

1. To learn technologies and concept underlying Web services
2. To learn about fundamental of XML
3. Analyze the WSDL Interface definition.
4. To learn web service conversion language interface components.
5. To learn concept of Web service standards and future trends.

Unit - I	**Introduction**	**12 Hours**

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 - II	**XML Fundamentals**	**12 Hours**

XML Fundamentals – XML documents - XML Namespaces- XML Schema –Processing XML.

Unit - III	Soap Model	12 Hours

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 - IV	Technologies and Standards	10 Hours

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 - V	Quality of Service	12 Hours

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.

Text Book(s):

1. Sandeep Chatterjee, James Webber, “Developing Enterprise Web Services-An ArchitectsGuide”, 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. Eric A Marks and Mark J Werrell, “Executive Guide to Web services”, John Wiley and sons, March 2003.
3. Anne Thomas Manes, “Web Services-A managers Guide”, Addison Wesley, June 2003.
4. Ramesh Nagappan, “Developing Java Web Services-Architecting and developing secure Web Services Using Java”, John Wiley and Sons, first Edition Feb 2003.

Web Resources:

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

Teaching Methodology: Videos, Audios, PPT, Role Play, Quiz, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning.

Learning Outcomes:

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

COs	Statements	Bloom's Level
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 standards and 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

Mapping (COs vs POs)									
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	S	S	S	M	M	S	M	M	M
CO2	S	S	S	M	M	S	M	S	M
CO3	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S

S – Strong - 3, M – Medium - 2, L – Low - 1

Semester - III	Course Code - 23PCSCP05	Hours/Week - 2	Credit - 3
COURSE TITLE : PRACTICAL - V DIGITAL IMAGE PROCESSING LAB USING MATLAB			

Course Overview:

1. Understand to the implement concepts of Java using HTML forms, JSP & JAR
2. Must be capable of implementing JDBC and RMI concepts
3. Able to write Applets with Event handling mechanism
4. To Create interactive web based applications using servlets and jip

Learning Objectives:

1. To learn about histogram Equalization.
2. Implements the image filtering technique.
3. Analyze the edge detection methods using operators.
4. To know about the concept of opening closing objects.
5. Able to manipulate image subtraction.

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. Program for opening and closing of the image
9. Program for edge detection algorithm.

Text Book(s):

1. Jamie Jaworski, "Java Unleashed", SAMS Techmedia Publications, 1999.
2. Campione, Walrath and Huml, "The Java Tutorial", Addison Wesley, 1999.

Reference Books:

1. Jim Keogh," The Complete Reference J2EE", Tata McGraw Hill Publishing Company Ltd, 2010.
2. David Sawyer McFarland, "JavaScript And J Query- The Missing Manual", Oreilly Publications, 3rd Edition, 2011.

Web Resources:

1. https://www.javatpoint.com/servlet-tutorial
2. https://www.tutorialspoint.com/java/index.htm
3. https://onlinecourses.nptel.ac.in/noc19_cs84/preview

Teaching Methodology: Videos, Audios, PPT, Role Play, Quiz, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning.

Learning Outcomes:
Upon successful completion of this course, the student will be able to:

COs	Statements	Bloom's Level
1.	To write programs in MATLAB for image processing using the techniques	K1,K2
2.	To able to implement Image Enhancements & Restoration techniques	K2,K3
3.	Capable of using Compression techniques in an Image	K3,K4
4.	Must be able to manipulate the image and Segment it	K5,K6
5.	To write programs in MATLAB for image processing using the techniques	K1,K2

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

Mapping (COs vs POs)									
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**
CO1	S	S	M	S	S	S	M	M	S
CO2	S	S	S	S	S	S	S	M	S
CO3	S	S	S	S	S	S	S	M	S
CO4	S	S	S	S	S	S	S	M	S

S-Strong-3, M-Medium-2, L-Low-1

Semester - III	Course Code - 23PCSCP06	Hours/Week - 4	Credit - 2
COURSE TITLE : PRACTICAL - VI CLOUD COMPUTING LAB			

Course Overview:

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

Learning Objectives:

1. To understand working concepts of google drive to make spreed sheets.
2. Able to launch a Linux virtual machine.
3. Know about how to install Google app engine.
4. Understand working and installation of Microsoft Azure.
5. To learn about Hadoop single node clusters.

1. Working with Google Drive to make spreadsheet and notes.
2. Launch a Linux Virtual Machine.
3. To host a static 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. Install Hadoop single node cluster and run simple applications like word count.
8. To Create and Query a SQL Table.

Text Book(s):

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.

Web Resources:

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

Teaching Methodology: Videos, Audios, PPT, Role Play, Quiz, Field Visit, Seminar, Chalk & Talk, Lecturing, Case Study, Demonstration, Problem Solving, Group Discussion, Flipped Learning.

Learning Outcomes:
Upon successful completion of this course, the student will be able to:

COs	Statements	Bloom's Level
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

Mapping (COs vs POs)

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

S-Strong-3, M-Medium-2, L-Low-1