VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(AUTONOMOUS)
M.Sc. , (COMPUTER SCIENCE)
(Candidates admitted from 2017-2018 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. Compute 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

Problem Understanding : 05 Marks

Program writing : 10 Marks

Debugging : 10 Marks

For Results : 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. It shall be opened to grant exemption to a candidate for valid reasons subject to conditions prescribed.

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 University rank.

e) If she fail 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 2017-18 (i.e.,) for the students who are to be admitted to the first year of the course during the academic year 2017-18 and thereafter.

Candidates who were admitted to the PG course of study before 2017-18 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 2019-20. 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
Theory

Time duration: 3 Hours Max. Marks: 75

PART- A: 5x5 = 25

Answer all the questions

One Question from each unit (either or type)

PART- B: 5x10 = 50

Answer all the questions

One Question from each unit (either or type)

The passing minimum shall be 50% out of 75 marks (38 marks)

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	: 10 Marks
For Results	: 05 Marks

EVALUATION PATTERN –Project Lab

Evaluation (External)	: 40 Marks
Viva-voce (External)	: 20 Marks

M.Sc. – COMPUTER SCIENCE

COURSE PATTERN AND SCHEME OF EXAMINATIONS UNDER CBCS

Candidates admitted from the year 2017-2018 (Onwards)

Sem	Course Code	Courses	Credits	Hours	Marks		
					I.A. Marks	E.E. Marks	Total Marks
I	17P1CSC01	Core Course-I - Computer Organization and Architecture	4	4	25	75	100
	17P1CSC02	Core Course-II -Design and Analysis of Algorithms	4	4	25	75	100
	17P1CSC03	Core Course-III –Web Technologies	4	4	25	75	100
	17P1CSC04	Core Course-IV- Advanced Database Management Systems	4	4	25	75	100
	17P1CSE__	Elective Course- I	4	4	25	75	100
	17P1CSP01	Core Course-II Design and Analysis of Algorithms Lab	2	4	40	60	100
	17P1CSP02	Core Course-III- Web Technlogies Lab	2	4	40	60	100
		Library		1			
		Net Lab		1			
	TOTAL		**24**	**30**	**205**	**495**	**700**
II	17P2CSC05	Core Course-V –Advanced Concepts in Operating System	4	4	25	75	100
	17P2CSC06	Core Course-VI – Java Server Programming	4	4	25	75	100
	17P2CSC07	Core Course-VII – Dot Net Programming	4	4	25	75	100
	17P2CSC08	Core Course-VIII – Mobile Computing	4	4	25	75	100
	17P2CSE__	Elective Course -II	4	4	25	75	100
	17P2CSP02	Core Course-VI - Java Programming Lab	2	4	40	60	100
	17P2CSPR01	Core Course-VII-Mini Project	2	4	40	60	100
		Library		1			
		Net Lab		1			
	TOTAL		**24**	**30**	**205**	**495**	**700**
III	17P3CSC09	Core Course-IX – Soft Computing	4	4	25	75	100
	17P3CSC10	Core Course-X - Open Source Technologies	4	4	25	75	100
	17P3CSC11	Core Course-XI – Data Mining and Warehousing	4	4	25	75	100
	17P3CSE__	Elective Course III	4	4	25	75	100
		EDC- I	4	4	25	75	100
	17P3CSP03	Core Course-X - Open Source Technologies Lab	2	4	40	60	100
	17P3CSP04	Core Course-XI - Data Mining Lab	2	4	40	60	100
	17P3HR01	Human Rights	1	-	25	75	100
		Library		1			
		Net Lab		1			
		TOTAL	**24**	**30**	**230**	**570**	**800**

IV	17P4CSC12	Core Course-XV – Distributed Computing	4	5	25	75	100
	17P4CSC13	Core Course-XVI – Digital Image Processing	4	5	25	75	100
	17P4CSE__	Elective Course -IV	4	5	25	75	100
	17P4CSPR02	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**	**1725**	**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 first and second Semesters as per the regulations passed in the academic year 2017-2018.

ELECTIVE COURSES

Elective-I:

Course Code	Course Name
17P1CSE01	Theory of Computing
17P1CSE02	Software Project Management and Quality Assurance
17P1CSE03	Client Server Technology

Elective-II:

Course Code	Course Name
17P2CSE04	Network Security
17P2CSE05	Wireless Application Protocol
17P2CSE06	Multimedia and Virtual Reality

Elective-III:

Course Code	Course Name
17P3CSE07	Compiler Design
17P3CSE08	Object Oriented Analysis and Design
17P3CSE09	Embedded Systems

Elective-IV:

Course Code	Course Name
17P4CSE10	Big Data Analytics
17P4CSE11	Artificial Neural Networks
17P4CSE12	Cloud Computing

EDC(Offered for other Department Students)

Course Code	Course Name
17P3CSED01	Introduction to Information Technology
17P3CSED02	Internet Techniques and Web Technology
17P3CSED03	Latex

Subject Title	**COMPUTER ORGANIZATION AND ARCHITECTURE**	**Semester**	**I**
Subject Code	**17P1CSC01**	**Specialization**	**NA**
Type	**Core: Theory**	**L:T:P:C**	**4:0:0:4**

Objectives

- **To learn about Computer function, Mapping function, DRAM & SRAM, Multithreading and Chip Multiprocessors**

Unit	Syllabus Contents	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.	**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	**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-.	**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 Signals.	**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.	**12**
	Relevant Case Analysis for each units for practical hours	

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 17)
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

Subject Title	**DESIGN AND ANALYSIS OF ALGORITHMS**	**Semester**	**I**
Subject Code	**17P1CSC02**	**Specialization**	**NA**
Type	**Core: Theory**	**L:T:P:C**	**4:0:0:4**

Objectives

- To learn about how to develop the algorithms and solving the problems.

Unit	Syllabus Contents	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.	**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	**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.	**12**
IV	Optimal binary - search tree – Knapsack problem – Backtracking – N-Queens problem – Hamiltonian circuit problem – subset sum problem.	**12**
V	Branch and bound: Assignment problem – Knapsack problem – Traveling salesman problem.	**12**

Learning Resources	
Text Books	1. Anany Levitin, "Introduction to the Design and Analysis of Algorithm", Pearson Education Asia, 2006.(Unit -I: chapter 1,2 Unit -II : chapter 4,9 Unit III: chapter 6,8 Unit -IV: chapter 8,11 Unit -V: chapter 11)
Reference Books	1. T.H.Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, "Introduction to Algorithms", PHI Pvt. Ltd., 2009, Third Edition. 2. Sara Baase and Allen Van Gelder, "Computer Algorithms – Introduction to Design and Analysis", Pearson Education Asia, 2003. 3. A.V.Aho, J.E. Hopcroft and J.D.Ullman, "The Design and Analysis of Computer Algorithms", Pearson Education Asia, 2003.
Website/Links	1.https://vtucsenotes.wordpress.com/fourth-sem/design-and-analysis-of-algorithms 2. https://www.smartzworld.com/notes/design-analysis-algorithm-notes-pdf-data

Subject Title	WEB TECHNOLOGIES	Semester	I
Subject Code	17P1CSC03	Specialization	NA
Type	Core: Theory	L:T:P:C	4:0:0:4

Objectives

- **To learn about Internet basics, browsers and security, client server programming concepts, server side programming techniques and various sources of web services**

Unit	Syllabus Contents	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.	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.	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.	12
IV	Server-Side Programming: Java Servlets: Servlet Architecture Overview – Servlet Generating Dynamic contents – Servlet Life Cycle – Parameter Data – Sessions – Cookies	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.	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

Subject Title	**ADVANCED DATABASE MANAGEMENT SYSTEMS**	**Semester**	**I**
Subject Code	**17P1CSC04**	**Specialization**	**NA**
Type	**Core: Theory**	**L:T:P:C**	**4:0:0:4**

Objectives

- **To learn about Extended Entity Relationship Model, Distributed Database Management Systems**
- **To develop the Object Oriented Databases, Server Side Extensions, Geographic Information Systems**

Unit	Syllabus Contents	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.	**12**
II	Advanced Database concepts: Transaction Management and Concurrency Control - Database Performance Tuning and Query optimization - Distributed Database Management Systems.	**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.	**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.	**12**
V	Mobile Database – Geographic Information Systems – Genome Data Management – Multimedia Database – Spatial Databases**.**	**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

2017-2018 Onwards	DESIGN AND ANALYSIS OF ALGORITHM LAB	M.Sc. Computer Science
I Semester	17P1CSP01	Core: Practical – I
Hours: 60	Practical -I	Credit : 2

Objectives : To provide fundamental concepts of sorting , merging, backtracking and branch and bound algorithms using C++ programming .

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
4. Construct a Minimum Spanning Tree using Greedy method
5. Perform Warshall's Algorithm using Dynamic Programming
6. Solve Dijkstra's Algorithm using Greedy Technique
7. Solve Subset Sum problem using Backtracking
8. Implement the 8-Queens Problem using Backtracking
9. Implement Knapsack Problem using Backtracking
10. Find the solution of Traveling Salesperson Problem using Branch and Bound technique

2017-2018 Onwards	WEB TECHNOLOGIES LAB	M.Sc. Computer Science
I Semester	17P1CSP02	Core: Practical – II
Hours: 60	Practical -II	Credit : 2

Objective : To provide fundamental concept of Internet, JavaScript, XML, JSP, ASP with a view to Developing professional software development skills

1. Create a HTML pages with frames, links, tables and other tags.
2. Applying styles to an HTML page using CSS.
3. Client side programming

    a) Java script for Displaying and comparing date.

    b) Form validation

4. Create an Online applications using JSP.
5. Write a Servlet program using HTTP Servlet.
6. Create an Online application with data access.
7. Write a JSP Program for user authentication.
8. Write a XML program and DTD for a document.
9. Parsing an XML document using DOM and SAX parsers.
10. Create a web application in the Open Source Environment – PHP.

Subject Title	ADVANCED CONCEPTS IN OPERATING SYSTEMS	Semester	II
Subject Code	17P2CSC05	Specialization	NA
Type	Core: Theory	L:T:P:C	4:0:0:4

Objectives

- **To learn the fundamentals of Operating Systems**
- **To gain knowledge on Distributed operating system concepts that includes architecture, Algorithms for Implementing DSM**
- **To know the components and management aspects of Real time, Mobile operating Systems**

Unit	Syllabus Contents	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**.**	**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.	**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.	**12**
IV	Linux Operating systems: Introduction – History of UNIX and Linux – System Features – Software Features – Differences between Linux and Other Operating System – hardware requirements - sources of Linux Information. Linux Startup and Setup: User accounts – Accessing the Linux system – Unix Commands	**12**
V	Linux File Structure: Linux file types – File structures – managing Files - Managing Directories – File and Directory operation. File Management Operation: File and Directory permissions – Jobs – System Administration – Shells in Linux. Shell operations: Command Line – Standard Input/output-Redirection – Pipes – Shell Scripts – Shell Variables - Arithmetic Shell Operations – Control Structures.	**12**

Learning Resources	
Text Books	1. Advanced Concepts in Operating Systems", Mukesh Singhal, Niranjan G.Shivarathr, 2011. 2. Richard Petersen, The Complete Reference – Linux , TMH sixth edition 2011.
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

Subject Title	JAVA SERVER PROGRAMMING	Semester	II
Subject Code	17P2CSC06	Specialization	NA
Type	Core: Theory	L:T:P:C	4:0:0:4

Objectives

- **To Create network based applications, Java Database Connectivity, Implementing Server side programming**
- **To Develop EJB Architecture, Hibernate Query Language**

Unit	Syllabus Contents	Number of Sessions
I	AWT: Using AWT Controls, Layout Managers and Menus. SWING: A Tour of SWING – Event Handling-Java Database Connectivity (JDBC).	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.	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.	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.	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.	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) 2. Java server pages in easy steps –Mike Mcgrath-2002-dreamtech-New Delhi.(Unit-II Chapters 1, 2, 3&5) 3. Herbert Schildt, "The complete Reference-Java2", fifth Edition 2002 TMH (Unit-I :Chapters 20, 22 & 26, Unit –III: Chapter 25) 4. Java server programming (J2ee 1.4)-2007 platinum Edition. Kogent solution Inc.(Unit-1V :Chapters 9& 18, Unit-V : Chapters 20& 21)
Reference 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-

Subject Title	DOT NET PROGRAMMING	Semester	II
Subject Code	17P1CSC07	Specialization	NA
Type	Core: Theory	L:T:P:C	4:0:0:4

Objectives

- **The ability to effectively use visual studio .NET**
- **An understanding of the goals and objectives of the .NET Framework. .NET is a revolutionary concept on how software should be developed and deployed**
- **A working knowledge of the C# programming language**

Unit	Syllabus Contents	Number of Sessions
I	Introduction the .NET Framework: .NET Framework – C#, VB.NET and the .NET Languages – CLR- .NET Class library. Learning the C# languages: C# language Basics- Variables- Data types – Variable Operations -Object based Manipulation - Objects and Namespaces.	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.	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.	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.	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	12

Learning Resources	
Text Books	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. https://www.amazon.com/Programming-Microsoft®-NET 2. https://docs.plm.automation.siemens.com/tdoc/nx/10/nx_api 3. www.amazon.in/Programming-Microsoft-Visual-Reference-Pro

Subject Title	MOBILE COMPUTING	Semester	II
Subject Code	17P1CSC08	Specialization	NA
Type	Core: Theory	L:T:P:C	4:0:0:4

Objectives

- **To demonstrate their understanding of the field of mobile computing**
- **To learn about mobile IP, and mobile TCP and understanding of ad hoc networks and wireless sensor networks**

Unit	Syllabus Contents	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.	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.	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.	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.	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.	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

Subject Title	**JAVA SERVER PROGRAMMING LAB**	**Semester**	**II**
Subject Code	**17P2CSP03**	**Specialization**	**NA**
Type	**Practical – III**	**L:T:P:C**	**4:0:0:2**

Objective: To develop the online program using JAVA.

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
11. To develop Web Application using Struts
12. To create Hibernate program

Subject Title	Mini Project	Semester	II
Subject Code	17P2CSPR01	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)

Subject Title	SOFT COMPUTING	Semester	III
Subject Code	17P3CSC09	Specialization	NA
Type	Core	L:T:P:C	4:0:0:4

Objectives

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

Unit	Syllabus Contents	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.	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.	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.	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**.**	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.	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**

Subject Title	OPEN SOURCE TECHNOLOGIES	Semester	III
Subject Code	17P3CSC10	Specialization	NA
Type	Core	L:T:P:C	4:0:0:4

Objectives

- **To enable the students to learn the concepts of XML, SOAP basics, PHP and MYSQL**

Unit	Syllabus Contents	Number of Sessions
I	Introduction: What is XML? – Origin Of the XML Standards - Where XML Can Be Used, And What U Can Use it For- Well-Formed XML: Parsing XML – Attributes - Comments –Empty Elements - XML Declaration - Processing Instructions – Illegal PCDATA Characters - Errors in XML- Validation: Document Type Definitions.	12
II	Programming: The XML Document Object Model (DOM) - Purpose of the XML DOM – The Document Object Model at the W3C - Two Ways to view DOM Nodes - Tools to Run the Examples - The Node Object - The Document Interface. Simple API for XML (SAX): What is SAX and Why Was It Invented? - Receiving SAX Events - Good SAX and Bad SAX- SOAP and WSDL.	12
III	Introduction to PHP - Programming with PHP- Introduction to MySQL – Introduction to SQL.	12
IV	Advance SQL and MySQL - Error Handling and Debugging – Using PHP with MySQL.	12
V	Cookies and Sessions – Security Methods - Perl-Compatible Regular Expression.	12
	Relevant Case Analysis for each units for practical hours	

Learning Resources

Text Books	1. David Hunter, Jeff Rafter, Joe Fawcett, Eric Vander Vlist ,Danny Ayers, John Duckett, Andrew Watt, Linda McKinnon "Beginning XML 4th Edition", -Wiley India Pvt. Limited -2008. (Unit I- Chapters 1,2,4. Unit II – Chapter 11, 12, 15). 2.Lary Ullman , "PHP6 AND MySQL5 For Dynamic Web Sites" -, Pearson Education – 2012. Unit III - Chapter 1, 2, 4. Unit IV- Chapters 6,7,8. Unit V, Chapters 11,12,13.
Reference Books	1.Chris Bates "Web Programming, Building Internet Applications", 2nd Edition, WILEY Dream tech. 2. Michael j. "Young Step by Step XML?" PHI, New Delhi, 2014.
Website/Links	1. en.wikipedia.org/wiki/Open_source 2. www.opensourcetechnologies.com 3. quintagroup.com/cms/open-source 4. opensource.org/osd-annotated 5. en.wikipedia.org/wiki/Open_source 6. www.onenewspage.com › Technology

Subject Title	DATA MINING AND WAREHOUSING	Semester	IV
Subject Code	17P4CSC11	Specialization	NA
Type	Core	L:T:P:C	4:0:0:4

Objectives

- **To introduce the concept of data mining with in detail coverage of basic tasks, metrics, issues, and implication. Core topics like classification, clustering and association rules are exhaustively are included**
- **To introduce the concept of data warehousing with special emphasis on architecture and design**

Unit	Syllabus Contents	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.	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.	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.	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.	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.	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. Soman K. P, Shyam Diwakar, V. Ajay, Data Mining, Printice Hall, 2014. 2. Arun K.Pujari, "Data Mining Techniques", Universities Press (India) Limited, 2014. 3. Pang-NingTan,Michael Steinbach,Vipin Kumar, Introduction to Data Mining, Pearson, 2014.
WebSite / 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

Subject Title	OPEN SOURCE TECHNOLOGIES LAB	Semester	III
Subject Code	17P3CSP04	Specialization	NA
Type	Core Practical	L:T:P:C	4:0:0:2

Objectives

- **To develop the program in XML-DOM and PHP & MySQL through open source technology**

I. Develop the following online Programs using XML.

1. To prepare CD Catalogs data as .xml file and view that data through xmlDoc object.
2. Write a program for xml validations.
3. Develop a book store data as .xml file and view that data through XML-DOM (loadXMLDoc() or loadXMLString())functions.
4. Write a simple program using SAX Events.

II. Develop the following online applications using PHP & MySQL.

1. Students Feedbacks System.
2. Job Registrations.
3. Library Management System.
4. Banking Transaction System.
5. Shopping Application.
6. Getting Web Data using Cookies Object.
7. Webpage Kit Counters using Session.
8. Airline Reservation System.

Subject Title	DATA MINING LAB	Semester	III
Subject Code	17P3CSP05	Specialization	NA
Type	Core Practical	L:T:P:C	0:0:6:2

Objectives

- **To develop the program in XML-DOM and PHP & MySQL through open source technology**

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.

Subject Title	DISTRIBUTED COMPUTING	Semester	IV
Subject Code	17P4CSC12	Specialization	NA
Type	Core	L:T:P:C	4:0:0:4

Objectives

- **To study software components of distributed computing systems**
- **The communication and interconnection architecture of multiple computer systems is introduced**
- **The design issues of distributed computing systems are discussed**
- **To emphasizes developing applications on various distributed computing platforms or environments**

Unit	Syllabus Contents	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.	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.	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.	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.	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.	12

Learning Resources	
Text Books	1. Andrew S.Tanenbaum, Maarten Van Steen, "Distributed Systems" Principles and Paradigms. Second Edition, PHI Publications, New Delhi 2008. Unit-I (Chapters -1,2,&3) , Unit-II (Chapters- 4 & 5), Unit-III (Chapters-6 & 7), Unit-IV (Chapters-8 & 9), Unit-V (Chapter-(10, 11 &12)
Reference Books	1. Birman, Kenneth P, "Reliable Distributed Systems - Technologies, Web Services, and Applications" , Springer Publications, 2011 Edition. 2. G.coulouris, Jean Dollimore & Tim Kindberg,Distributed Systems: Concepts and Design (4th Edition) , Addison Wesley Publications, 2011 Edition.
Website / Links	1. www.nptel.ac.in/courses/106106107/ 2. freevideolectures.com Computer Science UC Berkeley 3. www.ict.kth.se/courses/ID2203/video_lectures.html 4. cslecturevideos.blogspot.com/2010/10/distributed-systems.html

Subject Title	DIGITAL IMAGE PROCESSING	Semester	IV
Subject Code	17P4CSE13	Specialization	NA
Type	Elective	L:T:P:C	4:0:0:4

Objectives

- **Develop an overview of the field of image processing**
- **Understand the Enhancement using Arithmetic/Logic Operations**
- **To learn about image processing JPEG and MPEG Image Compression**

Unit	Syllabus Contents	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.	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.	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- Pseudocolor 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.	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.	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.	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, 2007. 2. Chanda & Majumdar, "Digital Image Processing and Analysis", Prentice Hall 3rd Edition, 2011.
Website / Links	1. www.comp.dit.ie/bmacnamee/.../dip/.../ImageProcessing1-Introduction.p 2. www.iitk.ac.in/eclub/summercamp/Courses/Ipro/Lecture1.ppt 3. www.utsa.edu/lrsg/Teaching/GEO5053.../L5_image%20processing.ppt 4. freevideolectures.com/Course/.../Digital-Image-Processing-IIT-Kharagpu 5. www.satishkashyap.com/2013/07/video-lectures-on-digital-image.html

Subject Title	THEORY OF COMPUTATION	Semester	I
Subject Code	17P1CSE01	Specialization	NA
Type	Elective-I : Theory	L:T:P:C	4:0:0:4

Objectives

Learning about automata, grammar, language, and their relationships. Further, gives an understanding of the power of Turing machine, and the decidable nature of a problem. Also, gives the idea on some new trends and applications.

Unit	Syllabus Contents	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.	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.	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.	12
IV	UNDECIDABILITY 8 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.	12
V	RECENT TRENDS & APPLICATIONS 9 Matrix grammar – Programmed grammar – Random context grammar – Regular Control grammar – Lindenmayer systems – A glance on DNA computing and Membrane computing.	12

Learning Resources	
Text 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.

Subject Title	**SOFTWARE PROJECT MANAGEMENT AND QUALITY ASSURANCE**	**Semester**	**I**
Subject Code	**17P1CSE02**	**Specialization**	**NA**
Type	**Elective-I : Theory**	**L:T:P:C**	**4:0:0:4**

Objectives

To Understand Product Life Cycle, Project Life Cycle, Software Configuration, Definitions and Terminology, Project Initiation, Quality Management, Project Management

Unit	Syllabus Contents	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.	**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.	**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.	**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.	**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.	**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_management 2. https://en.wikipedia.org/wiki/Software_quality_control

Subject Title	**CLIENT / SERVER TECHNOLOGY**	**Semester**	**I**
Subject Code	**17P1CSE03**	**Specialization**	**NA**
Type	**Elective-I : Theory**	**L:T:P:C**	**4:0:0:4**

Objectives

To understand Hardware Trends, Client Component, Server Hardware, Overview of Networking, Development and Deployment, Network Management Environment-Network, Development Methodology

Unit	Syllabus Contents	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.	**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.	**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.	**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.	**12**
V	Development and Deployment-Development Methodology-Convert Existing Screen Interfaces-Application Development Tools-Managing the Production Environment-Production Requirements-Future Trends.	**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 17,18 &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

Subject Title	NETWORK SECURITY	Semester	II
Subject Code	17P2CSE04	Specialization	NA
Type	Elective –II : Theory	L:T:P:C	4:0:0:4

Objectives

- **To study technologies and research problems in the Internet, wireless ad hoc and sensor networks, with concentration in security related issues**

Unit	Syllabus Contents	Number of Sessions
I	Introduction: Security Trends-The OSI Security Architecture - Security Attacks - Security Services- Security Mechanisms- Model for Internetwork Security - Internet Standards and the Internet Society. 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.	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	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 - Key Management.	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.	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.	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.

Subject Title	WIRELESS APPLICATION PROTOCOL	Semester	II
Subject Code	17P2CSE05	Specialization	NA
Type	Elective – II : Theory	L:T:P:C	4:0:0:4

Objectives

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

Unit	Syllabus Contents	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.	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.	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.	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.	12
V	Wireless Telephony Applications: Overview of the WTA Architecture – The WTA Client Framework – Design Considerations.	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

Subject Title	MULTIMEDIA AND VIRTUAL REALITY	Semester	III
Subject Code	17P3CSE06	Specialization	NA
Type	Elective-II : Theory	L:T:P:C	4:0:0:4

Objectives

- **To learn about multimedia skills, 3D modeling and animation tools , VR hardware & software**

Unit	Syllabus Contents	Number of Sessions
I	Introduction – what is multimedia – making multimedia – multimedia skills – Text.	12
II	Sound : Digital Audio-MIDI-Music CDs. Images: Making Still Images-Color-Image File Formats. Animation-Video.	12
III	Hardware: Macintosh versus Windows-Networking-Connections-Memory and Storage devices-Input devices- Output Hardware- Communication Devices.	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.	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.	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. www.richardbrice.net/chap01.htm

Subject Title	COMPILER DESIGN	Semester	III
Subject Code	17P3CSE07	Specialization	NA
Type	Elective-III : Theory	L:T:P:C	4:0:0:4

Objectives

- **To understand, design and implement a lexical analyzer, design and implement a parser, design code generation schemes, optimization of codes and runtime environment**

Unit	Syllabus Contents	Number of Sessions
I	Compilers – Analysis of the source program – Phases of a compiler – Cousins of the Compiler – Grouping of Phases – Compiler construction tools – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens	12
II	Role of the parser, Writing Grammars – Context – Free Grammars – Top Down parsing – Recursive Descent parsing – Predictive parsing – bottom –up parsing – shift Reduce Parsing – Operator Precedent Parsing – LR Parsers – SLR Parser – Canonical LR Parser – LALR Parser	12
III	Intermediate Languages – Declarations – Assignment Statements – Boolean Expressions – Case Statements – Back patching – procedure calls	12
IV	Issues in the design of code generator – The target machine – Runtime Storage management – Basic Blocks and Flow Graphs – Next use Information – A simple Code generator – DAG representation of Basic Blocks – Peephole optimizaion	12
V	Introduction – Principal Sources of Optimization – Optimization of basic Blocks – Introduction to Global Data Flow Analysis – Runtime Environments – Source Language issues – Storage Organization – Storage Allocation strategies – Access to non-local names – Parameter Passing.	12

Learning Resources

Text Books	1. Alfred Aho, Ravi Sethi, Jeffy D.Ullman, "Compilers – Principles, Techniques and Tools", Pearson Education Asia, 2011.
Reference Books	1. .Henk Alblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2013. 2. Kenneth C. Louden, 'Compiler Construction : Principles and Practices ', Thompson Learning, 2011.
Website/Links	*1.* www.tutorialspoint.com/compiler_design/

Subject Title	OBJECT ORIENTED ANALYSIS AND DESIGN	Semester	II
Subject Code	17P2CSE08	Specialization	NA
Type	Elective-III : Theory	L:T:P:C	4:0:0:4

Objectives

- **To learn the concept of the Evolution of the Object Model**
- **To get acquainted with UML Diagrams**
- **To understand Interaction Overview Diagrams**

Unit	Syllabus Contents	
I	The Object Model: The Evolution of the Object Model – Elements of the Object Model – Applying the Object Model. Classes and Objects: The Nature of the Object – Relationships among Objects-The Nature of a Class – Relationships among Classes – The Interplay of Classes and Objects – On Building Quality Classes and Objects.	**12**
II	Classification: The Importance of Proper Classification – Identifying Classes and Objects – Key Abstractions and Mechanisms. The Notation: Elements of the Notation – Class Diagrams – State Transitions Diagrams – Object Diagrams – Interaction Diagrams – Module Diagrams – Process Diagrams – Applying the Notation.	**12**
III	The Process: First Principal – The Micro Development Process - The Macro Development Process – Pragmatics: Managements and Planning – Staffing – Release Managements – Reuse – Quality Assurance and Metrics – Documentation – Tools – Special Topics – The Benefits and Risks of Objects – Oriented Developments.	**12**
IV	UML: Introduction- Development Process- Class Diagrams: The Essentials-Sequence Diagrams. Class Diagrams*:* Advanced Concepts.	**12**
V	Object Diagrams-Package Diagrams – Deployment diagrams-Use Cases-State Machine Diagrams – Activity Diagrams-Communication Diagrams-Composite structures-Component Diagrams-Collaborations- Interaction Overview Diagrams- Timing Diagrams.	**12**

Learning Resources	
Text Books	1. Grady Booch, " Object-Oriented Analysis and Design", Pearson Education, 2nd Edition, Third Impression 2008. (Unit-I:Chapter-2&3 Unit-II : Chapter-4 & 5, Unit-III:Chapter-6 &7) 2. Martin Fowler & Co ," UML Distilled ",", Pearson Education, 3rd Ed.-2010. Unit-IV:Chapter-1,2,3,4 & 5, Unit-V:Chapter-6 to 17)
Reference Books	1. Object Oriented Modeling and Design By James Rumabaugh , Michael Blaha, Prentice Hall - 2006. 2. Ali Brahmi , "Object Oriented System Development " TMH Intl Edition -2007.
Website / Links	1. https://en.wikipedia.org/wiki/Object-oriented_analysis_and_design 2. https://www.umsl.edu/~sauterv/analysis

Subject Title	EMBEDDED SYSTEMS	Semester	II
Subject Code	17P2CSE09	Specialization	NA
Type	Elective-III : Theory	L:T:P:C	4:0:0:4

Objectives

To Understand Embedded Systems, Processor and memory organization, Software engineering practices, RTOS, EDLC

Unit	Syllabus Contents	Number of Sessions
I	Introduction to Embedded Systems-Categories of embedded Systems-specialties of embedded systems- requirements of embedded systems – challenges and issues in embedded software development – recent trends in embedded systems-Architecture of embedded systems: Hardware architecture – software architecture-application software – Communication software – Embedded systems on a Chip (SoC) and the use of VLSI designed circuits.	12
II	Processor and memory organization-Devices and buses for Device Network Device drivers and Interrupt servicing mechanism.-program modeling concepts in single and multiprocessor systems software-development process.	12
III	Software Engineering Practices in the Embedded software development process- Inter-process communication and synchronization of process, tasks and threads- Hardware-software co-design in an embedded system.	12
IV	Hardware software co-design and program modeling-Embedded hardware design and development-embedded firmware design and development-Real-time operating system (RTOS) based embedded system design-	12
V	Introduction to embedded system design with vx works and MicroC/OS-II RTOS- Integration and Testing of embedded hardware and firmware-embedded system development environment-embedded product development life cycle(EDLC)	12

Learning Resources	
Text Books	1. Rajkamal, Embedded Systems Architecture, Programming and Design, TATA McGraw- Hill, Twelfth Reprint 2007. (Unit- I: Chapter 1, Unit – II: Chapter 2,3,4 &6, Unit- III: Chapter 7,8 &12) 2. Introduction to Embedded systems – SHIBU K V TATA McGraw-Hill 2009(Unit – IV: Chapter - 8,9&10, Unit-V: Chapter 11,12,13 & 15)
Reference Books	1. Embedded system design, ARNOLD S.BERGER ,south Asian edition – 2005 2. Embedded system design ,Frank Vahid/Tony givargis-reprint-2009
Website / Links	1. https://en.wikipedia.org/wiki/Embedded_system 2. https://en.wikibooks.org/wiki/Embedded_Systems/Atmel_AVR

Subject Title	BIGDATA ANALYTICS	Semester	IV
Subject Code	17P4CSE10	Specialization	NA
Type	Elective-IV : Theory	L:T:P:C	4:0:0:4

Objectives

- **Our goal is to learn about BigData, Careers in BigData, Hadoop systems, MapReduce Techniques and Hive Services**
- **Learn about Hive, No SQL and R Programming**

Unit	Syllabus Contents	Number of Sessions
I	Overview of BigData : Definition , History, Elements of BigData, BigData Analytics, Careers in BigData - Futures of BigData - Use of BigData in Business - Technologies for BigData - Hadoop Ecosystem.	**12**
II	Map Reduced fundamentals and HBase - BigData Technology foundations - Storing data in Databaes and Data Warehouses.	**12**
III	Processing Data with MapReduce – Customizing MapReduce Execution and Implementing Map reduce Program- Testing and Debugging MapReduce Applications.	**12**
IV	Exploring Hive : Introduction – Hive services, Data Types, Functions, Hive DLL, Data Manipulation in Hive, Data Retieval Queries,Joins in Hive. Analogy Data with Pig :- NoSQL Data Mangement- Data Movement with Flume and Sqoop – Introduction to Mahout – Understanding Analytics and Big data – Aanlytical Approaches and Tools to Analyze Data.	**12**
V	Exploring R – Reading Data set and exploring data from R - Manipulating and processing Data in R -Working with functions and Packages in R- Performing Graphical Analysis in R- Integrating R and Hadoop and Understanding Hive.	**12**

Learning Resources	
Text Books	1. BIG DATA – Black Book DT Editorial Services Publisher :Dreamtech press Edition, 2016 (Unit –I : Chapters 1-4, Unit II: Chapter 5 – 7, Unit III: Chapter 8 – 10 ,Unit IV : Chapter 12,13 ,15-19, Unit V :Chapter 20 – 25.
Reference Books	1. Jimmy Lin and Chris Dyer, Data-Intensive Text Processing with MapReduce, Morgan & Claypool Publishers, 2010. 2. Pang-Ning Tan, Michael Steinbach, and Vipin Kumar, Introduction to Data Mining, Addison-Wesley April 2005. 3. Anand Rajaraman and Jeff Ullman, Mining of Massive Datasets, Cambridge Press, Jiawei Han and Micheline Kamber, Data Mining: Concepts and Techniques, The Morgan Kaufmann Series in Data Management Systems, Jim Gray, Series Editor Morgan Kaufmann Publishers, August 2000.
Website / Links	1. http://netlab.ulusofona.pt/cp/HadoopinAction.pdf [Optional] 2. http://lintool.github.com/MapReduceAlgorithms/ [Mandatory] 3. http://infolab.stanford.edu/~ullman/mmds/book.pdf [Mandatory]

Subject Title	ARTIFICIAL NEURAL NETWORKS	Semester	IV
Subject Code	17P4CSE11	Specialization	NA
Type	Elective	L:T:P:C	4:0:0:4

Objectives

- **To study basics of artificial Neural Network**
- **To study applications of ANN**
- **To study different pattern recognition task using ANN**

Unit	Syllabus Contents	Number of Sessions
I	Basics of Artificial Neural Networks: Characteristics of Neural Networks – Historical Development of Neural Network Principles – Artificial Neural Networks : Terminology – Models of Neuron – Topology – Basic Learning.	10
II	Activation and Synaptic Dynamics: Introduction – Activation Dynamic Models – Synaptic Dynamic Model – Learning Models – Learning Methods.	10
III	Functional units of ANN for Pattern Recognition tasks: Pattern Recognition Problem – Basic Functional Units – Pattern Recognition Tasks by the Functional Units – Feed Forward Neural Networks : Introduction – Analysis of Pattern Association Networks – Analysis of Pattern Classification Networks – Analysis of Pattern Mapping Networks.	10
IV	Feedback Neural Networks: Introduction – Analysis of Linear Auto Associative FF Networks – Analysis of Pattern Storage Networks. Competitive Learning Neural Networks: Introduction – Components of a Competitive Learning Network – Analysis of Feedback Layer for Different Output Functions– Analysis of Pattern Clustering Networks – Analysis of Feed Mapping Network.	10
V	Applications of Neural Systems: Applications of Neural Algorithms and Systems character Recognition – Expert Systems Applications – Neural Network Control Applications, Spatio – Temporal Pattern Recognition – Neocognitron and other Applications.	10

Learning Resources

Text Books	1. For Units I to IV: "Artificial Neural Networks", B.Yegnanarayanan, Eastern Economy Edition – Chapter 1, 2. . 2. For Unit – V: "Introduction to Artificial Neural Systems" Jacek M. Zurada (1994) Jaico Publishing House.

Reference Books	1. "Artificial Neural Networks", Robert J.Schalkoff, Mc-Graw-Hill International Edition. 2. "Introduction to the theory of Neural Computation", - J.Hertz, A.Krogh. and R.G. Palmer, Addison – Wesley 2010. 3. "Neural Networks, Fuzzy Logic and Genetic Algorithms Synthesis and Application", S.Rajasekaran and G.A.Vijayalakshmi Pai PHI Learning Private Limited, 2011. 4. "Fundamentals of Neural Networks, Architectures, Algorithms and Applications", Laurene Fausett, Pearson Edition, 2012.
Website / Links	1. freevideolectures.com › Electronics › IIT Kharagpur 2. www.learnerstv.com/video/Free-video-Lecture-7631-Engineering.htm 3. meta-guide.com/videography/100-best-neural-network-videos/ 4. www.nptelvideos.in/2012/12/neural-networks-and-applications.htm

Subject Title	CLOUD COMPUTING	Semester	IV
Subject Code	17P4CSE12	Specialization	NA
Type	Elective-IV : Theory	L:T:P:C	4:0:0:4

Objectives

- **This paper covers a series of current cloud computing technologies, including technologies for Infrastructure as a Service, Platform as a Service, Software as a Service**

Unit	Syllabus Contents	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.	12
II	Cloud Computing Technology: Cloud Hardware and Infrastructure-Clients-Security-Network-Services. Accessing the Cloud: Platforms-Web Applications-Web API's-Web Browsers.	12
III	Cloud Storage: Overview- Cloud Storage Providers. Standards: Applications-Client-Infrastructure-Service.	12
IV	Software as a Service: Overview-Driving forces-Company offerings-Industries. Software plus Services: Overview-Mobile Device Integration-Providers-Microsoft Online.	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.	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

Subject Title	**INTRODUCTION TO INFORMATION TECHNOLOGY**	**Semester**	**III**
Subject Code	**17P3CSED01**	**Specialization**	**NA**
Type	**EDC(Offered For Other Department Students)**	**L:T:P:C**	**4:0:0:4**

Objective

- **To create awareness in information technology towards the recent trends of competition and to sketch out the hidden talent of student community**

Unit	Syllabus Contents	Number of Sessions
I	Information Technology: Defining Information Technology – Information Technology in Society – The state of IT Careers. Understanding the digital domain: Emergence of the digital Age – The difference between Analog and Digital representation of information – Manipulating bits - Advantages of digital technology.	**12**
II	Fundamentals of Computer: Computer Hardware – Fundamental components of computer – Inside typical computer – Types of computer and their applications – Storage technologies. Software: What is software? – Programming Languages – Types of software – The software development Process.	**12**
III	Transmission of Information: Fundamental of communication: Electrical Signaling – Radio wave communication – Light wave communication – Attenuation – Bandwidth – Multiplexing – Copper Transmission Media. Wireless Communications: Applications of Radio frequency – Satellite systems.	**12**
IV	Introduction to computer Networking: Local Area Network: Defining LANs – LAN Design characteristics – The Evaluation of LAN Types. Wide Area Networks: WAN background – WAN Alternatives – WAN access alternatives.	**12**
V	Communication Protocols: The need for Protocols – Protocol suites. Internet Architecture: Internet Architectural components – Internet application. Network Security: Understanding the threads – Network security strategies.	**12**

Learning Resources

Text Books	1. Introduction to Information Technology Pelin Aksoy, Laura DeNardis, Cengage Learning India Private Limited, First Indian Reprint 2008.
Reference Books	1. Introduction to Information Technology – V.Rajaraman – PHI Learning Private Limited – New Delhi 2009. 2. Information Technology and Stragetic Management – Dr.S.Skhandare & Dr. A.M. Sheikh – S.Chand publishing first edition 2010.

Subject Title	INTERNET TECHNIQUES & WEB TECHNOLOGY	Semester	III
Subject Code	(17P3CSED02)	Specialization	NA
Type	EDC(Offered For Other Department Students)	L:T:P:C	4:0:0:4

Objectives

- To understand basics of Internet and E-mailing
- To know the basic principles of web designing

Unit	Syllabus Contents	Number of Sessions
I	Internet: Introduction – overview of Internet – what's special about Internet – Internet connection concept – Internet protocols – Internet addressing. WWW: Introduction – Overview of WWW - Web pages – Web browser – Web browsing – searching the web - web Index - search engine - Meta search Engine – Internet chat – Internet Relay chat - chatting on web..	12
II	E-mail: Introduction e-mail concepts- e-mail security – How do you get your e-mail- creating e-mail ID – e-mail Addressing – Downloading e-mail – formatted e-mail attaching file to message – Mailing basics: Address book – signature – File attachment – setting priority – reply & format e-mail message – E-mail ethics – spamming – E-mail advantages and disadvantages – e-mail tips for effective e-mail usage.	12
III	HTML: Introduction – structure of HTML, Tags: Basic tags – formatted tags – paragraph tags – Heading tags. Creating page Template: Understanding table basics – examples of table creations.	12
IV	Graphics and colors – File format Basic – Computer color basic – graphic tool – using the <IMG> element – working with Hexadecimal color.	12
V	HTML Frames – Understanding Frames – Frames system – Targeting in frame sets - Planning Frame content – Publishing and maintaining Website.	12

Learning Resources	
Text Books	1. "Principles of Web Design" by Joel Sklar, 5th edition. 2. "Fundamentals of Information Technology", 2/e, Alexis Leon & Mathews Leon, Vikas Publishing House Pvt. Ltd., New Delhi.
Reference Books	1. "Internet Complete Reference" by Margaret Levine Young, Millennium edition, Tata McGrawhil.
Website/Links	1. https://www.codecademy.com/learn/web 2. https://www.w3schools.com/html/ 3. https://en.wikipedia.org/wiki/Website

Subject Title	LATEX	Semester	III
Subject Code	17P3CSED03	Specialization	NA
Type	EDC(Offered For Other Department Students)	L:T:P:C	4:0:0:4

Objective

- **To create awareness in programming language towards the recent trends of competition and to sketch out the hidden talent of student community**

Unit	Syllabus Contents	Number of Sessions
I	Introduction to LATEX - What is LATEX? - A Typical LATEX Input File - Characters and Control Sequences.	12
II	Producing Simple Documents using LATEX 5 2.1 Producing a LATEX Input File- Producing Ordinary Text using LATEX - Blank Spaces and Carriage Returns in the Input File - 8 2.4 Quotation Marks and Dashes - Section Headings in LATEX - Changing Fonts in Text Mode - Accents used in Text - Active Characters and Special Symbols in Text.	12
III	Producing Mathematical Formulae using LATEX Mathematics Mode - Characters in Mathematics Mode - Superscripts and Subscripts - Greek Letters - Mathematical Symbols - Changing Fonts in Mathematics Mode - Standard Functions (sin, cos etc.).	12
IV	Text Embedded in Displayed Equations - Fractions and Roots- Ellipsis (i.e., 'three dots')- Accents in Mathematics Mode - 26 Brackets and Norms Multiline Formulae in LATEX - Matrices and other arrays in LATEX - Derivatives, Limits, Sums and Integrals .	12
V	Further Features of LATEX - Producing White Space in LATEX Lists Displayed Quotations - 40 4.4 Tables -The Preamble of the LATEX Input file - Defining your own Control Sequences in LATEX.	12
	Relevant Case Analysis for each units for practical hours	

Learning Resources

Text Books	1. Getting Started with LATEX David R. Wilkins 2nd Edition Copyright c David R. Wilkins 1995.
Reference Books	1. "LATEX BEGINNERS GUIDE" by Stefan Kottwitz-Packt Publications. 2. "A Beginners Guide to Latex"-Chetan Shirore.