VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(AUTONOMOUS)

M.Sc., (COMPUTER SCIENCE)
(Candidates admitted from 2018-2019 Onwards)

REGULATIONS

I. SCOPE OF THE PROGRAMME

Master of Computer Science can be considered to be one of the most prominent Master's level programs in our country. This program mainly deals with the development of computer applications for the purpose of updating computer programming languages. M.Sc. (CS) also aims at creating strong knowledge of theoretical computer science subjects who can be employed in research and development units of industries. The course has a time period of two years with four semesters.

II. SALIENT FEATURES

- Regular conduct of guest lectures and seminars
- Campus recruitment
- Provides facilities such as internet access and in-house library
- Provides career guidance for Post Graduate Courses and the Certifications in programming languages
- Conduct of personality development program
- Visiting faculties from industries

III. OBJECTIVES OF THE COURSE

The course objective of the M.Sc. Computer Science program is to provide advanced and in-depth knowledge of computer science and its applications to enable students pursue a professional career in Information and Communication Technology in related industry, business and research. The course designed to impact professional knowledge and practical skills to the students.

IV. ELIGIBILITY FOR ADMISSION

A Candidate who has passed B.Sc. Computer Science /BCA/B.Sc. Computer Technology / B.Sc. Information Science Degree of Periyar university or any of the Degree of any other university accepted by the syndicate as equivalent thereto subject to such conditions as may be prescribed therefore shall be permitted to appear and qualified for the M.Sc. Computer Science Degree Examinations of the Periyar University after a course of study of two academic years.

V. DURATION OF THE PROGRAMME

- The course shall extend over a period of two academic years consisting of four semesters. Each academic year will be divided into two semesters. The First semester will consist of the period from July to November and the Second semester from December to April.

- The subjects of the study shall be in accordance with the syllabus prescribed from time to time by the Board of Studies of Vivekanandha College of Arts and Sciences for Women (Autonomous) with the approval of Periyar University.

VI. CONTINUOUS INTERNAL ASSESSMENT (CIA)

The performance of the students will be assessed continuously and the Internal Assessment Marks will be as under:

1. Average of two Tests	-	10 Marks
2. Seminar	-	05 Marks
3. Assignment	-	05 Marks
4. Attendance	-	05 Marks
Total	=	25 Marks

Internal Assessment Marks for Practical

1. Attendance	-	10 Marks
2. Observation	-	10 Marks
3. Test	-	20 Marks
Total	=	40 Marks

PASSING MINIMUM (Theory) - EXTERNAL

In the Semester Examinations, the passing minimum shall be 50 % out of 75 Marks. (38 Marks)

PASSING MINIMUM (Practical) - EXTERNAL

In the Semester Examinations, the passing minimum shall be 50 % out of 60 Marks. (30 Marks)

Distribution of Marks

Program writing : 10 Marks

Debugging : 10 Marks

For Results : 05 Marks

Viva – voce :05 Marks

The Passing minimum shall be 50% out of 60 marks (30 Marks)

VII. ELIGIBILITY FOR EXAMINATION

PERCENTAGE	MARKS	
	THEORY	PRACTICAL
75-80	1	2
81-85	2	4
86-90	3	6
91-95	4	8
96-100	5	10

A candidate will be permitted to appear for the Semester Examination only on earning 75 % of attendance and only when her conduct has been satisfactory. A candidate having 65% to 74% of attendance should pay condination fees prescribed by the controller of Examination office.

VIII. CLASSIFICATION OF SUCCESSFUL CANDIDATES

Successful candidates passing the examination of Core Courses (main and allied subjects) and securing marks

a) 75 % and above shall be declared to have passed the examination in first class with Distinction provided they pass all the examinations prescribed for the course at first appearance itself.
b) 60% and above but below 75 % shall be declared to have passed the examinations in first class without Distinction.
c) 50% and above but below 60% shall be declared to have passed the examinations in second class.

d) Candidates who pass all the examinations prescribed for the course at the first appearance itself and within a period of two consecutive academic years from the year of admission only will be eligible for rank.

e) If she fails to complete her course within the specified period, she can extend for two year's to complete her course.

IX. ELIGIBILITY FOR AWARD OF THE DEGREE

A candidate shall be eligible for the award of the degree only if she has undergone the above degree for a period of not less than two academic years comprising of four semesters and passed the examinations prescribed and fulfilled such conditions have been prescribed therefore.

X. PROCEDURE IN THE EVENT OF FAILURE

If a candidate fails in a particular subject, she may reappear for the semester examination in the concerned subject in subsequent semesters and shall pass the examination.

XI. COMMENCEMENT OF THE REGULATIONS

- The regulations shall take effect from the academic year 2018-19 (i.e.,) for the students who are to be admitted to the first year of the course during the academic year 2018-19 and thereafter.
- Candidates who were admitted to the PG course of study before 2018-19 shall be permitted to appear for the examinations under those regulations for the period of three years ie., upto and inclusive of the examinations of 2020-21. Thereafter, they will be permitted to appear for the examination only under the regulations then in force.

EVALUATION OF EXTERNAL EXAMINATIONS (EE)

QUESTION PAPER PATTERN

External Evaluation (Theory)

Knowledge Level	Section	Marks	Description	Total
K1 ,K2,K3,K4	A(Multiple choice questions)	20 x 1=20 Marks	Short Answers	**75**
K1 ,K2,K3,K4	B(Either or Pattern)	5x 5= 25 Marks	Descriptive Type	
K1 ,K2,K3,K4	C(Anawer any 3 out of 5)	3x 10= 30 Marks	Descriptive Type	

Internal Evaluation (Theory)

Knowledge Level	Section	Marks
K1 ,K2,K3,K4	CIA -1 , CIA -2 and Model	10
K1 ,K2,K3,K4	Assignment	5
K1 ,K2,K3,K4	Seminar	5
-	Attendance	5
Total		**25**

QUESTION PAPER PATTERN – Practical

Time duration: 3 Hours Max. Marks: 60

1. One compulsory question from the given list of programs : 30 Marks
2. One Either/OR type question from the given list of programs : 30 Marks

The Passing minimum shall be 50% out of 60 marks (30 marks)

Distribution of Marks

Problem Understanding : 05 Marks
Program writing : 10 Marks
Debugging & Result : 10 Marks
Viva voce : 05 Marks

QUESTION PAPER PATTERN – Project and Viva voce

Evaluation (External) : 75 Marks
Viva-voce (External) : 25 Marks

Continuous Assessment Test (CIA 1 and CIA 2)

Knowledge Level	Section	Marks	Description	Total
K1	A (Answer All)	10 x1= 10 Marks	MCQ/define	25
K2	B(Either or Pattern)	1x 5= 5 Marks	Short Answers	
K3	C (Either or Pattern)	1x 10= 10 Marks	Descriptive	

VIVEKANANDHA COLLEGE OF ARTS AND SCIENCE FOR WOMEN (AUTONOMOUS)

ELAYAMPALAYAM, TIRUCHENGODE, NAMAKKAL DT.

VISION

To evolve into a center of excellence in higher education through creative and innovative practices to social equity for women.

MISSION

- To provide sufficient learning infrastructure to the students to pursue their studies.
- To provide good opportunity for higher education and favorable environment to the students to acquire education.
- To provide quality academic programs training activities and research facilities.
- To facilitate industry-institute interaction.

PG DEPARTMENT OF COMPUTER SCIENCE

VISION

To provide high academic goals to the students and make them the world leaders both in educational and research through effective teaching.

MISSION

- To create, share and apply knowledge in Computer Science including inter disciplinary areas that extends the scope of Computer Science and benefit humanity.
- To educate students to be successful, ethical and effective problem solvers.
- To prepare the students to contribute positively to the economic well being of our region and nation.

M.Sc. – COMPUTER SCIENCE

COURSE PATTERN AND SCHEME OF EXAMINATIONS UNDER CBCS and OBE
(Candidates admitted from the year 2018-2019 Onwards)

Sem	Course Code	Courses	Credits	Hours	Marks		
					I.A. Marks	E.E. Marks	Total Marks
I	18P1CSC01	Core Course-I - Advanced Computer Organization and Architecture	4	4	25	75	100
	18P1CSC02	Core Course-II -Design and Analysis of Algorithms	4	4	25	75	100
	18P1CSC03	Core Course-III –Web Technologies	4	4	25	75	100
	18P1CSC04	Core Course-IV- Advanced Database Management Systems	4	4	25	75	100
	18P1CSE__	Elective Course- I	4	4	25	75	100
	18P1CSP01	Core Course-II Design and Analysis of Algorithms Lab	2	4	40	60	100
	18P1CSP02	Core Course-III- Web Technologies Lab.	2	4	40	60	100
		Library		1			
		Net Lab.		1			
	TOTAL		**24**	**30**	**205**	**495**	**700**
II	18P2CSC05	Core Course-V –Advanced Concepts in Operating System	4	4	25	75	100
	18P2CSC06	Core Course-VI – Java Server Programming	4	4	25	75	100
	18P2CSC07	Core Course-VII – Dot Net Programming	4	4	25	75	100
	18P2CSC08	Core Course-VIII – Mobile Computing	4	4	25	75	100
	18P2CSE__	Elective Course -II	4	4	25	75	100
	18P2CSP02	Core Course-VI - Java server programming Lab	2	4	40	60	100
	18P2CSPR01	Core Course-VII-Mini Project	2	4	40	60	100
		Library		1			
		Net Lab		1			
	TOTAL		**24**	**30**	**205**	**495**	**700**
III	18P3CSC09	Core Course-IX – Soft Computing	4	4	25	75	100
	18P3CSC10	Core Course-X - Python programming	4	4	25	75	100
	18P3CSC11	Core Course-XI – Data Mining and Warehousing	4	4	25	75	100
	18P3CSE__	Elective Course III	4	4	25	75	100
		EDC- I Resource Management Techniques	4	4	25	75	100
	18P3CSP03	Core Course-X - Python Programming Lab	2	4	40	60	100
	18P3CSP04	Core Course-XI - Data Mining Lab	2	4	40	60	100

	18P3HR01	Human Rights	1	-	25	75	100
		Library		1			
		Net Lab		1			
		TOTAL	**24**	**30**	**230**	**570**	**800**
IV	18P4CSC12	Core Course-XII – Cloud Computing	4	5	25	75	100
	18P4CSC13	Core Course-XIII – Digital Image Processing	4	5	25	75	100
	18P4CSE__	Elective Course -IV	4	5	25	75	100
	18P4CSPR02	Core Course-XVI – Project Lab	6	-	40	60	100
	TOTAL		**18**	**15**	**115**	**285**	**400**
	Total No. of credits (Core + EDC + HR + Elective)		**70+4+1+ 16=91**	**105**	**675**	**1825**	**2600**

EDC-EXTRA DISCIPLINARY COURSE

Students are expected to opt EDC (Non major elective) offered by other departments.

I.A. – INTERNAL ASSESSMENT

E.E. – END SEMESTER EXAMINATIONS

The content of the syllabus and regulations may be followed for at least two sets of students from 2018-19 and it passed in the academic year 2018-2019.

ELECTIVE COURSES

Elective-I:

Course Code	Course Name
18P1CSE01	Theory of Computing
18P1CSE02	Software Project Management and Quality Assurance
18P1CSE03	Client Server Technology
18P1CSE04	Internet of Things

Elective-II:

Course Code	Course Name
18P2CSE05	Network Security
18P2CSE06	Wireless Application Protocol
18P2CSE07	Multimedia and Virtual Reality
18P2CSE08	AI and Expert System

Elective-III:

Course Code	Course Name
18P3CSE09	Compiler Design
18P3CSE10	Object Oriented Analysis and Design
18P3CSE11	Embedded Systems
18P3CSE12	Professional Ethics

Elective-IV:

Course Code	Course Name
18P4CSE13	Big Data Analytics
18P4CSE14	Cyber Forensics
18P4CSE15	Distributed Computing
18P4CSE16	Ad Hoc Sensor Network

SEMESTER I

Subject Title	ADVANCED COMPUTER ORGANIZATION AND ARCHITECTURE	Semester	I
Subject Code	18P1CSC01	Specialization	NA
Type	Core: Theory	L:T:P:C	4:0:0:4

Course objective:

1. To know Structure and functions of Computer architecture and organizations
2. Observe the characteristics of various computer memory concepts.
3. To understand the computer arithmetic and machine instructions.
4. Understand the parallel processing concepts.

CO Number	CO Statement	Knowledge Level
CO1	Recognize the operation of functional units of a computer and chip	K1
CO2	Compare the performance of different types of memory	K2,K4
CO3	Describe the computational operation of hardware units associated with a computing device	K3
CO4	Demonstrate the operation of processing unit	K4
CO5	Recognize the operation of parallel processing	K4

Subject Title	ADVANCED COMPUTER ORGANIZATION AND ARCHITECTURE	Semester	I
Subject Code	18P1CSC01	Specialization	NA
Type	Core : Theory	L:T:P:C	4:0:0:4

Unit	Contents	Levels	Number of Sessions
I	Introduction: Structure and Function-Computer Evaluation and Performance: History of computers- Designing for Performance: Microprocessor speed-performance balance-Improvement in chip organization and architecture. Computer Function and Interconnection: Computer Components-Computer Function: Instruction Fetch and Execute. Interconnection structures.	K1	12
II	Cache Memory: Characteristics of Memory Systems-Memory hierarchy-Cache memory principles- Elements of cache design: Cache size-Mapping function. Internal Memory: Semi-conductor main memory: Organization-DRAM & SRAM. External Memory: Magnetic Disk: read and write mechanism	K2	12
III	Computer Arithmetic: ALU-Integer Representation: Sign magnitude representation-Twos complement Representation-Fixed point Representation. Integer Arithmetic: Negation-Addition & Subtraction. Instruction Sets: Characteristics & Functions: Machine Instruction characteristics: Elements of Machine Instruction. Instruction Sets: Addressing Modes and Formats: Addressing: Immediate- Direct- Indirect-.	K3	12
IV	Processor structure & Function: Processor Organization- Register organization- Instruction cycle. Control Unit Operations: Micro Operations: The fetch cycle- The Indirect Cycle- The Interrupt cycle- The Execute Cycle- The instruction Cycle. Control of the Processor: Functional Requirements-Control Signal.	K3,K4	12
V	Parallel Processing: Multiple Processor Organizations: Types of parallel processor Systems- Parallel Organizations. Symmetric Multiprocessors: Organization-Multiprocessor Operating System Design considerations. Cache Coherence and the MESI Protocol: Software Solutions-Hardware Solutions-Snoopy Protocols-The MESI Protocol-Read Miss-Read Hit-Write Miss-Write Hit.	K4	12

	Learning Resources
Text Books	1. Computer Organization & Architecture - Designing for Performance by William Stallings, 9th Edition, 2012, PEARSON Prentice Hall Publication. **(**Unit –I: Chapter 1,2 &3 Unit-II : Chapter 4,5&6 Unit-III : Chapter 9,10&11 Unit – IV: Chapter 12 &16 Unit –V: Chapter 18)
Reference Books	1. Computer Systems Organizations & Architecture by John D. Carpinelli, First Edition, 2007, PEARSON Prentice Hall Publication. 2. Computer Architecture: Concepts and Evaluation by Gerrit A. Blaauw, First Edition, 2008, PEARSON Prentice Hall Publication. 3. Computer System Architecture and Parallel Processing by Kai Hwang, Faye A. Briggs, 2009, McGraw-Hill Publications. 4. Computer organization & Design by David A Peterson and John L Hennessy, 2013, Fifth Edition.
Website/Link	1. https://www.tutorialspoint.com/computer_organization/index.asp 2. https://en.wikipedia.org/wiki/Computer_architecture 3. https://www.slideshare.net/kumar_vic/computer-system-architecture

Mapping with Programme Outcomes

	PS01	**PS02**	**PS03**	**PS04**
CO1	S	S	S	-
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S-Strong , M- Medium , L – Low

Subject Title	DESIGN AND ANALYSIS OF ALGORITHMS	Semester	I
Subject Code	18P1CSC02	Specialization	NA
Type	Core: Theory	L:T:P:C	4:0:0:4

Course objective:

1. To know the Fundamentals of the Analysis of Algorithm Efficiency
2. Understand the divide and conquer methodology.
3. Analysis search and boundary algorithm

CO Number	CO Statement	Knowledge Level
CO1	Summarize the relevance of algorithms for computational problems	K1
CO2	Differentiate different algorithmic approaches, techniques and methods.	K2
CO3	Apply optimization techniques for improving the efficiency of algorithms.	K3
CO4	*Analyze* each and every algorithm techniques	K4
CO5	Analyze a given algorithm for its efficiency based on time and space it occupies.	K4

Subject Title	DESIGN AND ANALYSIS OF ALGORITHMS	Semester		II
Subject Code	18P1CSC02	Specialization		NA
Type	Core: Theory	L:T:P:C		4:0:0:4

Unit	Syllabus Contents	Levels	Number of Sessions
I	Introduction – Notion of Algorithm – Fundamentals of Algorithmic Solving – Important Problem types – Fundamentals of the Analysis of Algorithm Efficiency – Analysis Framework – Asymptotic Notations - and Mathematical Analysis of Recursive and Non-Recursive Algorithms.	K1,K2	12
II	Divide and conquer methodology – Merge Sort – Quick Sort – Binary search – Binary Tree Traversal – Multiplication of large integers- Strassen's matrix multiplication Greedy method – Prim's algorithm – Kruskal's algorithm – Dijkstra's Algorithm	K2,K3	12
III	Transform and Conquer – Presorting - Balanced Search Tree – AVL Tree - Heaps and Heap Sort - Dynamic Programming - Computing a binomial coefficient – Warshall's and Floyd's algorithm.	K2,K4	12
IV	Optimal binary - search tree – Knapsack problem – Backtracking – N-Queens problem – Hamiltonian circuit problem – subset sum problem.	K4	12
V	Branch and bound: Assignment problem – Knapsack problem – Traveling salesman problem.	K3,K4	12

Mapping with Programme Outcome

	PS01	PS02	PS03	PS04
CO1	S	S	S	S
CO2	S	M	M	S
CO3	S	S	M	M
CO4	M	S	M	S
CO5	S	L	S	S

S – Strong , M- Medium , L - Low

Subject Title	WEB TECHNOLOGIES	Semester	I
Subject Code	18P1CSC03	Specialization	NA
Type	Core: Theory	L:T:P:C	4:0:0:4

Course Objective:

1. identify the basics of internet.
2. understand the role of web browsers and web servers.
3. Practiced client side programming
4. Practiced server side programming and web services

COURSE OUTCOME

On the successful completion of the course the student will be able to develop Web pages for several purposes.

CO Number	CO Statement	Knowledge Level
CO1	***Recognize*** Basics of internet and the significance of Web Technology.	K1
CO2	***Express*** the knowledge on Javascript, JSP and ASP.	K2
CO3	***Employ*** the understanding of the Client and Server side scripts and actively ***participate*** in teams for the creation of static and dynamic web pages.	K3
CO4	***Utilize*** the web designing tools effectively in the real world applications.	K4
CO5	***Design*** and ***Establish*** the Website or Web based Software.	K4

Subject Title	WEB TECHNOLOGIES	Semester		I
Subject Code	18P1CSC03	Specialization		NA
Type	Core: Theory	L:T:P:C		4:0:0:4

Unit	Syllabus Contents	Levels	Number of Sessions
I	The internet: Basics of Internet – Addresses and Names for the Internet, Objects and sites – E-mail - World Wide Web – File Transfer – The Telnet – The Usenet – Gopher- Wais - Archie -Veronica – Internet Chat.	K1	12
II	Web Servers, Browsers and Security: The Wed server – The Proxy Server – The fast ready connections on the web – Web Browsers – Netscape Communication Suite – Microsoft Internet Explorer – The Virus Menace in the Internet – Firewalls – Data Security.	K1,k2	12
III	Client Side Programming: The JavaScript Language: Introduction to JavaScript - JavaScript in Perspective – Basic Syntax – Variables & Data types – Statements – Operators – literals – Functions – Objects – Arrays – Built-in Objects – JavaScript Debuggers.	K2,k3	12
IV	Server-Side Programming: Java Servlets: Servlet Architecture Overview – Servlet Generating Dynamic contents – Servlet Life Cycle – Parameter Data – sessions – Cookies	K3	12
V	Web Services: JAX – RPC, WSDL, XML Schema and soap, Web Service Concepts – Writing a Java Web Service Client – Describing web Services: WSDL – Related Technologies.	K4	12

Learning Resources	
Text Books	1. Rajkamal, " Internet and Web Technologies", Tata McGraw Hill, 2002. [UNIT – I & II] 2. Jeffrey C.Jackson, "Web Technologies – A Computer Science Perspective"- Pearson Education 2012
Reference Books	1. R.N. Srivastava, "Web Technology" – Global academic Publishers & Distributors, 2015. 2. Ramesh Nagappan, Robert Skoczylas, Rima Patel Sriganesh, " Developing Java Web Services" - Wiley-India edition 2012
Website/Links	1 https://differential.com/.../14-technologies-every-web-developer-should-be-able-to-ex... 2 https://usersnap.com/blog/best-web-development-trends-2018/

Mapping with Programme Outcomes

	PS01	PS02	PS03	PS04
CO1	S	S	L	L
CO2	S	M	M	S
CO3	S	S	M	M
CO4	M	S	M	S
CO5	S	L	S	S

S – Strong , M- Medium , L - Low

Subject Title	ADVANCED DATABASE MANAGEMENT SYSTEMS	Semester	I
Subject Code	18P1CSC04	Specialization	NA
Type	Core: Theory	L:T:P:C	4:0:0:4

Objective:

1. To know the basics of Data base management system
2. To understand advanced and object oriented database concepts.
3. Analyze the principles of web and mobile databases.

COURSE OUTCOME

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

CO Number	CO Statement	Knowledge Level
CO1	Summarize the basics of advance data modeling and Advance SQL	K1
CO2	Differentiate different Database concepts and Concurrency Control.	K2
CO3	Apply various databases and data models in the different kind	K3
CO4	Analyze each and every databases and database systems	K4
CO5	Analyze different information systems and multimedia and spatial databases	K4

Subject Title	ADVANCED DATABASE MANAGEMENT SYSTEMS	Semester		I
Subject Code	18P1CSC04	Specialization		NA
Type	Core: Theory	L:T:P:C		4:0:0:4

Unit	Syllabus Contents	Levels	Number of Sessions
I	Advanced Data Modeling: Extended Entity Relationship Model, Entity Clustering, Entity Integrity, Design Cases. - Advanced SQL: Relational Set Operators, SQL Join Operators, Sub queries and Correlated Queries, SQL Functions, Views, Procedural SQL, Embedded SQL - Database design: SDLC, DBLC.	K1	12
II	Advanced Database concepts: Transaction Management and Concurrency Control - Database Performance Tuning and Query optimization - Distributed Database Management Systems.	K1,k2	12
III	Object Oriented Databases – Introduction – Evolution of Object Oriented Concepts- Object Oriented Concepts – Characteristics of an Object Oriented Data Models – OODM and Previous Models - OODBMS – How Object Orientation affects Database Design – Advantages and Disadvantages of OODBMS. Databases in Electronic Commerce.	K3	12
IV	Web Databases: Internet Technologies and Databases - Uses of Internet Databases - Web to Database Middleware - Server Side Extensions - The Web Browser - Internet Database Systems: Special Considerations - Database Administration.	K3,k4	12
V	Mobile Database – Geographic Information Systems – Genome Data Management – Multimedia Database – Spatial Databases.	K4	12

Learning Resources	
Text Books	1. Peter Rob and Carlos Coronel, "Database Systems – Design, Implementation and Management", Cengage Learning, 7th Edition, 2007. (Unit- I : Chapter6, 8 &9, Unit-II : Chapter 10,11&12). 2. Peter Rob and Carlos Coronel, "Database Systems – Design, Implementation and Management", Thompson Learning, Course Technology, 5th Edition, 2003. (Unit – III :Chapter11&14, Unit –IV : Chapter15.1, 15.2, 15.3,15.4,15.6&16). 3. Ramez Elmasri, Shamkant B.Navathe, "Fundamentals of Database Systems" 5/E,Pearson Education, (Unit-V : Chapter 24&30).
Reference Books	1. Thomas M. Connolly, Carolyn E. Begg, "Database Systems - A Practical Approach to Design , Implementation , and Management", 5th Edition , Pearson Education, 2009. 2. C.S.R.Prabhu, "Object Oriented Database Systems: Approaches & Architecture", PHI, 3rd Edition , 2010. 3. M.Tamer Ozsu , Patrick Ualduriel, "Principles of Distributed Database Systems", 3rd Edition, Pearson Education, 2007.
Website / Links	1. www.itportal.in/2011/09/advance-database-management-systems-be.html

Mapping with Programme Outcomes

	PS01	PS02	PS03	PS04
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	M	M	M
CO4	M	M	M	S
CO5	S	L	S	S

S – Strong , M- Medium , L – Low

2018-2019 Onwards	DESIGN AND ANALYSIS OF ALGORITHM LAB	M.Sc. Computer Science
I Semester	18P1CSP01	Core: Practical – I
Hours: 60	Practical -I	Credit : 2

COURSE OBJECTIVE

- To implement the fundamental concepts of sorting , merging, backtracking and branch and bound algorithms using C++ Programming
- To implement real time problem using C++ Programming

COURSE OUTCOME

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

CO Number	CO Statement
CO1	Demonstrate algorithms using divide and conquer approach
CO2	Solve problems using greedy method.
CO3	Employ dynamic programming techniques.
CO4	Problem solving Using backtracking techniques
CO5	Problem solving Using Branch and Bound techniques

LAB EXERCISE LIST

1. Apply the Divide and Conquer technique to arrange a set of numbers using Merge Sort method.
2. Perform Strassen's matrix multiplication using Divide and Conquer method.
3. Solve the Knapsack problem using Dynamic Programming.
2. Construct a Minimum Spanning Tree using Greedy method.
3. Perform Warshall's Algorithm using Dynamic Programming.
4. Solve Dijkstra's Algorithm using Greedy Technique.
5. Solve Subset Sum problem using Backtracking
6. Implement the 8-Queens Problem using Backtracking.
7. Implement Knapsack Problem using Backtracking.
8. Find the solution of Traveling Salesperson Problem using Branch and Bound technique.

Mapping with Programme Outcome

	PS01	PS02	PS03	PS04
CO1	S	S	S	S
CO2	M	M	S	S
CO3	M	M	S	S
CO4	M	S	S	S
CO5	M	S	S	S

S – Strong , M- Medium , L - Low

2018 Onwards	WEB TECHNOLOGIES LAB	M.Sc. Computer Science
I Semester	19P1CSP02	Core: Practical – II
Hours: 60	Practical -II	Credit : 2

Course Objective:

1. To learn the basic statements , methods, Events.
2. To learn the working environment of the JSP.
3. Implement the features of the

On the successful completion of the course the student will be able to develop various kind of web pages.

CO Number	CO Statement
CO1	Demonstrate basic skill needed for surfing internet.
CO2	Develop HTML coding for web features.
CO3	Employ java script programming techniques.
CO4	Program coding using ASP, JSP for authentication and commercial purpose.
CO5	Web page designing for database connection with application.

2018-2018 Onwards	WEB TECHNOLOGIES LAB	M.Sc. Computer Science
I Semester	18P1CSP02	Core: Practical – II
Hours: 60	Practical -II	Credit : 2

COURSE OBJECTIVE

- To familiar the students to the effective use of web pages.
- To implement web page development using java script, JSP and ASP.

Web technologies Practical Listing:

1. Write a XML program for job listing in HTML
2. Write a JavaScript code block, which checks the contents entered in a form's text element. If the text entered is in the lower case, convert to upper case

3. Write a JavaScript code block, which validates a username and password

   a) If either the name or password field is not entered display an error message

   b) The fields are entered do not match with default values display an error message

   c) If the fields entered match, display the welcome message

3 Write a JavaScript code to display the current date and time in a browser

4 Write a JSP Program for user authentication

5 Write a JSP Program for a simple shopping cart

6 Write a JSP Program to prepare a bio data and store it in database

7 Write an ASP Program using Response and Request Object

8 Write an ASP Program using AdRotator Component

9 Write an ASP program using database connectivity for student's record

Mapping with Programme Outcome

	PS01	PS02	PS03	PS04
CO1	S	S	S	S
CO2	M	S	S	S
CO3	M	S	S	S
CO4	M	S	S	S
CO5		S	S	S

S – Strong , M- Medium , L - Low

SEMESTER II

Subject Title	ADVANCED CONCEPTS IN OPERATING SYSTEMS	Semester	II
Subject Code	18P2CSC05	Specialization	NA
Type	Core: Theory	L:T:P:C	4:0:0:4

Course Objectives:

1. we learn the fundamentals of Operating Systems
2. To Learn The Architecture Distributed system
3. To understand the microprocessor and database operating system.

On successful completion of this course Systems architecture, Algorithms for Implementing DSM components and management aspects of Real time and Mobile operating Systems.

COURSE OUTCOMES

CO Number	CO Statement	Knowledge Level
C01	Understand the concepts of Operating System	K1
C02	To learn about DSM	K2
C03	To analyze the basics of Operating System Algorithms	K4
C04	To implement distributed database operating system in various places	K3
C05	Design and Establish the Operating system to apply in various places	K4

Subject Title	ADVANCED CONCEPTS IN OPERATING SYSTEMS	Semester	II
Subject Code	18P2CSC05	Specialization	NA
Type	Core: Theory	L:T:P:C	4:0:0:4

Unit	Syllabus Contents	Levels	Number of Sessions
I	Overview: Introduction- Functions of operating systems – Design Approaches – Types of Advanced Operating Systems. Synchronization Mechanisms: Introduction – Concept of Process – Concurrent Process – The critical section Problem. Process Deadlocks: Introduction – Preliminaries – Models of Deadlocks – Models of Resources – A Graph-Theoretic Model of a System State – Necessary and Sufficient Conditions for a Deadlock**.**	K1,K2	12
II	Architectures of Distributed Systems: Introduction – Motivation – System Architecture Types – Distributed operating Systems – Issues in Distributed operating System – Communication Network – Communication Primitives. Distributed Shared Memory: Introduction – Architecture and Motivation – Algorithms for Implementing DSM – Memory Coherence – Coherence Protocols – Design Issues.	K2	12
III	Multiprocessor System Architectures: Introduction – Motivations – Basic Multiprocessor System Architecture – Interconnection networks for Multiprocessor System – Caching – Hypercube Architecture. Multiprocessor Operating Systems: Introduction – Structures – Operating System Design Issues – Threads – Process Synchronization – Process Scheduling – Memory Management – Reliability/Fault Tolerance.	K2,K3	12
IV	Database Operating Systems: Introduction – Concurrency Control: Database Systems – Serializability Theory – Distributed database systems – Lock based and Timestamp based algorithm – Concurrency control algorithms.	K2,K3	12
V	CASE STUDY: Linux History- Design Principles-Kernel Modules- Process Management -Scheduling - Memory Management - File Systems- Input and Output - Interprocess Communication -Network Structure- Security	K1,K2, K3,K4	12

Learning Resources	
Text Books	1. Advanced Concepts in Operating Systems", Mukesh Singhal, Niranjan G.Shivarathr, 2011. 2. Operating System Concepts, Abraham Silberschatz, Peter B. Galvin and Greg Gagne, Ninth Edition, John Wiley and Sons Inc, 2012.
Reference Books	1. Operating System in depth: Design & Programming, Thomas.W,Doeppner, First Edition 2010. 2. The Linux Programming Interface: A Linux and Unix System Programming handbook, Michal Kerisk, First Edition, 2010.
Website / Links	1. https://books.google.co.in/books/.../Advanced_Concepts_InOperatingSystems.html 2. https://www.bookdepository.com/Advanced-Concepts-Operating-Systems 3. https://www.sfitengg.org/.../CSC201-advanced%20operating%20systems

Content beyond the syllabus:

1. Understand about operating system concepts and various deadlock models..
2. Know about advanced concepts of UNIX and LINUX system..
3. Pedagogy**:** Chalk and Talk, PPT, ICT etc…

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

PS0 / C0	PS01	PS02	PS03	PS04
C01	**S**	**L**	**S**	**M**
CO2	**L**	**M**	**S**	**S**
C03	**M**	**M**	**S**	**M**
C04	**M**	**M**	**S**	**M**

Subject Title	JAVA SERVER PROGRAMMING	Semester	II
Subject Code	18P2CSC06	Specialization	NA
Type	Core: Theory	L:T:P:C	4:0:0:4

Course Objectives:

1. To understand AWT Controls and JDBC
2. To Know About Java Server Pages And Java Servlet
3. Create client and server side applications
4. Apply EJP concept.
5. Implement Hibernate and spring.

On successful completion of this course we learn the following concepts

COURSE OUTCOMES

CO Number	CO Statement	Knowledge Level
C01	Understand the .concepts of java JSP,RMI,Servers,Servlets and Hibernet.	K1
C02	To know about Advance concept In EJB.	K2
C03	To analyze the concepts of RMI.	K4
C04	To apply RMI concepts in various networks.	K3
C05	To Design and Establish the server pages with client interaction.	K4

Subject Title	JAVA SERVER PROGRAMMING	Semester	II
Subject Code	18P2CSC06	Specialization	NA
Type	Core: Theory	L:T:P:C	4:0:0:4

Unit	Syllabus Contents	Levels	Number of Sessions
I	AWT: Using AWT Controls, Layout Managers and Menus. SWING: A Tour of SWING – Event Handling-Java Database Connectivity (JDBC).	K1,K2	12
II	Java Servlets: Life cycle of Servlet - constituents of javax.servlet.package Constituents of javax.servlet.http.package-Cookies- Session Tracking. Java Server Pages: Introducing Java Server Pages-Basic Elements–Actions Elements-Implicit Objects.	K2	12
III	Remote method Invocation: Remote Interface-java.rmi.server package-The Naming Class - RMI Security Manager Class -RMI Exceptions - Steps involved in creating RMI Client and Server Classes. Java Bean: Advantages of Java Bean –Application Builder Tools-JAR files-Introspection - Developing a Simple Java Bean using BDK- Persistence – Customizers - Java Mail.	K2,K3	12
IV	Understanding EJB: EJB Architecture-Session Bean-Developing Session Beans-Entity Beans - Bean managed persistence in Entity Beans. Understanding Struts: Introduction-MVC Framework- Struts Control flow - Building Model Components - Building View Components – Building Control Components.	K3	12
V	Hibernate: Features of Hibernate-Hibernate Architecture – Understanding Hibernate O/R Mapping - Hibernate Query Language. Spring: Introduction to the Spring Framework - Features of the Spring-Spring Architecture-Spring AOP-Testing-Data Access using JDBC.	K1,K2, K3,K4	12

Learning Resources	
Text Books	1. Dr C.Muthu "programming with Java", Vijay Nicole Imprints Private Ltd 2008(Unit-I :Chapter 18, Unit-II :Chapter 19, Unit-III : Chapter 20) Java server pages in easy steps –Mike Mcgrath-2002-dreamtech-New Delhi.(Unit-II Chapters 1, 2, 3&5) 2. Herbert Schildt, "The complete Reference-Java2", fifth Edition 2002 TMH (Unit-I :Chapters 20, 22 & 26, Unit –III: Chapter 25) 3. Java server programming (J2ee 1.4)-2007 platinum Edition. Kogent solution Inc.(Unit-1V :Chapters 9& 18, Unit-V : Chapters 20& 21)
Referenc e Books	1. Enterprise JavaBeans-Developing component based distributed Applications-Pearson Education, 2004. 2. Deitel H.M. & Deitel P.J, "Java How to Program", Prentice-Hall of India, 10th Edition , 2014. 3. Cay.S Horstmann, Gray Cornel, "Core Java 2 – Vol.II- Advanced features", Pearson Education, 8th Edition 2008.
WebSite / Links	1. https://www.ntu.edu.sg/home/ehchua/programming/java/JavaServlets.html 2. www.dreamtechpress.com/programming/java.../java-server-programming-j2ee 3. https://www.amazon.com/Professional-Java-Server-Programming-

Content beyond the syllabus:

1. Understand about Java concepts and various .AWT controls..
2. Know about advanced concepts of java Servlets and RMI system.
3. Pedagogy**:** Chalk and Talk , PPT, ICT etc…

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

PS0 / C0	PS01	PS02	PS03	PS04
C01	**S**	**L**	**M**	**L**
CO2	**L**	**M**	**M**	**M**
C03	**M**	**S**	**L**	**M**
C04	**M**	**S**	**L**	**S**

Subject Title	DOT NET PROGRAMMING	Semester	II
Subject Code	18P2CSC07	Specialization	NA
Type	Core: Theory	L:T:P:C	5:0:0:4

Objectives:

1. Learn .net framework and c# fundamentals
2. Understand Web form concepts
3. Familiarize with rich controls and Cookies
4. Implement ADO.NET and XML.

COURSE OBJECTIVES

On successful completion of this course we can understand how to develop static and dynamic Web pages using ASP.NET.

COURSE OUTCOMES

CO Number	CO Statement	Knowledge Level
C01	Understand the .NET framework (CLR, CTS, CLS etc.,) and its components	K1
C02	Express the Web Form Fundamentals and Web Control Events	K2
C03	To analyze the basics of ADO.NET Fundamentals	K4
C04	To apply ADO.NET connection and Data Binding	K3
C05	Design and Establish the Web based Software using ASP.NET and XML	K4

Subject Title	DOT NET PROGRAMMING	Semester	II	
Subject Code	18P2CSC07	Specialization	NA	
Type	Core: Theory	L:T:P:C	4:0:0:4	

Unit	Syllabus Contents	Levels	Number of Sessions
I	Introduction the .NET Framework: .NET Framework – C#, VB.NET andNET Languages – CLR- .NET Class library. Learning the C# languages: C# language Basics- Variables- Data types – Variable Operations -Object based Manipulation - Objects and Namespaces.	K1,K2	12
II	Web Form Fundamentals: HTML Control classes - Page class – Web Controls: Web Control classes – AutoPostBack and Web control events. Tracing, Logging and Error Handling: Exception Handling – Handling Exceptions -Throwing your own exception - Logging exceptions - Error Pages - Page Tracing.	K2,K3	12
III	Validation and Rich Controls: Validation – Examples – Understanding Regular Expression – Rich Controls – State Management: View state - Custom cookies - Session state – Application state. ADO.NET Fundamentals: ADO.NET and Data Management – ADO.NET Basics.	K3	12
IV	ADO.NET: Direct Data Access – Creating a Connection – Disconnected data access. Data binding: Introducing Data Binding - Single Value Data Binding – Repeated value Data Binding - Data Source Controls. The Data Controls: The Grid View –The Details View-The Form View.	K4,K5	12
V	XML: XML'S hidden role in .NET-.XML Explained – XML Classes – XML validation-XML display & transforms XML Data Binding – XML in ADO.NET. Getting Started with ASP.NET Ajax - Understanding the ASP.NET Ajax Architecture - Working with the XML Http Request Object – JSON	K1,K4	12

Learning Resources	
Text Books	1. 1 Beginning ASP.NET 2.0 in C# 2005: From Novice to Professional (Beginning: From Novice to Professional). Matthew MacDonald (Author) publication: APress 2005.(**Unit –**I: Chapter 1,2&3 **Unit-II** :Chapter 5,6&7 **Unit-III** :Chapter 8,9&13 **Unit- IV** :Chapter 13,14&15 **Unit-V** :Chapter 17). 2. Joydip Kanjilal and Sriram Putrevu, "Sams Teach Yourself ASP.NET Ajax in 24 Hours", SAMS, 2008. (Unit-V :Chapter 1,2,3&5).
Reference Books	1. William Sander, "ASP. NET 3.5 A Beginner's Guide", 2008. 2. Pro ASP.NET 4.0 in C# 2012-Matthew Macdonald and Mario Szpuszta-Apress. 3. C# 2012 for programmers – Fifth Editon-Deitel developer series:Paul J.Deitel and Harvey M.Deitel :Pearson. 4. Murach's ASP.NET 4.5 web programming C# 2012-Joel Murach & Anne Boehm:SPD (Shroff publishers & Distributors pvt.Ltd). **5.** Ajax The Definitive Guide: 2008 First Edition –Anthony T.Holdener III –SPD (Shroff publishers & Distributors pvt.Ltd).
Website/Links	1. www.learningtree.com 2. www.slideshare.net 3. www.shroffpublishers.com

Content beyond the syllabus:

4. Understand about network concepts and various .NETsystem..
5. Know about advanced concepts of ADO.NETand Data Binding system.
6. Pedagogy**:** Chalk and Talk , PPT, ICT etc…

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

PS0 / C0	PS01	PS02	PS03	PS04
C01	**M**	**L**	**S**	**L**
CO2	**S**	**M**	**S**	**L**
C03	**S**	**M**	**M**	**M**
C04	**S**	**M**	**L**	**M**

Subject Title	MOBILE COMPUTING	Semester	II
Subject Code	18P2CSC08	Specialization	NA
Type	Core: Theory	L:T:P:C	4:0:0:4

OBJECTIVES:

1. Introduce Mobile Communication
2. Understand Mobile computing Standards
3. Evaluate Mobile data and Adhoc network
4. Implement Mobile data network.

COURSE OBJECTIVES

On successful completion of this course we can learn the following,

COURSE OUTCOMES

CO Number	CO Statement	Knowledge Level
C01	Understand the telephone system.	K1
C02	Express the mobility management and detection process.	K2
C03	To analyze the basics of CDPD System and WAP.	K4
C04	To apply WCDMA Technology and Bluetooth technology.	K3
C05	Design and Establish the Ad-Hoc networks in TCP.	K4

Subject Title	MOBILE COMPUTING	Semester	II
Subject Code	18P2CSC08	Specialization	NA
Type	Core: Theory	L:T:P:C	4:0:0:4

Unit	Syllabus Contents	Levels	Number of Sessions
I	Introduction - Introduction to Telephone Systems - Mobile communication: Need for mobile communication - Requirements of mobile communication – History of mobile communication - Introduction to Cellular Mobile Communication.	K1,K2	12
II	Mobile Communication Standards - Mobility Management: Handoff Techniques – Handoff Detection and Assignment – Types of Handoffs – Radio Link Transfer – Roaming Management - Frequency Management - Cordless Mobile Communication Systems.	K2,K3	12
III	Mobile Computing: History of data Networks - Classification of Mobile data networks - CDPD System. Satellites in Mobile Communication - Global Mobile Communication – Mobile Internet - Wireless Network Security - Wireless Local Loop Architecture - Wireless Application Protocol.	K3	12
IV	WCDMA Technology and Fibre Optic Microcellular Mobile Communication – Ad Hoc Network and Bluetooth Technology - Intelligence Mobile Communication System - Fourth Generation Mobile Communication Systems.	K4,K5	12
V	Mobile network layer: Mobile IP – Dynamic host configuration protocol – Mobile Ad-Hoc networks. Mobile transport layer: Traditional TCP – Classical TCP Improvement – TCP over 2.5/3G Wireless networks – Performance enhancing proxies – Support for Mobility: File Systems – World Wide Web.	K1,K4	12

Learning Resources	
Text Books	1. T.G. Palanivelu & R.Nakkeeran, "Wireless and Mobile Communication",PHI Learning Private Limited , 2013.(Unit-I: Chapters–1,2,3,4. Unit-II: Chapters– 5,6,7,8. Unit-III:Chapters– 9,10,11,14,15,16,17.Unit-IV:Chapter–18,19,20,21.) 2. Jochen Schiller, "Mobile Communications", Pearson Education, Second Edition, 2012.(Unit-V : Chapters-8,9 &10)
Reference Books	1. William Stallings, "Wireless Communications and Networks", Pearson Education, 2015. 2. Asoke K Talukder "http://www.amazon.com/Mobile-Computing-Applications-McGraw-Hill-Communications/dp/0071477330Mobile Computing: Technology, Applications, and Service Creation", TataMcGraw-Hill Communications Engineering, 2012.
Website/Links	1. www.readorrefer.in/article/Mobile-Computing 2. www.readorrefer.in/article/Characteristics-of-Mobile-Computing

Content beyond the syllabus:

7. Understand about mobile computing concepts and various telephone system..
8. Know about advanced concepts of CDPD and WCDMA system.
9. Pedagogy**:** Chalk and Talk , PPT, ICT etc…

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

PS0 / C0	PS01	PS02	PS03	PS04
C01	**S**	**L**	**M**	**S**
CO2	**L**	**M**	**M**	**M**
C03	**M**	**M**	**S**	**M**
C04	**M**	**S**	**L**	**L**

Subject Title	JAVA SERVER PROGRAMMING LAB	Semester	II
Subject Code	18P2CSP02	Specialization	NA
Type	Practical – III	L:T:P:C	4:0:0:2

Objective:

1. To develop the online program using JAVA.
2. Implement JSP in real time processes.

On the successful completion of the course the student will be able to develop various kind of web pages.

CO Number	CO Statement
CO1	Demonstrate basic skill needed for surfing internet.
CO2	Develop HTML coding for web features.
CO3	Employ java script programming techniques.
CO4	Program coding using ASP, JSP for authentication and commercial purpose.
CO5	Web page designing for database connection with application.

Subject Title	JAVA SERVER PROGRAMMING LAB	Semester	II
Subject Code	18P2CSP02	Specialization	NA
Type	Practical – III	L:T:P:C	4:0:0:2

Practical programme list :

1. To Develop Student Information using AWT
2. To Prepare Electricity Bill Using Swing
3. To implement Library information using JDBC
4. To maintain Employee information using Servlets
5. To implement Session and Cookies concepts using Servlets
6. To develop Online Job Registration using JSP
7. Create an application using JSP and Java Beans
8. To develop Arithmetic Operation Using RMI
9. To create an application using Session Bean
10. To Implement Banking Operations using Entity Bean

Mapping with Programme Outcome

	PS01	PS02	PS03	PS04
CO1	S	S	S	S
CO2	M	S	S	S
CO3	M	S	S	S
CO4	M	S	S	S
CO5	L	S	S	S

S – Strong , M- Medium , L - Low

Subject Title	Mini Project	Semester	II
Subject Code	18P2CSPR01	Specialization	NA
Type	Project	L:T:P:C	4 : 0 : 0 : 2

FIRST REVIEW: **(15 Marks)**

1. Project Title
2. Project Platform
3. Details of Guide
4. Problem Description / Modules
5. Presentation (PPT)

FINAL REVIEW: **(25 Marks)**

1. Documentation
2. Screens Shots
3. DFD / ERD / System Flow Diagram (Whichever Applicable)
4. Presentation (PPT)
5. Final Project Report (with executable format including complete source code)

The Passing minimum shall be 40% out of 60 marks (24 Marks)

SEMESTER III

Subject Title	SOFT COMPUTING	Semester	III
Subject Code	18P3CSC09	Specialization	NA
Type	Core Theory	L:T:P:C	4:0:0:4

Objectives

- **To familiarize with neural network concepts.**
- **To introduce the ideas of Neural Networks, fuzzy logic and use of heuristics based on human experience its applications to soft computing using some applications**
- **To introduce the concepts of Genetic algorithm and**

COURSE OUTCOME

CO Number	CO Statement	Knowledge Level
CO1	Know the primitive functions of Neural network concepts.	K1
CO2	Understand the Back propagation	K2
CO3	Implement various Adaptive Resonance Theory	K3
CO4	Perform Fuzzy Set Theory operations	K4
CO5	Implement Genetic algorithms	K4

Subject Title	SOFT COMPUTING	Semester	IV
Subject Code	18P3CSC09	Specialization	NA
Type	Core Theory	L:T:P:C	4:0:0:4

Unit	Syllabus Contents	Levels	Number of Sessions
I	Fundamentals of Neural Networks**:** Basic Concepts of Neural Network-Model of an Artificial Neuron - Neural Network Architectures - Characteristics of Neural Networks - Learning Methods - Taxonomy of Neural Network Architectures - History of Neural Network Research - Early Neural Network Architectures - Some Applications Domain.	K1	12
II	Backpropagation Networks: Architecture of Backpropagation Network - Backpropagation Learning – Illustrations – Applications - Effect of Tuning Parameters of the Backpropagation Neural Network - Selection of various Parameters in Backpropagation Neural Network - Variations of Standard Backpropagation Algorithms.	K1,K2	12
III	Adaptive Resonance Theory (ART)**:** Introduction - Classical ART networks - Simplified ART Architecture - ART1 - Architecture of ART1 - Special Features of ART1 Models - ART1 Algorithm - ART2 - Architecture of ART2 - ART2 Algorithm -Applications.	K2	12
IV	Fuzzy Set Theory: Fuzzy Sets - Fuzzy Relations. Fuzzy Systems: Fuzzy Logic - Fuzzy Rule based system - Defuzzification Methods - Applications. Fuzzy Backpropagation Networks: LR-type Fuzzy Numbers - Fuzzy Neuron - Fuzzy Backpropagation Architecture**.**	K3	12
V	Fundaments of Genetic algorithms: Basic Concepts - Creation of Offsprings – Encoding - Reproduction. Genetic Modeling: Cross Over - Inversion and Deletion - Mutation Operator - Bit Wise Operators.	K4	12

Learning Resources	
Text Books	1. Rajasekaran. S and Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, New Delhi-2012. (Unit I-Chapters: 2.1, 2.3-2.10, Unit-II- Chapters: 3.1-3.7, Unit-III-Chapters: 5.1- 5.4, Unit-IV- Chapters: 6.3, 6.5, 7.3-7.6, 12.1-12.3, Unit-V: Chapters: 8.2,8.3, 8.5,8.7, 9.2,9.3,9.4,9,5).
Website/Links	1. *rkala.in/lectures.php* 2. https://en.wikipedia.org/wiki/Soft_computing

MAPPING WITH PROGRAM SPECIFIC OUTCOMES

CO / PSO	PSO1	PSO2	PSO3	PSO4
CO1	**S**	M	L	L
CO2	**S**	M	**S**	**M**
CO3	**S**	**S**	L	M
CO4	**M**	**M**	**L**	M
CO5	**M**	**S**	**L**	**L**

Subject Title	PYTHON PROGRAMMING	Semester	III
Subject Code	18P3CSC10	Specialization	NA
Type	Core : Theory	L:T:P:C	4:0:0:4

Objective:

1. Analyze the efficiency of algorithmic problem solving Techniques.
2. Acquire the mathematical foundation in analysis of algorithms
3. Understand different control logic in design strategies
4. Apply design principles and concepts to write source code for specific codings

COURSE OUTCOME

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

CO Number	CO Statement	Knowledge Level
CO1	Recognize the operation of algorithmic problem solving Technique.	K1
CO2	Identify and handle basic tokens of python programs and practice to write small coding in python.	K2
CO3	Describe the computational operation of conditionals , function and string modules.	K3
CO4	Demonstrate the operation list and advanced list operations and applications.	K4
CO5	Recognize the operation of files and exceptions and illustrative programs.	K4

Subject Title	PYTHON PROGRAMMING	Semester	III
Subject Code	18P3CSC10	Specialization	NA
Type	Core : Theory	L:T:P:C	4:0:0:4

Unit	Syllabus Contents	Levels	Number of Sessions
I	**INTRODUCTION** : Introduction to Python - Python's Technical Strengths - Types and Operations - Introducing Python Object Types - Numeric Types - String Fundamentals.	K1	**12**
II	**FILE HANDLING** : Lists and Dictionaries - Tuple, Files - Introducing Python Statements - Assignments, Expressions, and Prints.	K1 K2	**12**
III	**CONTROL STRUCTURES :** if Tests and Syntax Rules - while and for Loops - Iterations and Comprehensions	K2 K3	**12**
IV	**FUNCTIONS :** Functions and Generators - Function Basics – Scopes – Arguments - Advanced Function	K4	**12**
V	**PACKAGES :** Modules and Packages – Modules - Module Coding Basics - Module Packages - Advanced Module	K5	**12**

Learning Resources	
Text Books	1. Learning Python - Fifth Edition - Mark Lutz - O'rei
Reference Books	1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning, ISBN: 978-1111822705.**Python Essentials Reference** (http://www.dabeaz.com/per.html): The definitive reference for both Python and much of the standard library. 2. **Hitchhikers Guide to Python** (http://docs.python-guide.org/en/latest): Under active development, and still somewhat incomplete, but there is good stuff. 3. **Writing Idiomatic Python** (https://www.jeffknupp.com/writing-idiomatic-python-ebook): Focused on not just getting the code to work, but how to write it in a really "Pythonic" way.
Website/Link	• https://www.tutorialspoint.com/python programs • https://en.wikipedia.org/wiki/python programms • https://www.slideshare.net/kumar_vic/pythan for better programming.

Mapping with Programme Outcomes

	PS01	PS02	PS03	PS04
CO1	S	S	S	L
CO2	S	M	M	S
CO3	S	L	L	M
CO4	M	S	M	S
CO5	S	L	S	S

S- Strong, M- Medium, L – Low

Subject Title	Data Mining And Warehousing	Semester	III
Subject Code	18P3CSC11	Specialization	NA
Type	Core : Theory	L:T:P:C	4:0:0:4

OBJECTIVE:

- Learn the concepts of database technology.
- Understand the need for data mining and its applications.
- To examine the types of the data to be mined
- To present a general classification of tasks to integrate a data mining system.
- Apply preprocessing statistical methods for any given raw data.

COURSE OUTCOME

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

CO Number	CO Statement	Knowledge Level
CO1	Evaluate and implement a wide range of emerging and newly-adopted methodologies and technologies to facilitate the knowledge discovery	K2
CO2	Assess raw input data, and process it to provide suitable input for a range of data mining algorithms	K2
CO3	Discover and measure interesting patterns from different kinds of databases	K3
CO4	Characterize and discriminate data summarization forms and determine data mining functionalities	K4
CO5	Design and implement of a data-mining application using sample, realistic data sets and modern tools	K2

Subject Title	Data Mining and Warehousing	Semester	III
Subject Code	18P3CSC11	Specialization	NA
Type	Core : Theory	L:T:P:C	4:0:0:4

Unit	Syllabus Contents	Levels	Number of Sessions
I	Introduction: Data Mining – Data Mining Functionalities – Kinds of Patterns can be Mined – Classification – Data Mining Task Primitives - Major Issues. Data pre-processing: Descriptive Data Summarization - Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and concept Hierarchy Generation.	K2	12
II	Data warehouse and OLAP Technology: Data Warehouse – A Multidimensional Data Model – Data Warehouse Architecture – Data Warehouse Implementation – From data warehouse to data mining.	K2	12
III	Mining Frequent Patterns, Associations, and Correlations: Basic Concepts – Efficient and Scalable Frequent Itemset Mining Methods - Mining various kinds of Association Rules– From Association Mining to Correlation Analysis –. Constraint Based Association Mining. Classification and prediction: Issues regarding classification and prediction – Decision Tree Induction – Bayesian classification – Rule Based Classification - Classification by Back propagation – Prediction.	K3	12
IV	Cluster Analysis: Types of Data in Cluster Analysis - A categorization of Major Clustering Methods - Partitioning Methods - Hierarchical Methods – Density Based Methods - Grid Based Methods - Model Based Clustering Methods – Outlier Analysis - Mining Time-Series Data – Mining Sequence Patterns in Biological Data.	K4	12
V	Spatial Data Mining - Multimedia Data Mining – Text Mining -Mining the World Wide Web. Applications and Trends in Data Mining: Applications – Data Mining System Products and Research Prototypes – Additional Themes on Data Mining – Social Impacts of Data Mining – Trends in Data mining.	K2	12

Learning Resources	
Text Books	1. Jiwei Han, Michelien Kamber, "Data Mining Concepts and Techniques",Morgan Kaufmann Publishers an Imprint of Elsevier, 2008. (Unit I: Chapter 1,2, Unit II: Chapter 3, Unit III: Chapter5, 6, Unit IV: Chapter 7,8 Unit V: Chapter 10,11)
Reference Books	1. Arun K.Pujari, "Data Mining Techniques", Universities Press (India) Limited, 2014. 2. Pang-NingTan,Michael Steinbach,Vipin Kumar, Introduction to Data Mining, Pearson, 2014.
Web Sites/Links	1. freevideolectures.com › Computer Science › IIT Madras 2. videolectures.net/is2011_grobelnik_warehouses/ 3. www.learnerstv.com/video/Free-video-Lecture-1636-Computer-Science 4. mydatamine.com/2011/04/top-10-data-mining-video-sites 5. www.slideshare.net/vivekjv/data-warehouse-modeling-presentation

MAPPING WITH PROGRAM SPECIFIC OUTCOMES

CO \ PSO	PSO1	PSO2	PSO3	PSO4
CO1	**S**	M	L	L
CO2	**S**	M	**S**	**M**
CO3	**S**	**S**	L	M
CO4	**M**	**M**	**L**	M
CO5	**M**	**S**	**L**	**L**

2018 Onwards	PYTHON PROGRAMMING LAB	M.Sc. Computer Science
III Semester	18P3CSP05	Core: Practical - IV
Hours: 60	Practical -IV	Credit : 2

COURSE OBJECTIVE

- To familiar the students to the effective use of statements and syntax in python
- To implement various problems in python.

COURSE OUTCOME

On the successful completion of the course the student will be able to develop various kind of web pages.

CO Number	CO Statement
CO1	Recognize the operation of algorithmic problem solving Technique.
CO2	Identify and handle basic Statements of python programs and practice to write small coding in python.
CO3	Describe the computational operation of conditionals , function and string modules.
CO4	Demonstrate the operation list and advanced list operations and applications.
CO5	Recognize the operation of files and exceptions and illustrative programs.

2019-2020 Onwards	PYTHON PROGRAMMING LAB	M.Sc. Computer Science
III Semester	18P3CSP01	Core: Practical – I
Hours: 60	Practical -I	Credit : 2

LAB EXERCISES :

1. Compute G.C.D of Two Numbers
2. Find the Square root of given Number
3. Find the Exponentiation of the Number
4. Find the maximum of a list of numbers.
5. Find N prime Numbers.
6. Linear Search and Binary Search
7. Insertion Sort and Selection sort
8. Multiplication of two Matrix
9. String Functions.
10. Find the most frequent word in the text file

Mapping with Programme Outcome

	PS01	PS02	PS03	PS04
CO1	S	S	S	S
CO2	M	S	S	S
CO3	M	S	S	S
CO4	M	S	S	S
CO5	-	S	S	S

S – Strong , M- Medium , L – Low

Subject Title	Data Mining lab	Semester	III
Subject Code	18P3CSP04	Specialization	NA
Type	Core Practical	L:T:P:C	0:0:6:2

Objectives

- **To develop the program in WEKA to get knowledge on data mining concepts**
- **To familiarize with R programming to implement the process.**
- **Implement real world problems**

COURSE OUTCOME

CO Number	CO Statement	Knowledge Level
CO1	Know the primitive functions of numerical operations	K1
CO2	Understand the matrix operations	K2
CO3	Implement various statistical operations with R script.	K3
CO4	Perform K-Means clustering operations	K4
CO5	Implement real world problems.	K4

Subject Title	Data Mining Lab	Semester	III
Subject Code	19P3CSP04	Specialization	NA
Type	Core Practical	L:T:P:C	0:0:6:2

Lab Exercise List :

1. To get the input from user and perform numerical operations (MAX, MIN, AVG, SUM, SQRT, ROUND).
2. To perform data import/export (.CSV, .XLS, .TXT) operations using data frames.
3. To get the input matrix from user and perform Matrix addition, subtraction, multiplication, inverse transpose and division operations using vector concept.
4. To perform statistical operations (Mean, Median, Mode and Standard deviation).
5. To perform data pre-processing operations i) Handling Missing data ii) Min-Max normalization
6. To perform dimensionality reduction operation using PCA.
7. To perform Simple Linear Regression and Multi Linear Regression.
8. To perform K-Means clustering operation and visualize it.
9. Write R script to diagnose any disease using KNN classification.
10. To perform market basket analysis using Apriori algorithm.

MAPPING WITH PROGRAM SPECIFIC OUTCOMES

CO \ PSO	PSO1	PSO2	PSO3	PSO4
CO1	S	M	L	L
CO2	S	M	S	M
CO3	S	S	L	M
CO4	M	M	L	M
CO5	M	S	L	L

SEMESTER IV

Subject Title	CLOUD COMPUTING	Semester	IV
Subject Code	18P4CSC12	Specialization	NA
Type	Core : Theory	L:T:P:C	5:0:0:4

Objectives

1. To know the basics of Cloud Computing.
2. Understand the Models and Services of Cloud Computing.
3. Identify the purpose of Cloud Storage.
4. Evaluate cloud services with companys.

CO Number	CO Statement	Knowledge Level
CO1	Basic Knowledge on Cloud Computing.	K1
CO2	Understand the models and services of Technologies..	K2
CO3	Apply Cloud techniques for improving the efficiency of business.	K3
CO4	*Analyze* each and every service in cloud computing.	K4
CO5	Analyze a given algorithm for its efficiency based on cloud management.	K4

Subject Title	CLOUD COMPUTING	Semester	IV
Subject Code	18P4CSC12	Specialization	NA
Type	Core : Theory	L:T:P:C	5:0:0:4

Unit	Syllabus Contents	Levels	Number of Sessions
I	Cloud Computing Basics: Cloud Computing Overview-Applications-Intranets and the Cloud. Your Organization and Cloud Computing: When you can use Cloud computing-Benefits-Limitations-Security Concerns.	K1	12
II	Cloud Computing Technology: Cloud Hardware and Infrastructure-Clients-Security-Network-Services. Accessing the Cloud: Platforms-Web Applications-Web API‘s-Web Browsers.	K1,K2	12
III	Cloud Storage: Overview- Cloud Storage Providers. Standards: Applications-Client-Infrastructure-Service.	K1,K3	12
IV	Software as a Service: Overview-Driving forces-Company offerings-Industries. Software plus Services: Overview-Mobile Device Integration-Providers-Microsoft Online.	K3,K4	12
V	Local Clouds and Thin Clients**:** Virtualization in Your Organization-Server Solutions-Thin Clients. Migrating to the Cloud: Cloud Services for Individuals-Enterprise-Class Cloud Offerings-Migration.	K2,K4	12

Learning Resources	
Text Books	1. Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, "Cloud Computing –A Practical Approach", Tata McGraw Hill Education Pvt. Ltd, 2010.(UNIT- I (Chapter 1,2) UNIT-II(Chapter 5,6) UNIT-III(Chapter 7,8) UNIT-IV(Chapter 9,10) UNIT-V(Chapter 12,13).
Reference Books	1. Michael Miller," Cloud Computing: Web based Applications that change the way you work and Collaborate online", Que Publishing, August 2010. 2. Haley Beard, "Cloud Computing Best Practices for Managing and Measuring Processes for on demand computing, Applications and Data Centers in the Cloud with SLAs",Emereo Pvt. Ltd, July 2011.
Website / Links	1. nptel.ac.in/courses/106105033/41 2. freevideolectures.com › Computer Science › UC Berkeley 3. www.learnerstv.com/video/Free-video-Lecture-18965-Computer-Science... 4. https://class.coursera.org/massiveteaching-001/lecture/33 5. www.south.cattelecom.com/Technologies/CloudComputing/lec01.pdf

MAPPING WITH PROGRAM SPECIFIC OUTCOMES

CO \ PSO	PSO1	PSO2	PSO3	PSO4
CO1	**S**	L	**S**	**M**
CO2	L	**M**	L	L
CO3	**M**	L	**S**	**S**
CO4	**S**	L	**M**	**M**
CO5	**M**	M	**S**	**L**

Subject Title	Digital Image Processing	Semester	IV
Subject Code	18P4CSE13	Specialization	NA
Type / Hours	Elective: Theory	L:T:P:C	5 : 0 : 0 : 4

Objective:

- To develop experience with using computers to process images.
- To understand the basic principles and methods of digital image processing
- To formulate solutions to general image processing problems.

COURSE OUTCOME

On the successful completion of the course the student will able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the concept of Digital Image Processing	K1
CO2	Learn arithmetic and logic operations on images.	K1,K2
CO3	Learn about image restoration and color processing	K2,K3
CO4	Identify object recognition concepts	K4
CO5	Learn about the Wireless Telephony System	K4

Subject Title	Digital Image Processing	Semester	III
Subject Code	18P4CSE13	Specialization	NA
Type / Hours	Elective: Theory	L:T:P:C	5 : 0 : 0 : 4

Unit	Syllabus Contents	Levels	Number of Sessions
I	Introduction: What is Digital Image Processing? – Examples of Fields that Use Digital Image Processing – Fundamental Steps in Digital Image Processing – Components of an Image Processing System - Digital Image Fundamentals: Elements of Visual Perception – Light and Electro Magnetic Spectrum – Image Sensing and Acquisition – Image Sampling and Quantization – Some Basic Relationships between Pixels.	K1	12
II	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. Image Enhancement in the Frequency: Background - Introduction to the Fourier Transform and the Frequency Domain- Smoothing Frequency-Domain Filters- Sharpening Frequency Domain Filters- Homomorphic Filtering- Implementation.	K1,K2	12
III	Image Restoration: A Model of the Image Degradation / Restoration Process- Noise Models- Restoration in the Presence of Noise Only– Spatial Filtering - Estimating the Degradation Function- Inverse Filtering- Minimum Mean Square Error (Wiener) Filtering. Color Image Processing: Color Fundamentals- Color Models- Pseudo color Image Processing- Basics of Full-Color Image Processing- Color Transformations- Smoothing and Sharpening- Image Segmentation Based on Color - Noise in Color Images- Color Image Compression.	K2,K3	12
IV	Object Recognition: Knowledge Representation – Statistical Pattern Recognition – Neural Nets – Syntactic Pattern Recognition – Optimization Techniques - Fuzzy Systems – Mathematical Morphology – Basic Morphological Concepts – Binary Dilation and Erosion.	K4	12
V	Image Data Compression: Image Data Properties – Discrete Image Transforms in Image Data Compression – Predictive Compression Methods – Vector Quantization – Hierarchal and Progressive Compression Methods – Comparison of Compression Methods – Coding – JPEG and MPEG Image Compression - Texture	K3,K4	12

Learning Resources	
Text Books	1. Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing", Prentice Hall, Third Edition, 2008. (Unit I to III : Chapter-1,2,3,4,5&6) 2. Sonka, Hlavac, Boyle, "Digital Image Processing and Computer Vision", Cengage Learning, Fourth Indian Reprint 2011. (Unit-IV:Chapters: 9&13,Unit-V:Chapters: 14&15)
Reference Books	1. Anil.K.Jain, "Fundamentals of Digital Image Processing ", Prentice Hall, 1989. 2. Chanda & Majumdar, "Digital Image Processing and Analysis", Prentice Hall 3rd Edition.
Web Sites/Links	1. www.nptel.ac.in 2. www.imageprocessingplace.com/ 3. www.slideshare.net/sahilbiswas/image-processing

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

CO \ PSO	PSO1	PSO2	PSO3	PSO4
CO1	L	S	S	M
CO2	S	M	M	L
CO3	M	M	S	S
CO4	S	S	M	M
CO5	M	L	S	S

Subject Title	Major Project	Semester	IV
Subject Code	18P4CSPR02	Specialization	NA
Type	Major Project	L:T:P:C	2 : 0 : 6 : 2

FIRST REVIEW: **(10 Marks)**

1. Problem Identification
2. Problem definition
3. Presentation

SECOND REVIEW: **(10 Marks)**

1. Project Analysis
2. Design & Module description

FINAL REVIEW: **(20 Marks)**

1. DFD / ERD / System Flow Diagram (Whichever Applicable)
2. Coding and Implementation
3. Presentation
4. Final Project Report (with executable format including complete source code)

The Passing minimum shall be 40% out of 60 marks (24 Marks)

ELECTIVE – I

Subject Title	THEORY OF COMPUTATION	Semester	I
Subject Code	18P1CSE01	Specialization	NA
Type	Elective : Theory	L:T:P:C	4:0:0:4

Objective

1. To provide the knowledge on Learning about automata, grammar, language, and their relationships.
2. To gives an understanding of the power of Turing machine, and the decidable nature of a problem.
3. To gives the idea on new trends and applications.

COURSE OUTCOME

On the successful completion of the course the student will be able to understanding of the power of Turing machine, and the decidable nature of a problem.

CO Number	CO Statement	Knowledge Level
CO1	Summarize of Automa Theory, Non Deterministic Automata	K1
CO2	Context Free Grammar and Pushdown Automata	K2
CO3	Apply various Closure Properties	K3
CO4	*Analyze the* Undecidable problems	K4
CO5	Analyze a given grammar type and characteristics	K4

Subject Title	THEORY OF COMPUTATION	Semester	I
Subject Code	18P1CSE01	Specialization	NA
Type	Elective: Theory	L:T:P:C	4:0:0:4

Unit	Syllabus Contents	Levels	Number of Sessions
I	**REGULAR LANGUAGES :** Finite Automata (FA) – Deterministic Finite Automata (DFA) – Non-deterministic Finite Automata (NFA) – Finite Automata with Epsilon transitions - Regular Expression – FA and Regular Expressions – Pumping lemma for Regular languages - Equivalence and minimization of Finite Automata.	K1	12
II	**CONTEXT FREE LANGUAGES** : Context-Free Grammar (CFG) – Parse Trees – Ambiguity in grammars and languages – Equivalence of Parse trees and derivation - Normal forms for CFG - Definition of the Pushdown automata – Languages of a Pushdown Automata – Equivalence of Pushdown automata and CFG – Pumping lemma for CFL.	K1,K2	12
III	**CLOSURE PROPERTIES**: and Turing machines 8 Closure properties of Regular Sets: Complement and Intersection – Closure properties of CFL: Union, Concatenation, Kleene Closure, Intersection and Complement – Turing Machines – Language of a Turing machine – Turing machine as a computing device - Various techniques for construction of TMs – Equivalence of one tape and multi-tape Turing machines.	K1,K3	12
IV	**UNDECIDABILITY** : A language that is not Recursively Enumerable (RE) – An undecidable problem that is RE – Undecidable problems about Turing Machine – Rice theorem for Recursive and Recursively enumerable languages – Post's Correspondence Problem.	K4	12
V	**RECENT TRENDS & APPLICATIONS** :Matrix grammar – Programmed grammar – Random context grammar – Regular Control grammar – Lindenmayer systems – A glance on DNA computing and Membrane computing.	K4	12

Learning Resources	
ext Books	1. John E. Hopcroft and Jeffery D. Ullman, Introduction to Automata Theory, Languages and Computations, Narosa Publishing House, Delhi, 1989. 2. Kamala Krithivasan and R. Rama, Introduction to Formal Languages, Automata Theory and Computation, Pearson Education, Delhi, 2009.
Reference Books	1. Harry R. Lewis and Christos H. Papadimitriou, Elements of the theory of Computation, Second Edition, Prentice-Hall of India Pvt. Ltd, 2003. 2. J. Martin, Introduction to Languages and the Theory of Computation, Third Edition, Tata Mc Graw Hill, New Delhi, 2003. 3. Micheal Sipser, "Introduction of the Theory and Computation", Thomson Learning, 1997.

Mapping with Programme Outcomes

	PS01	PS02	PS03	PS04
CO1	S	S	S	S
CO2	S	M	M	M
CO3	S	M	M	M
CO4	S	M	M	S
CO5	S	L	S	S

S – Strong , M- Medium , L – Low

Subject Title	SOFTWARE PROJECT MANAGEMENT AND QUALITY ASSURANCE	Semester	I
Subject Code	18P1CSC02	Specialization	NA
Type	Core : Theory	L:T:P:C	4:0:0:4

Objective

- Use of different Life cycle Model for software development
- Have the mathematical foundation in finding of project cost of algorithms
- Understand different algorithmic design strategies
- Apply design principles and concepts to reengineering and reverse engineering

COURSE OUTCOME

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

CO Number	CO Statement	Knowledge Level
CO1	Summarize the relevance of software project management	K1
CO2	Differentiate different software configuration and tools	K2
CO3	Apply various software cost techniques in the different kind	K3
CO4	*Analyze* each and every algorithm techniques	K4
CO5	Analyze a given software for its efficiency based on the configuration	K4

Subject Title	SOFTWARE PROJECT MANAGEMENT AND QUALITY ASSURANCE	Semester	I
Subject Code	18P1CSC02	Specialization	NA
Type	Elective-I : Theory	L:T:P:C	4:0:0:4

Unit	Syllabus Contents	Levels	Number of Sessions
I	Introduction – Product Life cycle – Project life cycle models - Water fall model – Prototyping model – RAD model – Spiral Model – Process Models –The ISO-9001Model-The Capability Maturity Model- Metrics.	K1	12
II	Software Configuration Management – Definitions and terminology – The processes and activities – Configuration Audit – Metrics –Tools and Automation- Software Quality Assurance – Define Quality – Quality Control and Assurance – SQA Analysts Functions - QA Tools – Organizational Structures – Profile of a successful SQA-Measures of SQA success.	K1,K2	12
III	Project Initiation – Project Planning and Tracking – What, Cost, When and How – Organizational Processes – Assigning Resources – Activities to specific to Project Tracking – Project Closure – When and How.	K1,K3	12
IV	Quality Management-Software Quality, Software Quality Dilemma-Achieving Software Quality-Software Testing Strategies-Strategic Approach-Test Strategies for Conventional Software and Object Oriented Software.	K2,K3	12
V	Project Management -The People, The Product, The Process - Project Scheduling - Risk Management –Maintenance and Reengineering - Business Process Reengineering – Software Re Engineering – Reverse Engineering – Restructuring - Forward Engineering.	K4	12

Learning Resources	
Text Books	1. Gopalaswamy Ramesh, "Managing Global Software Projects" Tata McGraw Hill.Publishing Company Ltd, New Delhi, 2002. (Unit-I :Chapter 1,2,3,4&5, Unit-II: Chapter 6,7, Unit-III: Chapter 10,11 & 12) 2. Pressman, Roger, "Software Engineering ", A Practitioner's approach, 7th edition, Tata Mc- Graw Hill, 2006. 6th Edition (Unit-IV: Chapter 25,26, Unit-V: 21,31
Reference Books	1. Philip B Crosby, " Quality is Free: The Art of Making Quality Certain ", MassMarket, 2004. 2. Bob Hughes and Mike Cotterell "Software Project Management" 2nd Edition, TataMcGraw Hill Publishing Company Ltd., New Delhi, 2002. 3. Software Project Management, Ashfaque Ahmed 2013.
Website / Links	1. https://en.wikipedia.org/wiki/Software_quality_managementhttps://en.wikipedia.org/wiki/Software_quality_control

Mapping with Programme Outcomes

	PS01	PS02	PS03	PS04
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	M	M	M
CO4	M	M	M	S
CO5	S	L	S	S

S- Strong , M- Medium , L - Low

Subject Title	CLIENT / SERVER TECHNOLOGY	Semester	I
Subject Code	18P1CSE03	Specialization	NA
Type	Elective-I : Theory	L:T:P:C	4:0:0:4

Objective:

1. Know the basics of client /server technology.
2. Understand the client server hardware and software components.
3. Analyze the impact of client/server technology in business.
4. Development and deployment of client server platform.

On successful completion of this course we learn the following

COURSE OUTCOMES

CO Number	CO Statement	Knowledge Level
C01	Understand the concepts of client /server technology	K1
C02	To learn about s/w and h/w components of C/S technology	K2
C03	To analyze the basics of business in client server technolgy	K4
C04	To implement distributed client server system in various places	K3
C05	Design and Establish the client server system to apply in various environment.	K4

Subject Title	CLIENT / SERVER TECHNOLOGY	Semester	I
Subject Code	18P1CSE03	Specialization	NA
Type	Elective-I : Theory	L:T:P:C	4:0:0:4

Unit	Syllabus Contents	Levels	Number of Sessions
I	Introduction to Client Server Computing-Benefits of Client Server Computing-Hardware Trends-Components of Client Server Applications-Categories of Client Server Applications-Dispelling the Myths-Obstacles-Upfront and Hidden-Open Systems and Standards-Setting Organization-Factors for Success.	K1	12
II	Client Hardware and Software-Client Components-Client Operating System-GUI-X Window Vs Windowing-Database Access-Application Logic-Client Server Products-Requirements-GUI Design Standards-Open GUI Standards.	K2	12
III	Server Hardware-Benchmarks-Categories of Server-Features of Server Machines-Classes of Server Machines-Server Environment-Eight layers of Software-Network Management Environment-Network Computing Environment-Server Requirements-Platform Independence-Transaction Processing-Connectivity-Intelligent Database-Stored Procedures-Triggers-Load Leveling-Optimizer-Testing and Diagnostic Tools-Reliability-Backup and Recovery Mechanisms- Server Data Managements and Access Tools.	K2,K3	12
IV	Overview of Networking-Layers, Interfaces and protocols-Standard Architectures-Network Characteristics-Network Management Standards-LAN Hardware and Software-LAN Hardware-Network Operating System.	K3	12
V	Development and Deployment-Development Methodology-Convert Existing Screen Interfaces-Application Development Tools-Managing the Production Environment-Production Requirements-Future Trends.	K4	12

Learning Resources	
Text Books	1. Dawna Travis Dewire, "Client/Server computing, 11th Reprint 2009, Tata McGraw Hill. (Unit–I:Chapter 1,2,3&4, Unit-II: Chapter 5,6&7,Unit-III :Chapter 8,9,10,11&12) Unit – IV:Chapter 15 &16, Unit –V:Chapter 18,18 &19)
Reference Books	1. Jafferey D. Schank, "Novell's guide to Client/Server Application and Architecture", 2005 Edition, BPB Publications. 2. Robert Orfali, Dan Harkey and Jeri Edwards, "Client/Server Survival Guide", 3rd Edition, 2009 John Wiley & Sons, Inc.
Website / Links	1. www.opengroup.org/comsource/techref2/NCH1222X.HTM 2. www.springer.com/productFlyer

Mapping with Programme Outcomes

	PS01	PS02	PS03	PS04
CO1	S	S	S	S
CO2	S	M	M	M
CO3	M	M	M	M
CO4	M	M	L	S
CO5	S	L	L	L

Subject Title	Internet of Things	Semester	I
Subject Code	18P1CSE04	Specialization	NA
Type / Hours	Course / 60 Hours	L:T:P:C	4 : 0 : 0 : 4

Course objective:

1. To know the Fundamentals, characteristics of Internet Of Things.
2. Understand the IoT Enabling Technologies
3. Implementing IoT in whether forecasting.
4. Compare IoT and M2M
5. Synthesis Commercial IoT.

CO Number	CO Statement	Knowledge Level
CO1	Knowledge on IoT	K1
CO2	Understand IoT enabling Tehnologies..	K2
CO3	Apply IoT techniques for improving the efficiency of algorithms.	K3
CO4	*Analyze* each and every algorithm techniques IN IoT with M2M	K4
CO5	Analyze a given algorithm for its efficiency based on IoT management.	K4

Subject Title	Internet of Things	Semester	I
Subject Code	18P1CSE04	Specialization	NA
Type / Hours	Course / 60 Hours	L:T:P:C	4 : 0 : 0 : 4

Unit	Syllabus Contents	Levels	Number of Sessions
I	**Introduction:** Introduction to Internet of Things – Defintion & Characteristics of IoT – Things in IoT – IoT Protocols – Logical Design of IoT: IoT functional Blocks – IoT Communication Models – IoT Communication APIs.	K1	12
II	IoT Enabling Technologies: Wireless Sensor Networks – Cloud computing – Bigdata Analytics – Communication Protocols – Embedded Systems. Domain Specific IoTs: Home Automation – cities – Retail – Health & Monitoring.	K1,K2	12
III	Developing IoT: Introduction – IoT Design Methodology – Case Study on IoT System for Weather Monitoring.	K2,K3	12
IV	IoT and M2M: Introduction – M2M – Difference between IoT and M2M – SDN and NFV for IoT: Software defined Networking – Network Function Virtualization.	K2,K4	12
V	IoT System Management with NETCONF-YANG: Need for IoT System Management – SNMP – NETCONF – YANG. Tools for IoT: Introduction - Chef – Puppet.	K4	12

Learning Resources	
Text Books	1. Arshdeep Bahga, Vijay Madisetti " Internet of Things, A Hands on Approach" Universities Press 2015.
Reference Books	1. Oliver Hersent, David Boswarthick, Omar Elloumi. " The Internet of Things – Key applications and Protocols", Wiley, 2012.
Web Sites/Links	1. www.theinternetof things.eu 2. www.cisco.com/c/en_in/solutions/internet-of-things/overview.html

Mapping with Programme Outcomes

	PS01	PS02	PS03	PS04
CO1	S	S	S	S
CO2	S	M	M	S
CO3	S	S	M	M
CO4	M	S	M	S
CO5	S	L	S	S

Pedagogy : Talk, Demo… S – Strong , M- Medium , L - Low

ELECTIVE II

Subject Title	NETWORK SECURITY	Semester	II
Subject Code	18P2CSE05	Specialization	NA
Type	Elective –II : Theory	L:T:P:C	4:0:0:4

OBJECTIVE

1. To learn about the Security architecture security types and security mechanisms.
2. To learn about the Network security has four objectives: confidentiality, integrity, availability, and non repudiation.
3. To gain the knowledge of Securing information is equivalent to ensuring that computers keep your secrets.
4. To Identify the function of a firewall, and how it keeps a computer secure and safe from viruses and plan for anti-virus protection.

COURSE OUTCOME

On the successful completion of the course the student will able to To study technologies and research problems in the Internet, security trends and pretty good policy in security related issues.

CO Number	CO Statement	Knowledge Level
CO1	To understand the concept of security and Encryption algorithms	K1
CO2	To analyze public key cryptography and Message Authentication algorithms	K1,K2
CO3	To Describe and learn about the Electronic mail Security concepts	K2,K3
CO4	To Demonstrate about the web security considerations	K4
CO5	To learn about the intruders and virus protections	K4

Subject Title	NETWORK SECURITY	Semester		II
Subject Code	18P2CSE05	Specialization		NA
Type	Elective –II : Theory	L:T:P:C		4:0:0:4

Unit	Syllabus Contents	Levels	Number of Sessions
I	Introduction: Security Trends-The OSI Security Architecture - Security Attacks - Security Services- Security Mechanisms- Model for networkSecurity - Symmetric Encryption and Message Confidentiality: Symmetric Encryption Principles - Symmetric Block Encryption Algorithms - Stream Ciphers and RC4 - Cipher Block Modes of Operations - Location of Encryption Devices-Key Distribution.	K1	12
II	Public Key Cryptography and Message Authentication: Approaches to Message Authentication – Secure Hash Functions and HMAC - Public Key Cryptography Principles - Public Key Cryptography Algorithms - Digital Signatures - Key Management. Authentication Applications: Kerberos - X.509 Authentication service - Public Key Infrastructures	K2,K3	12
III	Electronic mail Security: Pretty Good Privacy (PGP) - S/MIME. IP Security: IP Security Overview – IP Security Architecture - Authentication Header - Encapsulating Security Payload - Combining security Associations .	K2,K3	12
IV	Web Security: Web Security Considerations- Security Sockets Layer (SSL) and Transport Layer Security (TLS) - Secure Electronic Transaction. Network Management Security: Basic Concepts of SNMP - SNMPV1 Community facility - SNMPV3.	K4,K3	12
V	Intruders: Intruders – Intrusion Detection – Password Management - Malicious Software: Viruses and Related Threats – Virus Countermeasures – Distributed Denial of Service Attacks. Firewalls: Firewall Design Principles – Trusted Systems – Common Criteria for IT Security Evaluation.	K4	12

Learning Resources	
Text Books	1. William Stallings, "Network Security Essentials – Applications and Standards", 3rd Edition, Pearson Education, 2009 Edition. Unit I : Chapter 1 & 2 , Unit II : Chapter 3 & 4, Unit III : Chapter 5 & 6, Unit IV : Chapter 7 & 8, Unit-V (Chapter 9, 10 & 11)
Reference Books	1. V.K.Pachghare , "Cryptography and Information Security" , PHI 2013. 2. William Stallings, "Cryptography and Network Security", Pearson Education – 2008. 3.Behrouz A Forouzan, Sophia Chung Fegan, "Data Communications and Networking", TMH-2013.

Content beyond the syllabus:

1. Understand about Network security concepts and various network algorithms.
2. Know about advanced concepts of electronic mail security and web security

Pedagogy: Chalk and Talk , PPT, ICT etc…

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

PSO / CO	PSO1	PSO2	PSO3	PSO4
CO1	L	S	S	M
CO2	M	M	M	L
CO3	S	M	M	M
CO4	S	S	M	M
CO5	M	L	L	S

Subject Title	WIRELESS APPLICATION PROTOCOL	Semester	II
Subject Code	18P2CSE06	Specialization	NA
Type	Elective – II : Theory	L:T:P:C	4:0:0:4

OBJECTIVE

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1. To understand fundamental trends of technological evolution of Wireless technology.
2. Have hands-on knowledge in developing simple and comprehensive Wireless WAP contents.
3. Be able to plan, design, and develop WAP pages and contents.
4. Acquire creative skills in design, layout, and interactivity of WAP pages.

COURSE OUTCOME

On the successful completion of the course the student will able to

CO Number	CO Statement	Knowledge Level
CO1	To understand the concept of security and Encryption algorithms	K1
CO2	To analyze public key cryptography and Message Authentication algorithms	K1,K2
CO3	To Describe and learn about the Electronic mail Security concepts	K2,K3
CO4	To Demonstrate about the web security considerations	K4
CO5	To learn about the intruders and virus protections	K4

Subject Title	WIRELESS APPLICATION PROTOCOL	Semester	II
Subject Code	18P2CSE06	Specialization	NA
Type	Elective – II : Theory	L:T:P:C	4:0:0:4

Unit	Syllabus Contents	Levels	Number of Sessions
I	Introduction – Key Services for the Mobile Internet – Business Opportunities. Making the Internet "Mobile": Challenges and Pitfalls – The Origins of WAP – WAP Architecture – Components of the WAP Standard – Network Infrastructure services Supporting WAP Clients.	K1	12
II	The Wireless Markup Language: Overview – The WML Document Model – WML Authoring – URLs Identify Content – Markup Basics – WML Basics – Basic Content – Events, Tasks and Bindings – Variables – Other Contents – Controls – Miscellaneous Markup – Sending Information – Application Security – Document Type Declaration – Errors and Browser Limitations.	K2,K3	12
III	User Interface Design: Making wireless Application easy to use: Web Site Design: Computer Terminals versus Mobile Terminals – Designing a usable WAP Site – Structured Usability Methods – User Interface Design Guidelines.	K2,K3	12
IV	Tailoring Content to the Client-Push Messaging: Overview of WAP Push – Push Access Protocol – WAP Push Addressing – Push Message – MIME media types for Push -Messages – Push Proxy Gateway – Push Over – the – Air Protocol – Push Initiator Authentication and Trusted Content.	K4,K3	12
V	Wireless Telephony Applications: Overview of the WTA Architecture – The WTA Client Framework – Design Considerations.	K4	12

Learning Resources	
Text Books	1. Sandeep Singhal, Thomas Bridgman, Lalitha Suryanarayana, Daniel Mauney, Jari Alvinen, David Bevis, Jim Chan., "The Wireless Application Protocol – Writing Application for the mobile internet ", Pearson Education, 2010. (UNIT-I :Chapter - 1 to 6, UNIT-II :Chapter - 7, UNIT-III :Chapter - 10, UNIT-IV: Chapter - 11&12, UNIT-V :Chapter - 13 to 15).
Reference Books	1. Charless Arehare, Nirmal Chidambaram, and others, "Professional WAP", Wrox Press Ltd., Shroff publ. And Dist – Pvt. Ltd., 2001. 2. Ryan Sean Younger , "WAP & WML : Designing Usable Mobile Sites", 2011.
Website/Links	1. www.//en.wikipedia.org/wiki/Wireless_Application_Protocol 2. www.readorrefer.in/article/Wireless-Application-Protocol-Overview

Content beyond the syllabus:

1. Understand about WAP and Wireless Markup Language.
2. Know about advanced concepts of MIME and WTA architecture.

Pedagogy: Chalk and Talk , PPT, ICT etc…

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

PSO / CO	PSO1	PSO2	PSO3	PSO4
CO1	L	M	M	L
CO2	M	M	M	S
CO3	S	S	S	S
CO4	S	S	S	M
CO5	S	L	M	L

Subject Title	Multimedia And Virtual Reality	Semester	II
Subject Code	18P2CSE07	Specialization	NA
Type	Elective-II : Theory	L:T:P:C	4:0:0:4

COURSE OBJECTIVE

.

- To Understand fundamental trends and evolution of Multimedia Technology.
- Have hands-on knowledge in developing simple Audio and Video technology.
- Be able to plan, design, and develop Multimedia devices.
- Acquire creative skills in design, layout, and interactivity of 3D modeling and Animation.
- To learn about multimedia skills, 3D modeling and animation tools.

COURSE OUTCOME

On the successful completion of the course the student will able to do the following,

CO Number	CO Statement	Knowledge Level
CO1	To understand the concept of Multimedia skills	K1
CO2	To know the audio concepts in multimedia	K1,K2
CO3	To Describe and learn about the hardware tools used.	K2,K3
CO4	To learn about the hardware tools used .	K4
CO5	To learn about the virtual reality concepts.	K4

Subject Title	Multimedia And Virtual Reality	Semester	II
Subject Code	18P2CSE07	Specialization	NA
Type	Elective II : Theory	L:T:P:C	4:0:0:4

Unit	Syllabus Contents	Levels	Number of Sessions
I	Introduction – what is multimedia – making multimedia – multimedia skills – Text**.**	K1	12
II	Sound : Digital Audio-MIDI-Music CDs. Images: Making Still Images-Color-Image File Formats. Animation-Video.	K2	12
III	Hardware: Macintosh versus Windows-Networking-Connections-Memory and Storage devices-Input devices- Output Hardware-Communication Devices.	K2,K3	12
IV	Basic Software Tools: Text Editing and Word Processing Tools – OCR Software – Painting and Drawing Tools. 3D Modeling and Animation Tools – Image Editing Tools – Animation, Video and Digital Movie Tools – Multimedia Authoring Tools.	K4	12
V	Virtual Reality: Introduction – A Generic VR System: Virtual Environment –VR Technology-Modes Of Interaction-VR Hardware: Sensor Hardware, Head Coupled Displays – Acoustic Hardware-Integrated VR – VR Software: Modeling Virtual Worlds- Physical Simulations – VR Applications	K3,K4	12

Learning Resources		
Text Books	1. Tay Vaughan , " Multimedia making it work" , 2014, TMH.(Unit I :Chapter-1,2,3& 4, Unit-II :Chapter-5,6,7& 8, Unit-III :Chapter-9,Unit-IV :Chapter-10 & 11) 2. John Vince, "Virtual Reality Systems", Addison Wesley, 4th Edition 2014. (Unit- V)	
Reference Books	1. Free T. Hofstetter, "Multimedia LITERACY", TMH, 1995. 2. Simoin j.,Gibbs, Dionysios C and Tsichriziz " Multimedia Programming" ,Addison Wesley, 2010. 3. John F.Koegel Buford, " Mutimedia Systems", Addison Wesley, 2014. 4. Ralf steinmetz and klaranahrstedt,"Multimedia : Computing, communications Applications" 2013.	
Website/Links	1.	2. *www.richardbrice.net/chap01.htm*

Content beyond the syllabus:

1. Understand about Multimedia skills.
2. Know about advanced concepts of Animation and Editing system.

Pedagogy: Chalk and Talk , PPT, ICT etc…

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

PSO / CO	PSO1	PSO2	PSO3	PSO4
CO1	L	S	S	M
CO2	M	S	M	L
CO3	M	M	S	S
CO4	M	S	S	M
CO5	M	M	S	M

Subject Title	Artificial Intelligence and Expert Systems	Semester	II
Subject Code	17U6CTE05	Specialization	NA
Type	Elective :II	L:T:P:C	4:0:0:4

COURSE OBJECTIVE

.

- To Understand fundamental trends and evolution of **Artificial Intelligence**.
- To know the knowledge representation issues..
- Be able to plan, design, and develop Multimedia devices.
- Acquire creative skills in design, layout, and interactivity of 3D modeling and Animation.
- To learn about multimedia skills, 3D modeling and animation tools.

COURSE OUTCOME

On the successful completion of the course the student will able to do the following,

CO Number	CO Statement	Knowledge Level
CO1	To understand the concept of Multimedia skills	K1
CO2	To know the audio concepts in multimedia	K1,K2
CO3	To design knowledge rules	K2,K3
CO4	To learn Statistical reasoning .	K4
CO5	To implement game playing concepts.	K4

Subject Title	Artificial Intelligence and Expert Systems	Semester		II
Subject Code	17U6CTE05	Specialization		NA
Type	Elective Theory :II	L:T:P:C		4:0:0:4

Unit	Syllabus Contents	Levels	Number of Sessions
I	Introduction: Artificial Intelligence Problems- Artificial Intelligence Techniques-Criteria for Success. Problems, Problems Space, Search: State Space Search-Production Systems-Problem Characteristics- Issues in design of search. Heuristic Search Techniques: Generate & Test- Hill climbing- Best First, problem Reduction, Constraint satisfaction, Means End Analysis.	K1	12
II	Knowledge Representation Issues: Representations and Mappings-Approaches to Knowledge representation-Issues in knowledge representations-The Frame Problem. Using Predicate Logic: Representing Simple Facts in Logic-Representing instance and ISA Relationships- Computable Functions and Predicates- Resolution-Natural deduction.	K2,K3	12
III	Representing Knowledge Rules: Procedural vs. Declarative Knowledge-Logic Programming- Forward vs Backward Reasoning- Matching-Control Knowledge-Symbolic Reasoning under Uncertainty: Introduction to Nonmonotonic Reasoning- Logics for Nonmonotonic Reasoning-Implementation Issues Augmenting Problem Solver-Implementation: Depth First Search-Implementation: Breadth First Search	K3,K4	12
IV	Statistical Reasoning: Probability and Bayes Theorem-Certainty Factors and Rule-based Systems- Bayesian Networks- Dempster- Shafer Theory- Fuzzy Logic- Weak slot -Filler Structures: Semantic Nets Frames. Strong Slot Filler Structures: Conceptual Dependency- Scripts	K3,K4	12
V	Game Playing: Overview-The Minimax Search Procedure-Adding Alpha-Beta Cutoffs-Additional Refinements- Expert Systems: Representing and using Domain Knowledge-Expert system Shells-Explanation- Knowledge Acquisition	K4	12

Learning Resources	
Text Books	1. Elaine Rich ,Kevin Knight,Shivashankar B Nair, "Artificial Intelligence", Tata McGraw-Hill Publication, 3rd Edition,2010
Reference Books	1. Donald A.Waterman – A Guide to Expert Systems Tata Mcgraw Hill – second Edition,1991. 2. Stuart Russell and Peter Norving ,"Artificial Intelligence – A Modern Approach"Second Edition,2007.
Web Sites / Links	1. www. tutorialspoint.com. 2. www.myreaders.info. 3. www.listpdf.com.

Content beyond the Syllabus:

1. The major advantages of AI over natural languages.
2. The role of the intelligent systems and their potential benefits.

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

PSO / CO	PSO1	PSO2	PSO3	PSO4
CO1	L	S	S	M
CO2	M	S	M	L
CO3	M	M	S	S
CO4	M	S	S	M
CO5	M	M	S	M

ELECTIVE III

Subject Title	COMPILER DESIGN	Semester	III
Subject Code	18P3CSE09	Specialization	NA
Type	Elective - Theory	L:T:P:C	4:0:0:4

Objectives

- To introduce the major concept areas of language translation and compiler design.
- To enrich the knowledge in various phases of compiler and its use,
- Understand code optimization techniques, code generation, and use of symbol table.
- To extend the knowledge of parser by parsing LL parser and LR parser.

On successful completion of this course the students do the following.

COURSE OUTCOMES

CO Number	CO Statement	Knowledge Level
C01	Understand the concepts of Compilers	K1
C02	To learn about context free grammars	K2
C03	To analyze the basics of syntax directed translations.	K4
C04	To implement lexical phase and syntactic phase concepts.	K3
C05	Design and Establish the compiler optimization process.	K4

Subject Title	COMPILER DESIGN	Semester	III
Subject Code	18P3CSE09	Specialization	NA
Type	Elective - Theory	L:T:P:C	4:0:0:4

Unit	Syllabus Contents	Levels	Number of Sessions
I	Introduction to Compliers: Compliers and Translator – Need of Translator – The structure of a Complier – Lexical analysis – Syntax analysis – Intermediate code generation –Optimization – Code generation – Complier writing tools. Finite automata and lexical Analysis: The role of the lexical analysis – A simple approach to the design of lexical analyzers- Regular expressions to finite automata – Minimizing the number of states of a DFA.	K1	12
II	The Syntactic specification of programming languages: Context free grammars –Derivations and parse trees - Capabilities of context free grammars. Basic parsing techniques: Parsers – Shift reduce parsing – Operator precedence parsing – Top down parsing – Predictive parsers.	K2	12
III	Syntax directed translation: Intermediate code – Postfix notation – Parse trees and syntax trees – 3 address code – Quadruples and triples – Boolean expressions – Statements that alter the flow of control. Symbol tables: The contents of a symbol table – Data structures for symbol table – Representing scope	K2,K3	12
IV	Run time storage administration: Implementation of a simple stack allocation scheme –Implementation of block-structured languages. Error deduction and recovery: Errors – Lexical phase errors – Syntactic phase errors – Semantic errors.	K4	12
V	Introduction of code optimization: The principle sources of optimization – Loop optimization – The DAG representation of basic blocks –Global data flow analysis. Code generation: Object programs – Problems in code generation–A simple code generator – Register allocation and assignment –Code generation from DAG‘s–Peepholes optimization.	K4	12

Learning Resources	
Text Books	1. Principles of Complier Design by Alfred V.Aho, Jeffrey D.Ullman , Narosa Publications House.
Reference Books	1. Modern Compiler Design by David Galles, Fifth Edition 2012.
Website / Links	www.tutorialspoint.com https://en.wikipedia.org www.faadooengineers.com

Content beyond Syllabus

1. Implementation of Lexical Analyzer
2. Translation of Assignment statement
3. Storage Allocation in Block structure language

Mapping with Programme Outcomes

	PS01	PS02	PS03	PS04
CO1	S	S	S	S
CO2	S	M	M	M
CO3	M	M	M	M
CO4	M	M	L	S
CO5	S	L	L	L

Subject Title	OBJECT ORIENTED ANALYSIS AND DESIGN	Semester	III
Subject Code	18P3CSE10	Specialization	NA
Type	Elective : Theory	L:T:P:C	4 : 0 : 0 : 4

Objective

- To learn the basics of object oriented system development.
- To understand the OOD methodologies.
- Apply UML Language.
- Understand different design strategies in OOAD.
- Apply design principles and concepts to software designing.

COURSE OUTCOME

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

CO Number	CO Statement	Knowledge Level
CO1	Summarize the relevance of software project management	K1
CO2	Differentiate different software configuration and OOAD tools	K2
CO3	Apply UML language techniques.	K3
CO4	*Analyze* each and every design techniques	K4
CO5	Analyze a given software for its efficiency based on the object oriented design	K4

Subject Title	OBJECT ORIENTED ANALYSIS AND DESIGN	Semester	III
Subject Code	18P3CSE10	Specialization	NA
Type	Elective : Theory	L:T:P:C	4 : 0 : 0 : 4

Unit	Syllabus Contents	Levels	Number of Sessions
I	An overview of object oriented systems development – Object Basics - object oriented systems development life cycle.	K1	12
II	Object Oriented Methodologies: Introduction - Rumbaugh Object Modeling Technique – The Booch Methodology – The Jacobson Methodologies – Patterns – Frameworks – The Unified Approach.	K2	12
III	Unified Modeling Language: Introduction – static and dynamic models – why modeling? – UML diagrams – UML class diagram – use-case diagram – UML dynamic modeling – UML extensibility.	K3	12
IV	Object Analysis: Classification – Introduction – Classification Theory – Approaches for Identifying Classes – Noun Phrase Approach – Common Class Patterns Approach – Use Case Driven Approach – Classes, Responsibilities And Collaborators – Naming Classes.	K4	12
V	Object Oriented Design Process and Design Axioms: Introduction – The Object Oriented Design Process – Object oriented design axioms – corollaries – design patterns - Designing Classes: UML object constraints language – class visibility: designing well defined public, private and protected protocols –designing classes: refining attributes.	K4	12

Learning Resources	
Text Books	1. Ali Bahrami, "Object Oriented Systems Development", McGRAW – Hill international editions, computer science series.
Reference Books	1. Grady Booch, Robert A. Maksimchuk, Michael W. Engel, and Bobbi J. Young, "Object-Oriented Analysis and Design with Applications", 3rd Edition 2. Simon Bennett, Steve McRobb, and Ray Farmer," Object-oriented Systems Analysis and Design Using UML".
Web Sites/Links	1. www.uml-diagrams.org 2. www.utdallas.edu

Mapping with Programme Outcomes

	PS01	PS02	PS03	PS04
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	M	M	M
CO4	M	M	M	S
CO5	S	L	S	S

Strong , M- Medium , L – Low

Subject Title	Embedded Systems	Semester	III
Subject Code	19P3CSC11	Specialization	NA
Type	Elective : Theory	L:T:P:C	4 : 0 : 0 : 4

Objective

- To enable the students to learn the concepts of Architecture.
- To understand the designing of Embedded Systems
- Applying debugging techniques.

COURSE OUTCOME

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

CO Number	CO Statement	Knowledge Level
CO1	Basics of embedded systems	K1
CO2	Learn the hardware fundamentals of embedded systems	K2
CO3	Analysis the Survey of software architecture	K3
CO4	Understanding the operating system services	K4
CO5	Evaluate the debugging Techniques.	K4

Subject Title	Embedded Systems	Semester	III
Subject Code	19P3CSC11	Specialization	NA
Type	Elective : Theory	L:T:P:C	4 : 0 : 0 : 4

Unit	Syllabus Contents	Levels	Number of Sessions
I	A first look at embedded systems – examples of embedded systems, typical hardware – hardware fundamentals for the software engineer – terminology, gates, a few other basic considerations, timing diagrams, memory.	K1	12
II	Advanced hardware fundamentals – microprocessors, buses, direct memory access, interrupts, other common parts, built-ins on the microprocessor, conventions used on schematics, a sample schematic, a last word about hardware – interrupts – microprocessor architecture, interrupt basics, the shared data problem, interrupt latency.	K2	12
III	Survey of software architecture – round robin, round robin with interrupts, function queue scheduling architecture, real time operating system architecture, selecting an architecture – introduction to real time operating systems – tasks and task states, tasks and data, semaphores and shared data.	K3	12
IV	More operating system Services – Message Queues, Mailboxes and pipes, Timer functions, events, Memory management, Interrupt routines in RTOS environment – embedded software Development tools – host and target machines, linker/locators for embedded software, getting embedded software into the target system.	K4	12
V	Debugging techniques – testing your host machine, instruction set simulators, the assert macro, using laboratory tools	K4	12

Learning Resources	
Text Books	**TEXT BOOKS:** 1. David E. Simon, *an Embedded Software Primer*, Pearson, 2011.
Reference Books	1. Shibu. K. V, Introduction to Embedded Systems, TMH, 2009 2. SteVe Heath, Embedded Systems Design, Second Edition, Newness (Elsevier), 2009 3. Tammy Noergaard, Embedded Systems Architecture, Newness (Elsevier), 2010 4. Arnold S.berger, "Embedded systems design", 1st edition, 2005 5. Oilver H.bailey, "Embedded systems desktop integration", 1st edition.

Mapping with Programme Outcomes

	PS01	PS02	PS03	PS04
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	M	M	M
CO4	M	M	M	S
CO5	S	L	S	S

Strong , M- Medium , L - Low

Subject Title	Professional ethics	Semester	III
Subject Code	18P3CSE12	Specialization	NA
Type / Hours	Elective - Theory	L:T:P:C	4 : 0 : 0 : 4

Course Objectives

- To provide the philosophical foundation of ethics.
- To provide Values based decision making and behavior
- To aid the students in professional code of ethics
- To understand how to apply them in their own work place.
- To provide resources assist them in appreciating universal human Values.

On successful completion of this course we can understand the following

COURSE OUTCOMES

CO Number	CO Statement	Knowledge Level
C01	Know the Nature and Scope of Business Ethics	K1
C02	Understanding Professional ethics	K2
C03	To analyze the basics of Corporate Social Responsibility	K4
C04	To apply Ethical values in india	K3
C05	Design and Establish the dimension of ethics..	K4

Subject Title	Professional ethics	Semester	III
Subject Code	18P3CSE12	Specialization	NA
Type / Hours	Elective / Theory/60 Hours	L:T:P:C	4 : 0 : 0 : 4

Unit	Syllabus Contents	Levels	Number of Sessions
I	**Nature and Scope of Business Ethics :**Introduction – Scope of Business Ethics - Religion and Ethics - Types of Ethics – Sources of Business Ethics - Factors Influencing Business Ethics – Importance of Business Ethics.	K1	12
II	**Professional Ethics :**Introduction – professional ethics – ethical problems faced by managers – new skill required for managers – managing ethical conduct in modern times.	K2	12
III	**Corporate Governance and CSR :**Principles of corporate governance – issues involved in corporate governance - theories of corporate governance – CSR – introduction – Various dimensions – argument for and against CSR..	K3	12
IV	**Ethics in India :**Religious foundations of ethics - Hinduism - Buddhism – Jainism - Ethical Values of Gandhi, Vivekananda, Aurobindo and Tagore.	K4	12
V	**Dimensions of Ethics :** Personal ethics - marketing ethics – technology ethics – environmental ethics	K5	12

Learning Resources	
Text Books	1. R.Nandagopal, Ajithsankar.R.N, "*Indian Ethos and ValuE Management*", Tata McGraw Hill education Private Ltd, New Delhi, 2010 2. S.Prabakaran, "*Business Ethics and Corporate Governance*", Excel books (2010), First Edition.
REFERENCES:	1. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004. 2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics – Concepts and Cases", Cengage Learning, 2009 3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003 4. Edmund G Seebauer and Robert L Barry, "Fundametals of Ethics for Scientists and Engineers" Oxford University Press, Oxford, 2001 5. Laura P. Hartman and Joe Desjardins, "Business Ethics: Decision Making for Personal Integrity and Social Responsibility" Mc Graw Hill education, India Pvt. Ltd.,New Delhi 2013. 6. World Community Service Centre, „ Value Education", Vethathiri
Web Sites/Links	**Web sources:** 1. www.onlineethics.org 2. www.nspe.org 3. www.globalethics.org 4. www.ethics.org

Content beyond the syllabus:

1. Ethics development Techniques.
2. Design efficient algorithms for mining the data from large volume.

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

PS0 / C0	PS01	PS02	PS03	PS04
C01	**S**	**S**	**M**	**S**
CO2	**S**	**M**	**L**	**L**
C03	**S**	**S**	**M**	**M**
C04	**M**	**L**	**L**	**S**

ELECTIVE IV

Subject Title	Big Data Analytics	Semester	IV
Subject Code	18P4CSE13	Specialization	NA
Type / Hours	Elective IV - Theory	L:T:P:C	4 : 0 : 0 : 4

Objectives

- To understand the applications using Map Reduce Concepts.
- To learn to use various techniques for mining data stream.
- To understand the various search methods and visualization techniques.
- To learn to analyze the big data using intelligent techniques.

On successful completion of this course we can understand how to develop static and dynamic Web pages using ASP.NET.

COURSE OUTCOMES

CO Number	CO Statement	Knowledge Level
C01	Know the big data analytics concepts	**K1**
C02	Understanding mining streams.	**K2**
C03	To analyze the basics of HADOOP Fundamentals	**K4**
C04	To apply HIVE data processing operations.	**K3**
C05	Design and Establish the HADOOP Environment.	**K4**

Subject Title	Big Data Analytics	Semester	I
Subject Code	19P1CSE01	Specialization	NA
Type / Hours	Elective / Theory/60 Hours	L:T:P:C	4 : 0 : 0 : 4

Unit	Syllabus Contents	Levels	Number of Sessions
I	**INTRODUCTION TO BIG DATA** Introduction to Big Data Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error.	K1	12
II	**MINING DATA STREAMS** Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.	K2	12
III	**HADOOP:** History of Hadoop- The Hadoop Distributed File System – Components of Hadoop- Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFS- Basics-Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features.	K3	12
IV	**HADOOP ENVIRONMENT:** Setting up a Hadoop Cluster - Cluster specification - Cluster Setup and Installation - Hadoop Configuration-Security in Hadoop - Administering Hadoop – HDFS - Monitoring-Maintenanc Hadoop benchmarks- Hadoop in the cloud.	K4	12
V	**FRAMEWORKS :** Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper - IBM InfoSphere BigInsights and Streams. Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications.	K5	12

Learning Resources	
Text Books	1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007. 2. Tom White " Hadoop: The Definitive Guide" Third Edition, O'reilly Media, 2012.
Reference Books	1. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Publishing, 2012 2. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
Web Sites/Links	1. www.greatlearning.in 2. www.edx.org

Content beyond the syllabus:

1. Big data analysis techniques.
2. Design efficient algorithms for mining the data from large volume.

MAPPING WITH PROGRAMME SPECIFIC OUTCOMES

PS0 / C0	PS01	PS02	PS03	PS04
C01	**S**	**S**	**M**	**S**
CO2	**S**	**M**	**L**	**L**
C03	**S**	**S**	**M**	**M**
C04	**M**	**L**	**L**	**S**

Subject Title	CYBER FORENSICS	Semester	IV
Subject Code	18P4CSE14	Specialization	NA
Type	Elective IV : Theory	L:T:P:C	4:0:0:4

OBJECTIVE:

- To provide an understanding Computer forensics fundamentals
- To analyze various computer forensics technologies
- To provide computer forensics systems
- To identify methods for data recovery.
- To apply the methods for preservation of digital evidence.

COURSE OUTCOMES

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL
CO1	Understand the basics of computer forensics	K1
CO2	Apply a number of different computer forensic tools to a given scenario	K2
CO3	Analyze and validate forensics data	K2,k3
CO4	Identify the vulnerabilities in a given network infrastructure	K4
CO5	Implement real-world hacking techniques to test system security	K3,K4

Subject Title	CYBER FORENSICS	Semester	IV
Subject Code	18P4CSE14	Specialization	NA
Type	Elective IV : Theory	L:T:P:C	4:0:0:4

Unit	Syllabus Contents	Level	Number of Sessions
I	Computer forensics fundamentals: Introduction – Computer forensics services- Benefits of Forensics methodology- Who use computer forensics evidence-. Types of computer forensic Technology: Military- Law enforcement – Forensic Techniques – Spyware and Adware- Encryption methods and Vulnerabilities – Internet Tracing methods – Security and wireless Technologies – Biometric Security systems.	K1	12
II	Types of computer Forensics System: Internet security- Storage area network security-Network Disaster recovery- Satellite encryption security – Instant messaging security- net privacy- Identity management and Identity theft – biometric Security- Vendor and computer forensics services.	K2	12
III	Computer forensics evidence and capture: Data recovery- evidence collection and data seizure- Duplication and preservation of digital evidence – computer Image verification and Authentication.	K2,K3	12
IV	Computer forensic Analysis : Discovery Of Electronic Evidence- Identification Of Data- Reconstructing Past Events- Networks.	K4	12
V	The information warfare arsenal of the future- Surveillance tools for warfare of the future. Advanced computer forensics . Computer forensics needs and challenges.	K3,K4	12

Learning Resources	
Text Book	1. Computer forensics computer crime scene investigation II Edition-John R.Vacca. Unit I: Chapter 1,2, Unit II: Chapter 3,4, Unit III:Chapter 5,6,7,8,Unit IV: 9,10,11,12, Unit V: Chapter 17,18,20,21
Reference Books	1. Bill Nelson, Amelia Phillips, Frank Enfinger, Christopher Steuart, —Computer Forensics and Investigations, Cengage Learning, India Edition, 2016. 2. CEH official Certfied Ethical Hacking Review Guide, Wiley India Edition, 2015. 3. MarjieT.Britz, —Computer Forensics and Cyber Crime: An Introduction, 3rd Edition, Prentice Hall, 2013. 4. AnkitFadia — Ethical Hacking Second Edition, Macmillan India Ltd, 2006 5. Kenneth C.Brancik —Insider Computer Fraud Auerbach Publications Taylor & Francis Group–2008.
Web Sites	1. https://en.wikipedia.org/wiki/Computer_forensics. 2. https://forensiccontrol.com/resources/beginners-guide-computer-forensics/ 3. https://www.us-cert.gov/sites/default/files/publications/forensics.pdf

Pedagogy : Talk, Demo…

MAPPING WITH PROGRAM OUTCOMES

PSO / CO	PSO1	PSO2	PSO3	PSO4
CO1	**S**	**S**	L	L
CO2	M	**S**	**M**	L
CO3	L	**M**	**S**	**L**
CO4	**S**	**S**	L	L
CO5	**S**	**M**	S	**L**

Subject Title	Distributed Computing	Semester	IV
Subject Code	18P4CSE15	Specialization	NA
Type	Elective IV : Theory	L:T:P:C	4 : 0 : 0 : 4

COURSE OBJECTIVE

- This course provides an introduction to the fundamentals of distributed computer systems, assuming the availability of facilities for data transmission.
- The structure of distributed systems using multiple levels of software is emphasized.

COURSE OUTCOME

CO Number	CO Statement	Knowledge Level
CO1	Demonstrate knowledge of the basic elements and concepts related to distributed system technologies;	K1
CO2	demonstrate knowledge of the core architectural aspects of distributed systems	K2
CO3	design and implement distributed applications	K3
CO4	demonstrate knowledge of details the main underlying components of distributed systems (such as RPC, file systems)	K4
CO5	use and apply important methods in distributed systems to support scalability and fault tolerance	K4

Subject Title	Distributed Computing	Semester	IV
Subject Code	18P4CSE15	Specialization	NA
Type	Elective IV : Theory	L:T:P:C	4 : 0 : 0 : 4

Unit	Syllabus Contents	Levels	Number of Sessions
I	Introduction: Definition Of distributed system- goals - Types of Distributed Systems Architectures: Architectural Styles - System Architectures - Architectures Vs Middleware – Self-Management in Distributed Systems. Processes: Threads – Virtualization - Clients Servers - Code Migration.	K1	12
II	Communication: Fundamentals - Remote Procedure Call – Message-Oriented Communication – Stream-Oriented Communications - Multicast Communication. Naming: Names, Identifiers and Addresses - Flat Naming - Structured Naming – Attribute-Based Naming.	K2	12
III	Synchronization: Clock Synchronization - Logical Clocks - Mutual Exclusion -Global Positioning of Nodes - Election Algorithms. Consistency and Replication: Introduction – Data-Centric Consistency Models – Client-Centric Consistency Models-Replica Management - Consistency Protocols.	K3	12
IV	Fault Tolerance: Introduction to Fault Tolerance - Process Resilience - Reliable Client-Server Communication - Reliable Group Communication - Distributed Commit- Recovery. Security: Introduction to Security - Secure Channels - Access Control - Security Management.	K4	12
V	Distributed Object-Based Systems: Architecture – Processes – Communication –Naming – Synchronization - Consistency and Replication – Fault Tolerance -Security. Distributed file system: Architecture –Processes-communication-Naming-Synchronization-Consistency and Replication - Fault Tolerance – Security – Distributed Web-Based Systems.	K4	12

Learning Resources	
Text Books	1. Andrew S.Tanenbaum, Maarten Van Steen, "Distributed Systems" Principles and Paradigms. Second Edition, PHI Publications, New Delhi -2008.
Reference Books	1. Birman, Kenneth P, "Reliable Distributed Systems - Technologies, Web Services, and Applications" , Springer Publications, 2005 Edition, 2. G.coulouris, Jean Dollimore & Tim Kindberg,Distributed Systems: Concepts and Design (4th Edition) , Addison Wesley Publications, 2005 Edition.
Web Sites/Links	1. www.dezyre.com 2. www.techtarget.com

Content beyond the syllabus:

1. Distributed computing Vs. parallel computing
2. Distributed computing Vs. Cloud computing
3. Distributed computing Vs. distributed databases
4.

Pedagogy : Chalk and Talk, PPT ,ICT……..

MAPPING WITH PROGRAM SPECIFIC OUTCOMES

CO / PSO	PSO1	PSO2	PSO3	PSO4
CO1	L	L	**M**	**M**
CO2	L	**S**	L	L
CO3	**S**	S	**M**	**M**
CO4	**S**	M	M	M
CO5	**S**	M	**S**	**S**

Subject Title	Adhoc Sensor Networks	Semester	IV
Subject Code	18P4CSE16	Specialization	NA
Type	Elective - Theory	L:T:P:C	4 : 0 : 0 : 4

Objectives:

- To study the protocols and the functionalities of ad hoc networks
- To understanding the various applications developed based on ad hoc networking,
- Identify and addressing issues and challenges created.
- To know about the challenges in establishing infrastructure.

COURSE OUTCOMES

On successful completion of this course the students do the following.

CO Number	CO Statement	Knowledge Level
C01	Understand the concepts of Adhoc networks	K1
C02	To learn about Routing protocols	K2
C03	To analyze the basics of secure routing protocols.	K4
C04	To compare sensor networks and networking sensors	K3
C05	Design and Establish the topology control in networks	K4

Subject Title	Adhoc Sensor Networks	Semester	IV
Subject Code	18P4CSE16	Specialization	NA
Type	Elective - Theory	L:T:P:C	4 : 0 : 0 : 4

Unit	Syllabus Contents	Levels	Number of Sessions
I	INTRODUCTION AND MAC PROTOCOLS : Cellular and Ad hoc Networks - Issues in Ad hoc Networks - Design Issues and Design Goals of MAC protocol for Ad hoc Networks - Classification of MAC protocols - Contention Based Protocols - Reservation and Scheduling Mechanisms - Other Protocols.	K1	12
II	ROUTING PROTOCOLS : Design Issues and Classifications of unicast and multicast Routing Protocols - Proactive, Reactive and Hybrid routing protocol – Tree based and Mesh based multicast protocols, Energy Efficient and QoS guaranteed multicast protocols.	K2	12
III	TRANSPORT LAYER AND SECURITY ISSUES : Design Issues, Design Goals and Classifications of Transport layer protocols - TCP over Ad Hoc – Security in Ad hoc Networks - Network Security Requirements - Network Security Attacks - Key Management - Secure Routing in Ad hoc Networks	K2,K3	12
IV	SENSOR NETWORKS AND NETWORKING SENSORS : Unique Constraints and Challenges – Advantages and Applications – Collaborative Processing – Key Definitions – Localization and Tracking – Networking Sensors – MAC – Geographic, Energy Aware and Attribute based Routing.	K4	12
V	INFRASTRUCTURE ESTABLISHMENT AND NETWORK DATABASE Topology Control – Clustering – Time Synchronization – Localization and Localization Services – Task Driven Sensing – Roles of Sensor Nodes and Utilities – Network Database	K4	12

Learning Resources	
Text Books	1. C. Siva Ram Murthy and B.S. Manoj, "Ad Hoc Wireless Networks – Architectures and Protocols", Pearson Education, 2nd Edition, 2005. 2. Feng Zhao and Leonidas Guibas, "Wireless Sensor Networks – An Information Processing Approach", Elsevier Publications, 2004.
Reference Books	1. C.K.Toh, "Ad hoc Mobile Wireless Networks – Protocols and Systems", Pearson Education, 1st Edition, 2007. 2. George Aggelou, "Mobile Ad hoc Networks – From Wireless LANs to 4G Networks", Tata McGraw Hill, 2009. 3. Holger Karl and Andreas Willing, "Protocols and Architectures for Wireless Sensor Networks" Wiley Publications, 2005.
Web Sites/Links	1. www.uta.edu 2. www.oldcitypublishing.com

Content beyond the syllabus:

1. Motivation and applications of ad hoc networks
2. Knowing about mobile ad hoc networks
3. Applications of sensor networks

Mapping with Programme Outcomes

	PS01	PS02	PS03	PS04
CO1	S	S	S	S
CO2	S	M	M	M
CO3	M	M	M	M
CO4	M	M	L	S
CO5	S	L	L	L