SEMESTER-III						
COMMON CORE - TRANSFORMS WITH MATLAB						
Code: 17PCCC31Hrs/Week: 4Hrs/Sem: 60Credits : 3						

**Objectives** 

- Comprehend the concepts of Z and Fourier Transforms
- To enable students develop their calculation skills using MATLAB.

# UNIT I

Fourier Transforms:Introduction - Fourier Integral theorem - Fourier Transforms - Alternative form of Fourier complex integral formula - Relationship between Fourier Transforms and Laplace Transforms.

(Text Book 1 - Chapter 2 : Sections 2.1 , 2.2 , 2.3 , 2.4 , 2.5) UNIT II

Properties of Fourier Transforms - Finite Fourier Transforms.

# (Text Book 1 - Chapter 2 : Sections 2.6, 2.7)

# UNIT III

Z - Transforms : Introduction - Properties of Z- Transforms - Z-Transforms of some basic functions - Inverse Z- Transforms - Use of Z-Transforms to solve finite differential equations.

(Text Book 1 -Chapter 5: Section 5.1, 5.2, 5.3, 5.4, 5.5)

# (Exercise Problems are not included)

## **UNIT IV: MATLAB**

Introduction : MATLAB Environment - Types of files - Search - Constants , Variables and Expressions - Vectors and Matrices - Polynomials - Input / Output statements-MATLAB graphics.

(Text Book 2 - Chapter 1, 2, 3, 4, 5,6) UNIT V

Control Structures - Writing Programmes and functions - Ordinary Differential Equations and Symbolic Mathematics - MATLAB Applications : Z-Transforms and Fourier Transforms.

# (Text Book 2 - Chapter 7, 8, 9, 15 ( Sections : 15.1, 15.6, 15.7, 15.8)

# **TEXT BOOKS:**

- 1. T. Veerarajan : Transforms and Partial Differential Equations (Updated Edition).
- 2. RajkumarBansal, Ashok Kumar Goel, Manoj Kumar Sharma : MATLAB and its Applications in Engineering, Pearsons Publications.

SEMESTER- II					
CORE ELECTIVE – WEB DESIGNING & MULTIMEDIA					
Code: 17PCSE21	Code: 17PCSE21Hrs / week :6Hrs / Semester: 90Credits :3				

# **Objective:**

• To study the basic and advanced concepts in Web designing and multimedia.

# **UNIT I : HTML**

Introduction – Creating, Saving, Viewing HTML documents – Applying Structure tags – Linking - Images – Formatting Text

# UNIT II:

Tables:Creatingtables,Inserting,Deleting,Updating,Formatting– Forms: Creating and processing forms - Frames:Understandingframes,Creatingframes,Enabling and Effective Frames,Creating inline Frames

# UNIT III : XML

Introduction – New kinds on the block – displaying XML – XML in the real world – Well Formed and Valid Documents – Cascading Style sheets

# **UNIT IV: MULTIMEDIA**

Definition – Where to use multimedia – Adobe Photoshop: Layering – Designing – Transporting – Filtering – Cropping - Rotating

# UNIT V:

Flash: Text Effects – Frame by frame animation - animation using guided path animation using multilayer – text/ image morphing.

# **TEXT BOOKS:**

- Mastering HTML 4, premium edition, Deborah S. Ray & Eric J. Ray, BPB Publications.
- Boumphrey, Stephen Mohr, Paul Houle, and others, 'XML Applications', Wrox Press Ltd, Sohr Publishers & Distributors Pvt Ltd.
- Photoshop CS5
- Flash CS5 in Simple Steps Edition-2011 Published by Dream Tech Press Authored byKogentLearing Solutions Inc

# **BOOKSFOR REFERENCE:**

- Adobe photoshop CS6 Bible by Lisa DanaeDayley& Brad Dayley
- Web Technology & Design. Author, C. Xavier. Publisher, New Age International,

SEMESTER-III					
ELECTIVE I - CLOUD COMPUTING					
Code: 17PCSE31Hrs/week:5Hrs/sem:75Credits: 5					

# **Objectives:**

- Comprehend the core concepts of the cloud computing.
- Apply the fundamental concepts in data centers to understand the tradeoffs in power, efficiency and cost.
- Analyze various cloud programming models and apply them to solve problems on the cloud.

# UNIT I: UNDERSTANDING CLOUD COMPUTING

Cloud computing - cloud types- the cloud cube model- deployment models-service modelscharacteristics of cloud computing-assessing the role of open standards.

# **UNIT II: CLOUD ARCHITECTURE**

The cloud computing stack – composability – infrastructure – platforms – virtual appliances – communication protocols – Connecting to the cloud: The Jolicloud net book OS – Chromium OS the browser as an operating system.

# UNIT III: DEVELOPING CLOUD SERVICES

Infrastructure as a service (IaaS) – IaaS workloads- Platform as a service (PaaS) – Software as a service (SaaS)– Identity as a service (IDaaS) – Compliance as a service(CaaS).

# UNIT IV: VIRTUALIZATION AND CLOUD APPLICATIONS

Virtualization technologies – load balancing and virtualization – advanced load balancing – the Google cloud – Google Analytics – Google translate- Google Toolkit –Google APIs-windows azure service – windows Azure App fabric.

# **UNIT V: CLOUD STORAGE**

Cloud storage – unmanaged cloud storage – managed cloud storage – creating cloud storage systems – working with Amazon storage systems: Amazon Elastic compute cloud(EC2)-Amazon simple storage system(S3) – Amazon Elastic block store(EBS)- cloud front.

# **TEXT BOOK:**

1. Barrie Sosinsky, Cloud Computing Bible, Wiley India Pvt. Ltd, 2012. New Delhi. Chapters:1,3,4,5(pgs:94-99),8(pgs:162-173),10(pgs:201-216),15(pgs:316-321),9(pgs:185-199)

# **BOOK(S) FOR REFERENCE:**

- 1. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing, Second Edition, August 2008.
- 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. Limited, July 2008.

SEMESTER II					
Core IX – Digital Image Processing					
Code: 19PCCC21	Code: 19PCCC21Hrs/Week: 5Hrs/Sem: 75Credits: 4				

# Vision

To interpret images mathematically and process them for the extraction of data using matlab

# Mission

To equip the students with the knowledge of fundamental concepts and techniques in basic digital image processing and their applications to solve real life problems.

## **Course Outcome:**

CO. No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	calculate the Fourier transforms of standard functions both from the definition and by using tables.	2	Ap
CO-2	design and implement the different transforms like Fourier transform and Z transform.	2	Cr
CO-3	write given function in terms of sine and cosine in Fourier series and also to get knowledge in Fourier Transforms.	2	Re
CO-4	solve finite difference equations using Z- transform using MATLAB	1	Ар
CO-5	review the fundamental concepts of a digital image processing system.	3	Re
CO-6	analyze images in the frequency domain using various transforms.	2	Re
CO-7	interpret Image compression, segmentation and representation standards	3,4	An
CO-8	understand image filtering for use in various applications	1	Un

SEMESTER II					
Core IX – Digital Image Processing					
Code: 19PCCC21	Code: 19PCCC21Hrs/Week: 5Hrs/Sem: 75Credits: 4				

## **Unit I- Introduction**

Introduction – steps in image processing, Image acquisition, representation, sampling and quantization, relationship between pixels. – color models – basics of color image processing.

## **Unit II - Image Enhancement**

Image enhancement in spatial domain – some basic gray level transformations – histogram processing – enhancement using arithmetic , logic operations – basics of spatial filtering and smoothing.

## **Unit III - Image Enhancement**

Image enhancement in Frequency domain – Introduction to Fourier transform: 1- D, 2 –D DFT and its inverse transform, smoothing and sharpening filters.

## **Unit IV - Image Restoration**

Image restoration: Model of degradation and restoration process – noise models – restoration in the presence of noise- periodic noise reduction. Image segmentation: Thresholding and region based segmentation.

## **Unit V - Image Compression**

Image compression: Fundamentals – models – information theory – error free compression – Lossy compression: predictive and transform coding. JPEG standard.

## **Text Book:**

1. R.C. Gonzalez, R.E.Woods, 2002, Digital Image processing, 2nd Edition, Pearson Education.

## **Books for Reference:**

- 1. T.Veerarajan : Transforms and Partial Differential Equations (Updated Edition).
- 2. Rafael C. Gonzalez, Richard E. Woods: Digital Image Processing, Pearsons Education, third edition.
- 3. RajkumarBansal, Ashok Kumar Goel, Manoj Kumar Sharma : MATLAB and its Applications in Engineering, Pearsons Publications.

SEMESTER – I				
Core II - J2EE				
Code : 19PCSC12     Hrs / Week : 5     Hrs / Sem : 75     Credits : 4				

Vision: To acquire knowledge on the usage of recent platforms in developing web applications

# Mission:

- Enhancing the students skills to design and develop interactive, client-side, serverside executable web applications.
- Able to apply the skill learnt for projects.

## **Course Outcome:**

CO. No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	identifying a high-level overview of the J2EE architecture	2	Re
CO-2	identify the services and components which comprise the J2EE specification	2	Re
CO-3	explain how J2EE technology applications are packaged	1,2	Un
CO-4	illustrate Web application development using Web Components Servlet and JSP	1,5,8	Un
CO-5	summarize the features of Servlet and frameworks used in web applications development	5	Un
CO-6	understand design applications using Straut and Hibernate and Spring	1,6	Un
CO-7	finding new applications from existing beans in Enterprise beans.	1,8	An
CO-8	summarizing the types of Enterprise beans	2	Un
CO-9	recognizing the Hibernate framework in the development of Java application.	1,5	Re

SEMESTER – I					
Core II - J2EE					
Code : 19PCSC12Hrs / Week : 5Hrs / Sem : 75Credits : 4					

## Unit I

J2EE introduction – J2EE Architecture (J2EE Tiers, Containers, Roles) –J2EE Servers and services –Services of EJB Container – J2EE Technology – Packaging – Web services – Advantages of J2EE Applications

# Unit II

Enterprise Bean introduction – Benefits of Enterprise Beans - Types of Enterprise Beans – Session Bean – Entity Bean – Message-Driven Bean – The Contents of a Enterprise Bean – The Life Cycles of Enterprise Beans.

# Unit III

Servlet - Servlet Lifecycle - Servlet API -Object model of Servlet framework - Understanding web.xml, servlet tags and directory structure of web application - GenericServlet and HttpServlet, ServletConfig & ServletContext - Handling Form data with get and post request - Initializing a servlet - Request Dispatcher, Redirecting Request - Session Management -Filters in servlet -programs in servlet to read all parameters from form, database handling program, reading cookies values. JSP - What is JSP page? Compare it with servlet - Lifecycle of JSP page - JSP syntax using Directive, Declaration , Expression , Scriplet, Comment - Using javabean and Action Tag in JSP - JSP implicit objects - Using JSP standard tag library (JSTL) - Session management - Exception handling - Custom tag - Transferring Control to Another Web Component - Using JDBC in JSP -Programs in JSP -Integrating JSP with JQuery, Bootstrap, Angular JS, JSON.

# Unit IV

Basic of Struts2 - Understanding MVC architecture - Struts2 framework - Understanding defaultstack - comparing struts with other framework - Working with Struts2 Actions - Introducing Struts 2 actions - Packaging your actions - Implementing actions Adding workflow with interceptors - Why intercept requests? - Interceptors in action - Surveying the built-in Struts 2 interceptors - Declaring interceptors - Building your own interceptor Data transfer: OGNL and type conversion - Data transfer and type conversion: common tasks of the web application domain - OGNL and Struts 2 - Built-in type converters - Customizing type conversion Validation framework - RequiredFieldValidator Class - RequiredStringValidator Class -ExpressionValidator Class - Email Validator Class - RegexFieldValidator Class -DateRangeFieldValidator Class Struts

# Unit V

Hibernate - Introduction to Hibernate - Understanding ORM (Object Relational Mapping) - Understanding Transient, Persistent and Detached Object states - Issues while writing manual JDBC code - Hibernate and JPA (Java Persistence API) - Writing persistence classes -Steps to work with Hibernate - Handling CRUD operations in Hibernate - Mapping Inheritance between classes with tables in database -HQL -One to One and One to One mapping in Hibernate- Core Spring -Springing into action -Wiring beans. -Advanced wiring. -Aspect oriented Spring - Spring in Web and Backend -Building spring web application -JDBC with spring / Hibernate with spring.

# **Text Book:**

1. Elliotte Rusty Harold, "Java Network Programming", O'Reilly publishers, 2000

# **Books for Reference:**

- 1. Ed Roman, "Mastering Enterprise Java Beans", John Wiley & Sons Inc., 1999.
- 2. Hortsmann & Cornell, "CORE JAVA 2 ADVANCED FEATURES, VOL II", Pearson Education, 2002.
- 3. Patrick Naughton, "COMPLETE REFERENCE: JAVA2", Tata McGraw-Hill, 2003.
- 4. Struts 2 in Action , Manning publication , Donald Brown, Chad Michael Davis, and Scott Stanlick Spring in Action , Craig Walls , Manning Dreamtech press
- 5. Pure JSP by James Goodwill Techmedia SAMS publication
- 6. Hibernate in Action Manning publication , Christian Bauer and Gavin King Java Servlet Programming O'Reilly Publication-Author: Jason Hunter.
- 7. Struts 2 Black Book James Holmes "Struts: The Complete Reference, " 2nd Edition 2007 McGraw Hill Professional
- 8. Patrick Peak And Nick Heudecker, Patrick Peak, Nick Heudecker Hibernate Quickly, " 2007 Dreamtech
- 9. Subrahmanyam Allamaraju and Cedric Buest , "Professional Java Server Programming (J2EE 1.3 Edition), ", Shroff Publishers & Distributors Pvt Ltd.

SEMESTER – II				
Core VI - Distributed Database Management System				
Code : 19PCSC21Hrs / Week : 4Hrs / Sem : 60Credits : 4				

**Vision :** To build the background of database systems by deepening the understanding of the theoretical and practical aspects of the database technologies, showing the need for distributed database technology to tackle deficiencies of the centralized database systems and finally introducing the concepts and techniques of distributed database including principles, architectures, design, implementation and major domain of application.

# Mission :

- Identify the introductory distributed database concepts and its structures.
- Describe terms related to distributed object database design and management.
- Produce the transaction management and query processing techniques in DDBMS.
- Relate the importance and application of emerging database technology.

CO. No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	understand what is Distributed DBMS	4	Un
CO-2	understand various architectures of DDBMS	4	Un
CO-3	apply various fragmentation techniques in a given problem	4	Ар
CO-4	understand the steps of query processing	4	Un
CO-5	finding how optimization techniques are applies to Distributed Database	4,6	An
CO-6	learn and understand various Query Optimization Algorithms	3	Un
CO-7	understand Transaction Management & Compare various approaches to concurrency control in Distributed database	6	Un
CO-8	understand various algorithms and techniques for deadlock and recovery in Distributed database	3	Un

# **Course Outcome**

SEMESTER – II				
Core VI - Distributed Database Management System				
Code : 19PCSC21 Hrs / Week : 4 Hrs / Sem : 60 Credits : 4				

# **Unit I : Introduction**

Distributed Data Processing, Distributed Database Systems, Promises of DDBSs, Complicating factors - Distributed DBMS Architecture Models- Autonomy, Distribution, Heterogeneity DDBMS Architecture – Client/Server, Peer to peer, MDBS

# Unit II: Data Distribution Alternatives:

Design Alternatives – localized data, distributed data Fragmentation – Vertical, Horizontal (primary & derived), hybrid, general guidelines, correctness rules Distribution transparency – location, fragmentation, replication - Impact of distribution on user queries.

# Unit III: Query Processing

Query Processing Problem, Layers of Query Processing Query Processing in Centralized Systems – Parsing & Translation, Optimization, Code generation, Example Query Processing in Distributed Systems – Mapping global query to local .

**Optimization of Distributed Queries:** Query Optimization, Centralized Query Optimization, Join Ordering Distributed Query Optimization Algorithms.

# Unit IV: Distributed Transaction Management & Concurrency Control

Transaction concept, ACID property, Objectives of transaction management, Types of transactions, Objectives of Distributed Concurrency Control, Concurrency Control anomalies, Methods of concurrency control, Serializability and recoverability, Distributed Serializability, Enhanced lock based and timestamp based protocols, Multiple granularity, Multi version schemes, Optimistic Concurrency Control techniques

# Unit V : Distributed Deadlock & Recovery Deadlock concept, Deadlock in Centralized systems

Deadlock in Distributed Systems – Detection, Prevention, Avoidance, Wait-Die Algorithm, Wound-Wait algorithm Recovery in DBMS - Types of Failure, Methods to control failure, Different techniques of recoverability, Write- Ahead logging Protocol, Advanced recovery techniques- Shadow Paging, Fuzzy checkpoint, ARIES, RAID levels, Two Phase and Three Phase commit protocols.

# **Text Book:**

1. Principles of Distributed Database Systems, Ozsu, Pearson Publication

# **Books for Reference:**

- 1. Rahimi & Haug, Wiley, Distributed Database Mangement Systems,
- 2. Chanda Ray, Distributed Database Systems, Pearson Publication
- 3. Sachin Deshpande, Distributed Databases, Dreamtech
- 4. A. Silberschatz, H.F. Korth and S. Sudharshan, 2006, Database System Concepts,5thEdition, Tata McGraw Hill, New Delhi.

SEMESTER- II				
Core VII – .Net Framework Programming				
Code: 19PCSC22Hrs / week :5Hrs / Sem: 75Credits :4				

# Vision:

Create and deploy database driven applications and services

# Mission:

- Learn to use controls in programming
- Learn to develop user friendly applications

# **Course Outcome:**

CO No.	Upon completion of this course, students will be able to	PSO	CL
		addressed	
CO-1	set up a programming environment for ASP.net programs	1	Ap
CO-2	creating ASP.Net applications using standard .net controls	1	Cr
CO-3	develop a data driven web application	1,4	Ap
CO-4	connecting to data sources and managing them	1,4	Ap
CO-5	maintain session and controls related information for user used	1	Ap
	in multi-user web applications		
CO-6	understand the fundamentals of developing modular	1,4	Re
	application by using object oriented methodologies		
CO-7	learn to diagnose the cause of errors and handle it	1	Ap
CO-8	create and deploy ASP.NET web applications	1,4,6,8	Cr

SEMESTER- II				
Core VII – .Net Framework Programming				
Code: 19PCSC22Hrs / week :5Hrs / Sem: 75Credits :4				

#### Unit I

Introduction to Visual Basic .NET : Window forms – working with controls – working with dialog boxes –MDI- Drag and drop operation – variables – Controlling Program flow.-Procedures in VB.Net-Accessing a Database.

## Unit II

Introducing ASP.Net – Getting started with ASP.Net applications: Web forms – creating ASP.Net Webform applications – Using ASP.Net Webforms for server controls : Beginning with server controls – Taking a closer look at web controls – Illustrating Basic web controls – Working with Validation Controls : The compare Validator – The Range Validator – Regular Expression Validator – Custom validator –Validation Summery control – Multiple validation control.

#### **Unit III**

Developing ASP.Net Server controls : Developing ASP.Net server controls – Creating and using Web User Control – Creating ASP.Net Pages to web user control – Using Rich Web controls: Calendar web server control.

#### Unit IV

Debugging ASP.Net Web Applications: Tracing ASP.Net Applications – Handling Errors in ASP.Net applications – Using ADO.Net with ASP.Net: ADO.Net – ADO.Net Object model .

#### Unit V

Welcome to C# - Working with variables, Operators and Expressions – Writing methods applying scope – using decision statements-Using Iteration Statements – Managing Errors and Exceptions – Creating and Managing Classes – Using Arrays and Collections

## **Text Book:**

1. Mridula Parihar, Yesh Sinhal and Nitin Pandey, "Visual Studio .Net Programming", PHI, 2002.

#### **Books for Reference:**

- 1. John Sharp, Jon Jagger, "Microsoft Visual C# .Net Step by Step", PHI, 2005.
- 2. Nitin Pandey, "Microsoft Asp.NET", PHI, 2002.
- 3. "ASP.NET Made Simple" BPB Publictaions, First Edition, 2001.
- 4. Kiric Allen Evans, Ashwin Kamanna, Joel and Muller, "XML and ASP.NET", Pearson Education, First Indian Reprint, 2002.
- 5. Andrew Trolsen, "C# and the .NET Platform", APress, Second Print, 2006.

SEMESTER- II				
Core VIII – Data Mining & R Programming				
Code: 19PCSC23Hrs / week :4Hrs / Sem: 60Credits :4				

# Vision:

Extract patterns of usable data using appropriate algorithms

# Mission:

- To study the basic and advanced concepts in Data Mining Techniques.
- To understand the various algorithms involved in data mining and its applications.

# **Course Outcome:**

CO No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	display a comprehensive understanding of different data mining tasks and the algorithms most appropriate for addressing them.	1	Un
CO-2	know Strengths & Limitations of Data Mining Methods	1	Un
CO-3	display interesting patterns from large data, to extract and analyse, make predicitons and solve problems	1,4	An
CO-4	evaluate models/algorithms with respect to their accuracy.	6	Ev
CO-5	demonstrate capacity to perform a self directed piece of practical work that requires the application of data mining techniques.	1	Ev
CO-6	develop hypotheses based on the analysis of the results obtained and test them.	1	Ev
CO-7	learn to Set Up Data for Experiments	1,4	Ap
CO-8	conceptualize a data mining solution to a practical problem.	1,4, 8	Ap

SEMESTER- II				
Core VIII – Data Mining & R Programming				
Code: 19PCSC23Hrs / week :4Hrs / Sem: 60Credits :4				

## Unit I

Introduction: Basic Data Mining Tasks- Data Mining Versus Knowledge Discovery in Databases. Data Mining Techniques: Introduction-A Statistical Perspective on Data Mining-Similarity Measures- Decision Trees-Neural Networks-Genetic Algorithms

# Unit II

Classification: Introduction- Statistical Based Algorithms-Distance Based Algorithms-Decision Tree Based Algorithms-Neural Network Based Algorithms- Rule Based Algorithms-Combining Techniques.

# Unit III

Clustering: Introduction-Similarity and Distance Measures-Outliers Hierarchical Algorithms-Partitional Algorithms.

# Unit IV

Introduction: Overview and History of R, Getting Help, Data Types, Subsetting, Vectorized Operations, Reading and Writing Data. (5L) Control Structures, Functions, lapply, tapply, split, mapply, apply, Coding Standards. (5L) Scoping Rules, Debugging Tools, Simulation, R Profiler.

# Unit V

Association rules, frequent itemsets- Finding high-correlation with low-support- Classifiers -Bayesian, Nearest Neighbour- Decision Trees- Clustering techniques -Supervised, Semisupervised learning: Expectation maximization; Web search: HITS and PageRank

# **Text Book:**

1. Margaret H. Dunham, "Data Mining Introductory and Advanced Topics", Pearson publications, Ninth Impression.

# **Books for Reference:**

- 1. K. P. Soman, ShyamDivakar, V. Ajay "Insight in to Data Mining Theory and Practice", PHI Learning Pvt. Ltd, 2006.
- 2. Jiawei Han, MichelineKamber, Jian Pei " Data Mining Concepts and Techniques", Morgan Kaufmann Publishers, Third Edition
- 3. W. N. Venables, D. M. Smith, An Introduction to R, R-core team, 2015
- 4. Jiawei Han, Micheline Kamber: Data mining: concepts and techniques (2nd ed), Morgan
- 5. Kaufman (2006).
- 6. Bing Liu: Web Data Mining: Exploring Hyperlinks, Contents and Usage Data, Springer (2006).
- 7. Soumen Chakrabarti: Mining the Web: Discovering knowledge from hypertext data, Elsevier (2003).
- 8. Christopher D Manning, Prabhakar Raghavan and Hinrich Schütze : An Introduction to Information Retrieval, Cambridge University Press (2009).

SEMESTER- II				
Core X – Advanced Computer Networks				
Code: 19PCSC24Hrs / week :4Hrs / Sem: 60Credits :4				

# Vision

To give exemplary graduate education in information networking, information security, and mobility.

# Mission

- To understand modern computer networks
- to familiarize routing algorithms
- to detect the technical problems in networking

## **Course Outcome:**

CO.No	Upon completion of this course, students will	PSO	CL
	be able to	Addressed	
CO-1	solve technical problems in ARQ protocols,	3,7	Ар
	MAC protocols and Routing Algorithm.		
CO-2	demonstrate the working of HUB and Switches.	7	Ap
CO-3	examine the Performance of ARQ Protocols,	7	Ар
	Ethernet LAN, Token Ring, RIP, TCP and UDP.		
CO-4	identify the networking technologies and	7	An
	associated network standards.		
CO-5	solve technical problems in ARQ protocols,	3,7	Ар
	MAC protocols and Routing Algorithm.		
CO-6	construct the route discovery algorithm to	5,7	Ар
	determine the shortest path in an internet		
	represented as a weighted graph.		
CO-7	understand network architecture	7	`Un
CO 8	implementation of motocold like TCD LIDD and	57	A - 12
0-0	Inplementation of protocols like TCP, UDP and ID using ODNET and NS 2	5,7	Ар
	IF USING OF INE 1 and INS-2		

SEMESTER- II				
Core X – Advanced Computer Networks				
Code: 19PCSC24Hrs / week :4Hrs / Sem: 60Credits :4				

# Unit I

## Layered Network Architecture and Network Topologies:

Introduction - Evolution of data Networks - Switching Techniques - Categories of networks - ISO/OSI Reference Model - TCP/IP Model,Network Topologies.

## Unit II

## Internetworking devices and Data Link Layer:

Repeaters – Hubs – Switches – Bridges: Transparent and Source Routing– Routers.Logical Link Control – Error Detection Techniques – ARQ protocols – Framing – HDLC –Point to Point protocol. Medium Access Control – Random access Protocols – Scheduling approaches to MAC.

## Unit III

## Local Area Networks& Wide Area Networks and Network Layer:

Ethernet- Token Bus/Ring , FDDI – Virtual LAN ,WAN Technologies – Frame Relay, ATM, Wireless LAN. Internetworking – IP Addressing – Subnetting – IPv4 and IPv6– Routing – Distance Vector and Link State Routing – Routing Protocols.

## Unit IV

# **Transport Layer and Services:**

Connection oriented and Connectionless Service – User Datagram Protocol – Transmission Control Protocol – Congestion Control – QoS parameters.

# Unit V

## **Application Layer and Contemporary Issues:**

Domain Name System – Simple Mail Transfer Protocol – File Transfer Protocol – Hypertext Transfer Protocol - World Wide Web.Contemporary Issues

## **Text Book:**

1. Alberto Leon-Garcia, "Communication Networks" Tata McGraw-Hill 2012.

## **Books for Reference:**

- 1. Robert Gallager, "Data Networks", Prentice Hall, 2009.
- 2. W. Stallings, Data and Computer Communications, Prentice Hall, 2007
- 3. Fred Halsall, Data communications, "Computer Networks and Open systems", Addison Wesley 2006.
- 4. BhushanTrivedy, Computer Networks, Oxford university press, 2012.

SEMESTER – I				
Core Practical - I J2EE Lab				
Code : 19PCSCR1Hrs / Week : 4Hrs / Sem : 60Credits : 2				

- 1. Write a Servlet to display "Hello World" on browser.
- 2. Write a Servlet to display all the headers available from request.
- 3. Write a Servlet to display parameters available on request
- 4. Write a Servlet to display all the attributes available from request and context
- 5. Write a Servlet which displays a message and also displays how many times the message has been displayed (how many times the page has been visited).
- 6. Assume that the information regarding the marks for all the subjects of a student in the last exam are available in a database, Develop a Servlet which takes the enrollment number of a student as a request parameter and displays the marksheet for the student.
- 7. Develop a Servlet which looks for cookies for username and password, and forwards to a home.jsp in case the cookies are valid and forwards to login.jsp, in case the cookies are not found or the cookies are not valid.
- 8. Develop a Servlet to authenticate a user, where the loginid and password are available as request parameters. In case the authentication is successful, it should setup a new session and store the user's information in the session before forwarding to home.jsp, which displays the user's information like full name, address, etc.
- 9. Write a simple JSP page to display a simple message (It may be a simple html page).
- 10. Write a JSP page, which uses the include directive to show its header and footer.
- 11. Create a Java class called Product with the following properties: name, description, price. Create a listener that notifies (through System.out) whenever a user adds a product to a shopping cart (i.e. adds an object to the session object) or removes it again. Hint: check out the class HttpSessionAttributeListener. Make it print the name and price of the object (hint: access the session through the HttpBindingEvent object). Also, let the listener print the total price of all objects saved in the session so far (one way to accomplish this could be to keep a collection of all objects saved to the session or just their keys in the listener or an associated class).
- 12. Create a servlet filter that logs all access to and from servlets in an application and prints the following to System.out: a. the time the request was received b. the time the response was sent c. how much time it took to process the request d. the URL of the resource requested e. the IP address of the visitor
- 13. Develop a interest calculation application in which user will provide all FACULTY OF COMPUTER APPLICATIONS information in HTML form and that will be processed by servlet and response will be generated back to the user.
- Develop an application to demonstrate how the client (browser) can remember the last time it visited a page and displays the duration of time since its last visit. (Hint: use Cookie)
- 15. Develop an application to keep track of one user across several servlet invocations within the same browser session.

SEMESTER- II				
Core Practical III – Data Mining Lab (R Lab)				
Code: 19PCSCR3Hrs / week :4Hrs / Sem: 60Credits :2				

Using R programming language write programs for the following concepts:

1.Vectorization

- 2. Control structures
- 3. Functions
- 4. Scoping Rules
- 5. Loop functions
- 6. Graphics and visualization
- 7. Grammar of data manipulation (dplyr and related tools)

# 8. Debugging/profiling

9. Statistical simulation

SEMESTER- II				
Core Practical IV – Network Simulation Lab I				
Code: 19PCSCR4Hrs / week :4Hrs / Sem: 60Credits :2				

- 1. Implementation of File System Calls
- 2. Implementation of ICP Techniques Pipe, Message Queue, Shared Memory
- 3. Socket Programming
  - a) TCP Sockets
  - b) UDP Sockets
  - c) Applications using Sockets
- 4. Simulation of Sliding Window Protocol
- 5. Simulation of Routing Protocols
- 6. RPC
- 7. Development of applications such as DNS / HTTP / E-mail / Multi-user chat

SEMESTER – III				
ELECTIVE II - OBJECT ORIENTED SOFTWARE ENGINEERING				
Code: 19PCSE32	Hrs / Week : 4	Hrs / Sem : 60	Credits : 2	

#### Vision:

To be a professional developer of software products

## Mission:

To understand different conventions in software modelling

To perform software testing and validation

## **Course Outcome:**

CO.No	Upon Completion of this course, students will be able to	PSOs Addressed	CL
CO-1	Design and implement a software system to meet desired needs.	3,6	Cr
CO-2	Identify requirements of systems and applications.	3	An
CO-3	Use modern software systems and tools.	1,6	Ар
CO-4	Understand different software life cycle concept.	7	Un
CO-5	Study and design SRS documents for software projects.	3,8	An
CO-6	Study and model software projects using different modelling techniques.	3,8	An
CO-7	Understand different techniques to map models to code	7	Un
CO-8	Discuss about project organisation and communication	8	Ev

## Unit I

**Software Life Cycle Models:** System concepts – Project Organisation – Communication – Life cycle models – Unified Process – Iterative and Incremental – Workflow – Agile Processes-Project Planning and Estimation.

# Unit II

**SRS Documentation:** Requirements Elicitation – Requirement Documentation – Use Cases – Unified Modeling language-Introduction.

**UML Diagram:** - Class diagrams – Sequence diagrams – Object diagrams – Deployment diagrams – Use case diagrams –State diagrams, Activity diagram, Component diagrams, Case Study, Identifying Classes – Noun Phrase Approach, Common class Pattern Approach, Use-CaseDriven Approach, CRC.

#### Unit III

**Analysis Phase:** Analysis Object Model (Domain Model)- Analysis Dynamic Models- Non-functional requirements – Analysis Patterns.

**Design Phase:** System Design Architecture – Design Principles – Design Concepts – Design Patterns – Architectural Styles – Dynamic Object Modeling – Static Object Modeling – Interface Specification – Object Constraint Language.

#### Unit IV

**Mapping:** Mapping Design(Models) to Code – Model Transformation – Refactoring – Mapping Associations – Mapping Activities.

**Testing & Implementation:** Testing – Configuration Management – Maintenance process – System documentation –program evolution dynamics.

## Unit V:

**Project Organization and Communication:** Introduction: A Rocket Example - An Overview of Projects - Project Organization Concepts - Project Communication Concepts - Organizational Activities.

**Methodologies:** Introduction: The First Ascent of K2 - Project Environment - Methodology Issues - A Spectrum of Methodologies - Case Studies.

- 1. Bernd Bruegge, Alan H Dutoit, "Object Oriented Software Engineering" Second edition, Pearson Education, 2004.
- 2. Craig Larman, "Applying UML and Patterns" Third edition, Pearson Education, 2005.
- 3. Object-Oriented Software Engineering Using UML, Patterns, and Java, 3rd Edition By Bernd Bruegge, Allen H. Dutoit Published by Pearson
- 4. Stephen Schach, "Software Engineering" Seventh edition. McGraw-Hill, 2007.
- 5. Ivar Jacobson, GrandyBooch, James Rumbaugh, "The Unified Software development Process", Pearson Education, 1999.
- 6. Alistair Cockburn, "Agile Software Development" Second edition, Pearson
- 7. Education, 2007.

SEMESTER –I				
CORE I - DESIGN AND ANALYSIS OF ALGORITHMS				
Course Code:21PCSC11	Hrs/week:5	Hrs/Semester:75	Credits:4	

- To be technologically adept, innovative and be able to develop new algorithms.
- To understand the course of the algorithm, its features and complexity
- To compare different algorithms for the same problem.

#### **Course Outcomes:**

CO.No.	Upon Completion of this course, students will be able	PSOs	CL
	to	Addressed	
CO-1	analyze the running time and space complexity of	1,3	An
	algorithms using asymptotic analysis.		
CO-2	understand different tree traversals, graph traversals and	1,3	Un
	spanning tress.		
CO-3	apply divide and conquer to binary search, quick sort,	3	Ар
	merge sort.		
CO-4	apply greedy method to knapsack problem, prims,	3	Ар
	kruskal algorithms.		
CO-5	apply dynamic programming to optimal binary search	3	Ар
	trees,0/1 knapsack problem, etc.		
CO-6	apply Backtracking ton-queen problem, sum of subsets	3	Ар
	problem, graph coloring etc.		
CO-7	apply branch and bound to Travelling sales person	3	Ар
	problem, 0/1 knapsack problem.		
CO-8	classify the notions of P, NP, NP-complete, and NP-hard	3	An

## UNIT- I

Introduction – Performance Analysis - Divide and conquer Method: Binary Search, Finding Maximum and Minimum, Merge Sort and Quick Sort.

# UNIT - II

Greedy Methods: Knapsack Problem, Minimum Cost Spanning Trees, Optimal Storage on Tapes and Single Source Shortest Path Problem-**Net Exam Related Problems**.

## UNIT - III

Dynamic Programming: Multistage Graphs, 0/1 knapsack and Traveling Salesman Problem. Basic Traversal and Search Techniques: Techniques for Binary Tree, Techniques for Graphs: Depth First Search and Breadth First Search - Connected Components and Spanning Tree-**Net Exam Related Problems** 

## UNIT - IV

Backtracking: 8 Queens Problems, Sum of Subsets, Graph Colouring, Hamiltonian Cycle and Knapsack Problem.

# UNIT - V

Branch and Bound: Least Cost Search. Bounding: FIFO Branch and Bound and LC Branch and Bound.0/1 Knapsack Problem, Travelling Salesman Problem.

## **Text Book**

1. E.Horowitz, S.Sahni and Sanguthevarrajasekaran. Fundamentals of Computer Algorithms,

2<sup>nd</sup> edition, Universities Press, 2008.

- 1. S. K. Basu. Design Methods and Analysis of Algorithms. PHI, 2005.
- 2. Goodman and S. T. Hedetniem. *Introduction to the Design and Analysis of Algorithms*. MGH, 1977.
- 3. A.V. Aho, J.D. Ullman and J.E.Hospcraft. *The Design and Analysis of Computer Algorithms*, Pearson Education.

SEMESTER I				
CORE II – DIGITAL IMAGE PROCESSING USING MATLAB				
Course Code: 21PCSC12 Hrs/Week: 5 Hrs/Sem: 75 Credits: 4				

- To interpret images mathematically and process them for the extraction of data using MATLAB.
- To familiarize students with image enhancement and restoration techniques.
- To introduce the concepts of image processing and basic analytical methods to be used in image processing.

## **Course Outcomes:**

CO. No.	Upon Completion of this course, students will be able to	PSOs	CL
		Addressed	
CO-1	develop programming skills and techniques to solve mathematical problem.	1	Ар
CO-2	learn graphic features of MATLAB and they are able to use this feature effectively in the various applications	1	Ар
CO-3	distinguish the need for image transforms different types of image transforms and their properties.	2,3	An
CO-4	learn different techniques employed for the enhancement of images.	3	Un
CO-5	analyze images in the frequency domain using various transforms.	3	An
CO-6	interpret Image compression, segmentation and representation standards	3	An
CO-7	choose image filtering in various applications	2	Ар
CO-8	analyze different causes for image degradation and overview of image restoration techniques.	3	An

## **UNIT I: MATLAB**

Introduction: MATLAB Environment - Types of files - Search - Constants, Variables and Expressions - Vectors and Matrices - Polynomials - Input / Output statements-MATLAB graphics-Control Structures - Writing Programmes and functions. (Text Book 1 - Chapter 1, 2, 3, 4, 5,6,7,8)

#### **UNIT II: INTRODUCTION & IMAGE ENHANCEMENT**

Introduction – steps in image processing, Image acquisition, representation, sampling and quantization, relationship between pixels. – color models – basics of color image processing. Image enhancement in spatial domain – some basic gray level transformations – histogram processing – enhancement using arithmetic, logic operations – basics of spatial filtering and smoothing.

## UNIT III: INTENSITY TRANSFORMATIONSAND SPATIAL FILTERING& FREQUENCY DOMAIN PROCESSING

Intensity Transformation Functions- Histogram Processing and Function Plotting-Spatial Filtering- Image Processing Toolbox Standard Spatial Filters

The 2-DDiscrete Fourier Transform- Computing and Visualizing the 2-D DFT in MATLAB- Filtering in the Frequency Domain- Obtaining Frequency Domain Filters from Spatial Filters -Generating Filters Directly in the Frequency Domain- Sharpening Frequency Domain Fillers.

#### **UNIT IV: IMAGE RESTORATION & COLOR IMAGE PROCESSING**

A Model of the Image Degradation/Restoration Process - Noise Models - Restoration in the Presence of Noise Only-Spatial Filtering- Periodic Noise Reduction by Frequency Domain Filtering-Modeling the Degradation Function -Direct Inverse Filtering -Wiener Filtering

Color Image Representation in MATLAB- Converting to Other Color Spaces -The Basics of Color Image Processing Color Transformations.

#### **UNIT V: IMAGE COMPRESSION & IMAGE SEGMENTATION**

Coding Redundancy -Huffman Codes - Huffman Encoding - Huffman Decoding - Interpixel Redundancy -Psychovisual Redundancy - JPEG Compression.

Point, Line, and Edge Detection- Thresholding- Region-Based Segmentation.

## (Text Book 2 - Chapter 2, 3, 4, 5,6,8,10)

## **Text Books:**

1. Rajkumar Bansal, Ashok Kumar Goel and Manoj Kumar Sharma. MATLAB and its

Applications in Engineering. Pearsons Publications, 2016.

2. Rafael C. Gonzalez. Digital Image Processing using MATLAB. 2<sup>nd</sup> Edition, 2010.

#### **Reference Books:**

1. R.C. Gonzalez and R.E.Woods. *Digital Image Processing*, 3<sup>rd</sup> Edition, Pearson Education. 2002,by Peter Issa Kattan

SEMESTER – I				
<b>CORE III - MATHEMATICAL FOUNDATIONS FOR COMPUTER SCIENCE</b>				
Course Code : 21PCSC13	Hrs / Week : 4	Hrs / Sem : 60	Credits : 4	

- To understand and apply the class of functions which transform a finite set into another finite set which relates to input output functions in computer science.
- Apply the concept of two dimensional random variables to correlation, regression and Central limit theorem
- Analyze whether given graphs are isomorphic and apply different algorithms to find the shortest path.

## **Course Outcomes:**

CO. No.	Upon Completion of this course, students will be	PSOs	CL
	able to	Addressed	
CO-1	test the complementary relationship of skewness with	2	An
	measures of central tendency and dispersion in		
	describing a set of data.		
CO-2	apply 'moments' as a convenient and unifying method	2	Ар
	for summarizing several descriptive statistical measures.		
CO-3	analyze the strength and direction of a linear	2	An
	relationship between two variables using Correlation.		
CO-4	demonstrate how much a dependent variable changes	2	Ар
	based on adjustments to an independent variable using		
	regression.		
CO-5	discover the logical operations and predicate calculus	2	An
	needed for computing skill.		
CO-6	understand the application of various type of graphs in	2	Un
	real life problem.		
CO-7	apply abstract concepts of graph theory in modeling	2	Ар
	and solving non-trivial problems in different field of		
	study.		
CO-8	apply theories and concepts to test and validate intuition and	2	Ар
	independent mathematical thinking in problem solving.		
CO-9	integrate core theoretical knowledge of graph theory to solve	2	Ap
00 /	problems.		

# UNIT - I

Moments-Skewness and kurtosis-Curve Fitting-Method of least squares-fitting linesparabolic, exponential & logarithmic curves

# UNIT - II

Correlation & regression –Scatter diagram- Karl Pearson's coefficient of correlationlines of regression coefficient - rank correlation.

## UNIT - III

Mathematical Logic: Propositions and Predicate logic - Truth table - Propositional Equivalence- Normal forms - Predicate and Quantifiers-Rules of Inference.

# $\mathbf{UNIT} - \mathbf{IV}$

Graph Theory:Introduction – Paths and Circuits: Isomorphism – Sub graphs – Walks, Paths, Circuits Connected Graphs, Disconnected Graphs and Components – Euler Graphs – Operations on Graph – Hamiltonian Paths and Circuits - Trees and Fundamental Circuits: Trees – Some properties of Trees – Distance and Centers in a Tree – Rooted and Binary Trees – Spanning Trees – Fundamental Circuits – Finding all Spanning Trees of a Graph – Spanning Tress in a weighted Graph

## UNIT – V

Cut-Sets and Cut-Vertices: Cut-Sets – Properties of Cut-Sets – All Cut-Sets in a Graph – Fundamental Circuits and Cut-Sets – Connectivity and Separability – Combinational vs geometric graphs – Planer graphs – Different representation of a planer graph – Matrix: Incidence, Submatrices, Circuit – Matchings – Coloring – The four color problem - Directed graphs – Types of directed graphs – Digraphs and binary relations – Directed paths and connectedness – Euler graphs.

## **Text Books:**

- 1. Dr.M.K.Venkatraman, Dr. N. Sridharan and N.Chandrasekaran. *Discrete Mathematics*. 2012
- 2. S. Arumugam and A. Issac. *Statistics*. New Gamma publishing House. Palayamkottai, 2011.
- 3. NarsinghDeo. *Graph Theory with Application to Engineering and Computer Science*. Prentice-Hall of India Pvt.Ltd, 2003.

- 1. Tremblay and Manohar. *Discrete Mathematical Structures with applications to Computer Science*, Tata McGraw Hill.
- 2. Kenneth H.Rosen. *Discrete Mathematics and Its Applications*, Tata McGraw Hill, 4<sup>th</sup> Edition, 2002.
- 3. A.Tamilarasi and A.M.Natarajan. *Discrete Mathematics and its Application*. Khanna Publishers, 2<sup>nd</sup> Edition 2005.
- 4. Bondy, J. A. and Murty, U.S.R. *Graph Theory with Applications*. North Holland Publication, 2008.

SEMESTER –I				
CORE IV- COMPILER DESIGN				
Course Code:21PCSC14Hrs/week:4Hrs/Semester:60Credits:4				

- To learn the process of translating a modern high-level language to executable code.
- To identify the methods and strategies of parsing techniques.
- To generate intermediate code, and to design syntax directed translation scheme and apply code optimization techniques.

# **Course Outcomes:**

CO. No	Upon Completion of this course, students will be able to	PSO addressed	CL
CO-1	understand the basic principles of compiler in high level programming language	1,5	Un
CO-2	represent language tokens using regular expressions, finite automata	5	An
CO-3	apply parsing techniques and able to write Context Free Grammars for various languages	5	Ар
CO-4	apply the knowledge of intermediate code generation to build efficient systems	5	Ар
CO-5	develop the knowledge on Run-time Environment	5	Ар
CO-6	understand the need of intermediate representation for the generation of target code	5	Ар
CO-7	design code generator and apply code optimization techniques	5	Ар
CO-8	apply optimization techniques to intermediate code and generate machine code for high level language program	5	Ар

# UNIT – I: Lexical Analysis

Structure of a compiler – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens –Finite Automata – Regular Expressions to Automata – Minimizing the number of states of a DFA.

# UNIT – II: Syntax Analysis

Introduction – Context-free Grammars – Writing a Grammar – Top-Down Parsing – Bottom-Up parsing – LR Parsing – Ambiguous Grammar – Parser Generators

# **UNIT – III: Intermediate Code Generation**

Syntax Directed Definitions - Evaluation Orders for Syntax Directed Definitions - Variants of Syntax trees - Three-Address Code - Types and Declarations - Translation of

Expressions – Type Checking

# UNIT – IV: Run Time Environments and Code Generation

Storage Organization – Stack Allocation of Space - Access to Nonlocal Data on the Stack - Issues in the Design of a Code Generator – Target Language – Address in the Target Language - A Simple Code Generator

# UNIT – V: Code Optimization

Basic Blocks and Flow Graphs - Optimization of Basic Blocks - Peephole Optimization - Machine-Independent Optimizations: Introduction to Data-Flow Analysis

# **Text Book:**

1. Alfred V. Aho, Monica S. Lam, RaviSethi and Jeffery D.Ullman. *Compilers: Principles, Techniques and Tools.* Pearson, 2<sup>nd</sup> Edition, 2014.

- 1. J.P. Tremblay and P.G. Sorrenson. *The Theory and Practice of Compiler Writing*. McGraw Hill, 1985.
- 2. David Galles. Modern Compiler Design. Pearson Education Asia, 2007.
- 3. Steven S. Muchnick. *Advanced Compiler Design & Implementation*. Morgan Kaufmann Pulishers, 2000.

SEMESTER – II				
CORE V- J2EE				
Course Code : 21PCSC21Hrs / Week : 5Hrs / Sem : 75Credits : 4				

- To acquire knowledge on the usage of recent platforms in developing web applications.
- Enhancing the student's skills to design and develop interactive, client-side, serverside executable web applications.
- Able to apply the skill learnt for projects.

## **Course Outcomes:**

CO. No.	Upon Completion of this course, students will be able	PSOs	CL
	to	Addressed	
CO-1	make use of a high-level overview of the J2EE	1	Ар
	architecture		
CO-2	identify the services and components which comprise the	1	Ар
	J2EE specification		
CO-3	explain how J2EE technology applications are packaged	1	Ар
CO-4	acquire the knowledge of EJB and its types	1	An
CO-5	build server side java application called Servlet to catch	1	Cr
	form data sent from client and store it on database		
CO-6	build server side java application called JSP to catch	1	Cr
	form data sent from client, process it and store it on		
	database.		
CO-7	differentiate Servlet and JSP	1	An
CO-8	understand Struts to develop MVC based web	1	Un
	applications that are easy to develop and maintain.		

## **UNIT I: J2EE Introduction**

J2EE introduction – J2EE Architecture (J2EE Tiers, Containers, Roles) –J2EE Servers and services –Services of EJB Container – J2EE Technology – Packaging – Web services – Advantages of J2EE Applications

## **UNIT II: Enterprise Java Bean Introduction**

Enterprise Bean introduction – Benefits of Enterprise Beans - Types of Enterprise Beans – Session Bean – Entity Bean – Message-Driven Bean – The Contents of a Enterprise Bean – The Life Cycles of Enterprise Beans.

## **UNIT III: Servlet**

Servlet - Servlet Lifecycle - Servlet API -Object model of Servlet framework -Understanding web.xml, servlet tags and directory structure of web application - Generic Servlet and HttpServlet, ServletConfig & ServletContext - Handling Form data with get and post request - Initializing a servlet - Request Dispatcher, Redirecting Request - Session Management -Filters in servlet -programs in servlet to read all parameters from form, database handling program, reading cookies values.

## **UNIT IV: JSP**

JSP - What is JSP page? Compare it with servlet - Lifecycle of JSP page - JSP syntax using Directive, Declaration, Expression, Scriplet, Comment - Using JavaBean and Action Tag in JSP - JSP implicit objects - Using JSP standard tag library (JSTL) - Session management - Exception handling - Custom tag - Transferring Control to Another Web Component - Using JDBC in JSP -Programs in JSP -Integrating JSP with JQuery, Bootstrap, Angular JS, JSON.

# **UNIT V: Struts**

Basic of Struts2 - Understanding MVC architecture - Struts2 framework -Understanding default-stack - comparing struts with other framework - Working with Struts2 Actions - Introducing Struts 2 actions - Packaging your actions - Implementing actions Adding workflow with interceptors - Why intercept requests? - Interceptors in action - Surveying the built-in Struts 2 interceptors - Declaring interceptors - Building your own interceptor Data transfer: OGNL and type conversion - Data transfer and type conversion: common tasks of the web application domain - OGNL and Struts 2 - Built-in type converters - Customizing type conversion Validation framework -RequiredFieldValidator Class - RequiredStringValidator Class - ExpressionValidator Class - Email Validator Class - RegexFieldValidator Class - DateRangeFieldValidator Class Struts.

# **Text Books:**

- 1. Stephanie Bodoff, Dale Green, Kim Hasse ,Eric Jendrock, Monica Pawlan and Beth Stearns. *J2EE Tutorial*. Addison-Wesley, 2002.
- 2. Keogh. J2EE: The Complete Reference, .McGraw Hill India, 2002.
- 3. Phil Hanna. *The Complete Reference JSP*. Osborne/McGraw-Hill Publication, 2003.
- 4. Donald Brown, Chad Michael Davis and ScottStanlick. Struts 2 in Action. Manning

Publications, 2008.

5. Budi Kurniawan. Java for Web with Servlets, JSP and EJB: ADeveloper's Guide to J2EE Solutions. New Riders Publishing.

- 1. Bryan Basham, Kathy Sierra and Bert Bates.*Head First Servlets and JSP:* Passing the Sun Certified Web Component Developer Exam.2<sup>nd</sup> Edition.
- 2. Jonathan Wetherbee, Massimo Nardone, Chirag Rathod and Raghu Kodali.*Beginning EJB in Java EE 8: Building Applications with Enterprise JavaBeans*. 3rd Edition.

SEMESTER- II				
CORE VI- DATA MINING & R PROGRAMMING				
Course Code: 21PCSC22Hrs / week :5Hrs / Semester: 75Credits :4				

- Extract patterns of usable data using appropriate algorithms
- To study the basic and advanced concepts in Data Mining Techniques.
- To understand the various algorithms involved in data mining and its applications.

## **Course outcomes:**

CO. No.	Upon Completion of this course, students will be able to	PSOs Addressed	CL
CO-1	classify different data mining tasks and the algorithms most appropriate for addressing them.	1,3	An
CO-2	discover Strengths & Limitations of Data Mining Methods	1,4	An
СО-3	display interesting patterns from large data, to extract and analyse, make predictions and solve problems	1, 4	An
CO-4	evaluate models/algorithms with respect to their accuracy	3	Ev
CO-5	demonstrate capacity to perform a self-directed piece of practical work that requires the application of data mining techniques.	1,4	Ev
CO-6	develop hypotheses based on the analysis of the results obtained and test them.	1	Ev
CO-7	learn to Set Up Data for Experiments	1,4	Ар
CO-8	conceptualize a data mining solution to a practical problem.	1,4	Ар

# UNIT I:

Introduction: Basic Data Mining Tasks- Data Mining Versus Knowledge Discovery in Databases. Data Mining Techniques: Introduction-A Statistical Perspective on Data Mining-Similarity Measures- Decision Trees-Neural Networks-Genetic Algorithms

# UNIT II:

Classification: Introduction- Statistical Based Algorithms-Distance Based Algorithms-Decision Tree Based Algorithms-Neural Network Based Algorithms- Rule Based Algorithms-Combining Techniques.

# **UNIT III:**

Clustering: Introduction-Similarity and Distance Measures-Outliers Hierarchical Algorithms- Partitional Algorithms.

## **UNIT IV:**

Introduction: Overview and History of R, Getting Help, Data Types, Subsetting, Vectorized Operations, Reading and Writing Data. (5L) Control Structures, Functions, lapply, tapply, split, mapply, apply, Coding Standards. (5L) Scoping Rules, Debugging Tools, Simulation, R Profiler.

## UNIT V:

Association rules-frequent itemsets-Basic Association Rules-Web Mining-Introduction-Content Mining-Social Network Analysis-HITS and Page rank-Usage Mining

## **Text Books:**

- 1. Margaret H. Dunham. Data *Mining Introductory and Advanced Topics*. Pearson publications, Ninth Impression, 2002.
- 2. Roger .D.Peng. R programming for Data Science, 2015.

- 1. K. P. Soman, ShyamDivakar and V. Ajay. *Insight in to Data Mining Theory and Practice*. PHI Learning Pvt. Ltd, 2006.
- 2. Jiawei Han, MichelineKamber and Jian Pei. *Data Mining Concepts and Techniques*. Morgan Kaufmann Publishers, 3rd Edition.
- 3. Bing Liu. Web Data Mining: Exploring Hyperlinks, Contents and Usage Data.Springer, 2006.

SEMESTER – II				
CORE VII - DISTRIBUTED DATABASE MANAGEMENT SYSTEM				
Course Code : 21PCSC23Hrs / Week : 4Hrs / Sem : 60Credits : 4				

- Identify the introductory distributed database concepts and its structures.
- Describe terms related to distributed object database design and management.
- Produce the transaction management and query processing techniques in DDBMS.
- Relate the importance and application of emerging database technology.

## **Course Outcomes:**

CO. No.	Upon Completion of this course, students will be	PSOs	CL
	able to	Addressed	
CO-1	understand the concept of Distributed DBMS	4	Un
CO-2	apply various architectures of DDBMS	4	Ap
CO-3	apply various fragmentation techniques in a given problem	4	Ар
CO-4	visualize the steps of query processing	4	Ap
CO-5	finding how optimization techniques are applies to Distributed Database	1,4	An
CO-6	compare various Query Optimization Algorithms	3	An
CO-7	identify various approaches to concurrency control in Distributed database	4	An
CO-8	apply various algorithms and techniques for deadlock and recovery in Distributed database	3,4	Ap

# **UNIT I: Introduction to DDBMS**

Introduction: Distributed Data Processing, Distributed Database Systems, Promises of DDBSs, Complicating factors - Distributed DBMS Architecture Models-Autonomy, Distribution, Heterogeneity DDBMS Architecture – Client/Server, Peer to peer, MDBS

# UNIT II: Data Distribution Alternatives

Design Alternatives – localized data, distributed data Fragmentation – Vertical, Horizontal (primary & derived), hybrid, general guidelines, correctness rules Distribution transparency – location, fragmentation, replication - Impact of distribution on user queries.

#### **UNIT III: Query Processing**

Query Processing Problem, Layers of Query Processing Query Processing in Centralized Systems – Parsing & Translation, Optimization, Code generation, Example Query Processing in Distributed Systems – Mapping global query to local.

**Optimization of Distributed Queries:** Query Optimization, Centralized Query Optimization, Join Ordering Distributed Query Optimization Algorithms.

#### **UNIT IV: Distributed Transaction Management & Concurrency Control**

Transaction concept, ACID property, Objectives of transaction management, Types of transactions, Objectives of Distributed Concurrency Control, Concurrency Control anomalies, Methods of concurrency control, Serializability and recoverability, Distributed Serializability, Enhanced lock based and timestamp-based protocols, Multiple granularity, Multi version schemes, Optimistic Concurrency Control techniques

# UNIT V: Distributed Deadlock & Recovery Deadlock concept, Deadlock in Centralized systems

Deadlock in Distributed Systems – Detection, Prevention, Avoidance, Wait-Die Algorithm, Wound-Wait algorithm Recovery in DBMS - Types of Failure, Methods to control failure, Different techniques of recoverability, Write- Ahead logging Protocol, Advanced recovery techniques- Shadow Paging, Fuzzy checkpoint, ARIES, RAID levels, Two Phase and Three Phase commit protocols.

#### **Text Book**:

1. Ozsu. Principles of Distributed Database Systems. Pearson Publication, 2020.

## **Reference Books:**

1. Rahimi and Haug. Distributed Database Mangement Systems. Wiley publication.

2. A. Silberschatz, H.F. Korth and S. Sudharshan. *Database System Concepts*. New Delhi, Tata

McGraw Hill,5<sup>th</sup> Edition,2006.

SEMESTER- II				
CORE VIII - SINGLE BOARD COMPUTERS AND IOT				
Course Code: 21PCSC24Hrs / week :4Hrs / Sem: 60Credits :4				

- To deliver a deep knowledge of Internet of Things and Single Board Computers.
- To understand the architecture of Single Board Computers and ability on setup Raspberry Pi .
- To recognize the concepts of Internet of Things and its security measures.

## **Course Outcomes:**

CO.No	Upon Completion of this course, students will be able to	PSO addressed	CL
CO-1	code program and develop applications using single board computers	8	Ap
CO-2	create a good working setup of Raspberry Pi	8	Cr
CO-3	understand the concepts of Internet of Things	8	Un
CO-4	identify and applying different IoT technologies	8	Ap
CO-5	inculcate knowledge on communication middleware and Information security in IoT	7,8	Un
CO-6	analyze basic protocols in wireless sensor network	7	An
CO-7	implement State of the Art - IoT Architecture	8	Ap
CO-8	examine the security and privacy issues in IoT	7,8	An

## **UNIT - I: Introduction to Single Board Computers**

Introduction - history of Single Board Computers - Classification - Comparison -Evolution - Architecture - applications - Overview on Raspberry Pi - GPIO - shields overview on Beaglebone - features.

# UNIT - II: Setting up RASPBERRY Pi

Installing and preparing Raspberry Pi - flashing SD Card - Booting up -Configuring Pi - Troubleshooting - Using Command Line interface - Linux commands configuring network connection- Arduino and Pi- Basic Input and Output

# **UNIT – III: Introduction to Internet of Things**

Internet of Things: Introduction-Definition & Characteristics of IoT-Physical design of IoT and logical design of IoT- IoT Enabling Technologies: WSNs, Cloud Computing, Big Data Analytics, Communication Protocols and Embedded Systems. IoT and M2M: Introduction-M2M-Difference between IoT and M2M Scenario.

## **UNIT – IV: Internet of Things Concepts**

IoT concepts: IoT architectures-Resource management-IoT data management and analytics-Communication protocols-Applications-Programming frameworks for Internet of Things: Overview-Embedded Device Programming Languages-Message passing in Devices-Stream processing in IoT-Introduction-The foundations of stream processing in IoT- Continuous Logic Processing System-Challenges and future directions.

# UNIT – V: Security and Privacy in the Internet of Things

Concepts- IoT Security Overview-Security Frameworks for IoT-Privacy in IoT Networks-Obfuscation and Diversification for Securing the Internet of Things: Introduction-Distinguishing Characteristics of IoT-Obfuscation and Diversification Techniques

## **Text Books:**

- 1. Matt Richardson and Shawn Wallace.*Getting started with Raspberry Pi*. O'ReillyMedia, Inc, 1st edition, 2012.
- 2. ArshdeepBahga and Vijay Madisetti.*Internet of Things-A Hands-on Approach*. Universities Press Amir (India), 2015.

- 1. RajkumarBuyya and VahidDastjerdi. *Internet of Things: Principles and Paradigms*. Cloud Computing and Distributed Systems (Clouds) Laboratory, Manja Soft Pty Ltd., Australia, 2016.
- 2. Fei Hu. Security and Privacy in Internet of Things (IoTs): Models, algorithms, and Implementations. CRC Press, 2016.
- 3. Tim Cox. Raspberry Pi Cookbook for Python Programmers. 2014.

Semester III			
CORE IX - SOFTWARE TESTING			
Course Code: 21PCSC31	Hrs / week : 4	Hrs / Sem: 60	Credits :4

- To provide basic understanding of the software development life cycle including testing, test planning &design and test team organization.
- To study the various types of test in the life cycle of the software product.
- To build design concepts for system testing and execution

## **Course Outcomes:**

CO.No	Upon Completion of this course, students will be able to	PSO addressed	CL
CO-1	understand the fundamental concepts and techniques in Software Testing	1	Un
CO-2	identify and apply the functional and system testing methods in commercial environment	3	Ар
CO-3	design Test Planning	3	Ар
CO-4	understand the categories of the system testing methods	3	Un
CO-5	distinguish between methods of judging test case adequacy and how to design tests that will accomplish the obligations of such methods.	1	An
CO-6	apply and manage the test process in real-time applications	1	Ар
CO-7	demonstrate the process of validation and verification and write code to automate test execution and analysis	1	Ар
CO-8	implement various test processes for quality improvement	1	Ap

# UNIT- I Basic Concepts, Issues and Techniques

Quality Revolution- Verification and Validation-Failure, Error, Fault, and Defect- Objectives of Testing- Testing Activities-Sources of Information for test Case Selection - White-Box and Black-Box Testing-Test Planning and design-Test Tools and Automation- Test Team Organization and Management.

# UNIT - II System Testing

System Integration Testing: System Integration Techniques- Software and Hardware Integration-Test Plan for System Integration-Built- in Testing. Functional Testing:Testing a Function in Context- Boundary Value Analysis- Decision Tables. Acceptance Testing - Selection of Acceptance Criteria-Acceptance Test Plan-Acceptance Test Execution. Software Reliability: Fault and Failure-Factors Influencing Software Reliability- Reliability Models.

# UNIT - III System Test Categories

System Test Categories: Taxonomy of System Tests-Command Line Interface Tests, Functionality Tests- GUI Tests-Security Tests-Feature Tests, Robustness Tests- Boundary Value Tests, Power Cycling Tests, Interoperability Tests, Scalability Tests, Stress Tests, Load and Stability Tests, Reliability Tests, Regression Tests, Regulatory Tests. Test Generation from FSM models: State-Oriented Model- Finite-State Machine Transition Tour Method-Testing with State Verification-Test Architectures.

# UNIT – IV System Test Design and Execution

System Test Design: Test Design Factors-Requirement Identification-Modeling a Test Design Process-Test Design Preparedness Metrics- Test Case Design Effectiveness. System Test Execution: Modeling Defects- Metrics for Tracking System Test-Metrics for Monitoring Test Execution- Metrics for Monitoring Defect Reports-Defect Causal Analysis-Beta testing-Measuring Test Effectiveness.

# UNIT - V Software Quality

Software quality: Five Views of Software Quality-McCall's Quality Factors and Criteria- ISO 9000:2000 Software Quality Standard .Maturity Models: Capability Maturity Model-Test Process Improvement-Testing Maturity Model

# **Text Book:**

1. Kshirasagar. *Software Testing and Quality Assurance, Theory and Practice*. John Wiley & Sons, Inc., Hoboken, New Jersey, 2008.

- 1. Srinivasan Desikan and Gopalswami Ramesh. Software Testing: Principles and Practices. Pearson Education, 1st Edition, 2008.
- 2. Paul C. Jorgensen. *Software Testing: A Craftman's Approach.*, Auerbach Publications, 4th Edition, 2008.

SEMESTER – III				
CORE X - CLOUD COMPUTING AND BIG DATA				
Course Code : 21PCSC32Hrs / Week : 4Hrs / Sem : 60Credits : 4				

- To explore the fundamental concepts of big data analytics.
- To learn to analyze the big data using intelligent techniques.
- To know about the Cloud Computing architecture and services.
- To learn to design the trusted Cloud Computing system.
- To understand the concept of Virtualization and design of Cloud Services.

## **Course Outcomes :**

CO. No.	Upon completion of this course, students will be able to	PSOs addressed	CL
CO-1	carrying out the decisions based on data analytics.	4	Ар
CO-2	analyze the big data analytic techniques for useful business applications.	4	An
CO-3	identifying the data models in relation to Big Data Storage and Analytics.	4	Re
CO-4	implementing Big Data applications Using Pig and Hive	4	Ap
CO-5	plan to work with big data platform	4	Cr
CO-6	identify the architecture, infrastructure and delivery models of cloud computing.	7	Re
CO-7	apply suitable virtualization concept.	7	Ар
CO-8	organize the core issues of cloud computing such as security, privacy and interoperability	7	An
CO-9	design Cloud Services and Set a private cloud	7	Cr
CO-10	identifying the significant concepts on Parallel and Distributed Programming.	4	Re

## UNIT I

Big data introduction – Characteristics of Big data – Structure of Big data – Evolution of Analytical Scalability – Map Reduce – Cluster Analysis –

Real time analytics platform applications – Case studies for real time Sentiment analysis, Stock market predictions.

# UNIT II

 $Introduction \ to \ NoSQL-Aggregate \ data \ models-HBase-Pig-Grunt\ - \ Hive \ .$ 

# UNIT III

Vision of Cloud computing – Cloud Definition – Characteristics and Benefits – Virtualization – Cloud computing Architecture – Cloud Reference Model, Types of Clouds – Cloud Platforms in Industry.

# UNIT IV

Parallel and Distributed Programming Paradigms – MapReduce , Twister and Iterative MapReduce – Hadoop Library from Apache – Mapping Applications - Programming Support - Google App Engine,

Amazon AWS - Cloud Software Environments -Eucalyptus, Open Nebula, OpenStack, Aneka, CloudSim

# UNIT V

Security Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data

Security – Application Security – Virtual Machine Security - Identity Management and Access Control – Autonomic Security.

# **Text Books:**

- 1. Rajkumar Buyya, Christian Vecchiola and S.Thamarai Selvi. *Mastering Cloud Computing*. TMGH,2013.
- 2. Kai Hwang, Geoffrey C Fox and Jack G Dongarra. *Distributed and Cloud Computing, From Parallel Processing to the Internet of Things*. Morgan Kaufmann Publishers, 2012.
- 3. John W.Rittinghouse and James F.Ransome. *Cloud Computing: Implementation, Management, and Security.* CRC Press, 2010.
- 4. Arshdeep Bahga and Vijay Madisetti.*Big Data Science & Analytics A Hands -On Approach.*2019.

- 1. Viktor Mayer-Schonberger and Kenneth Cukier.*Big Data: A Revolution That Will Transform How We Live, Work and Think*.
- 2. Venkat Ankam .Big Data Analytics. 2016.
- 3. PeteWarden. Big Data Glossary. O'Reilly, 2011.
- 4. Toby Velte, Anthony Velte and Robert Elsenpeter.Cloud *Computing, A Practical Approach.* TMH, 2009.
- 5. George Reese. *Cloud Application Architectures: Building Applications and Infrastructure in the Cloud.* O'Reilly.
- 6. Ronald L. Krutz, Russell and Dean Vines. *Cloud Security A comprehensive Guide to Secure Cloud Computing*. India , Wiley ,2010.

SEMESTER III			
CORE XI - DATA SCIENCE USING PYTHON			
Course Code: 21PCSC33	Hrs / week :4	Hrs / Sem: 60	Credits : 4

- To enable the students to understand the concepts of data science and apply data analysis in various application areas
- To provide comprehensive knowledge of python programming paradigms required for Data Science.
- To perform a wide variety of mathematical operations on arrays using NumPy

# **Course Outcomes:**

CO.No	Upon Completion of this course, students will be able to	PSO	CL
		Addressed	
CO-1	explore the fundamental concepts of data science	4	An
CO-2	explain how data is collected, managed and stored for data science	4	Un
CO-3	visualize and present the inference using various tools	4	Ap
CO-4	evaluate the data analysis techniques for applications handling large data	4	Ар
CO-5	implement numerical programming, data handling and visualization through NumPy and Pandas	1	Ар
CO-6	understand and demonstrate the usage of universal functions and list of Arrays in Python	1	Ap
CO-7	understand the working of different data types and their related functions	1	Ap
CO-8	analyze the significance of python program development environment and apply it to solve real world applications	1,3	Un

# UNIT – I

Introduction: What Is Data Science?- How Does Data Science Relate to Other Fields?- The Relationship between Data Science and Information Science- Data: Introduction- Data Types-Data Collections- Data Pre-processing–Techniques: Introduction – Data analysis and Data analytics- Descriptive Analysis- Diagnostic analytics-predictive analytics- prescriptive analytics- exploratory analysis – mechanistic analysis

# UNIT – II

Tools for Data Science: UNIX: Introduction- Getting access to UNIX- Connecting to a UNIX server- Basic commands- Editing on UNIX- Redirecting and piping-Python: Introduction-Getting access to Python- Examples- Control structures- statistics essentials

# UNIT – III

Introduction to NumPy: Understanding Data Types in Python- The Basics of NumPy Arrays-Computation on NumPy Arrays: Universal Functions- Aggregations: Min, Max, and Everything in Between- Computation on Arrays: Broadcasting- Comparisons, Masks, and Boolean Logic- Fancy Indexing- Sorting Arrays- Structured Data: NumPy's Structured Arrays

# $\mathbf{UNIT} - \mathbf{IV}$

Data Manipulation with Pandas: Installing and using Pandas- Data Indexing and Selection-Operating on Data in Pandas- Handling Missing Data-Hierarchical Indexing-Combining Datasets-

## UNIT – V

Data Manipulation with Pandas: Aggregation and Grouping – Pivot Tables – Vectorized String Operations- Working with Time Series- High performance Pandas: eval() and query()

## **Text Books:**

1. Chirag Shah. A Hands-on Introduction to Data Science. Cambridge University Press, 1<sup>st</sup> Edition 2020.

2. Jake VanderPlas. *Python Data Science Handbook Essential Tools for Working with Data*, O'Reilly Media, Inc., 1<sup>st</sup> Edition, 2016.

## **Reference Books:**

1. Wes McKinney. *Python for Data Analysis*. O'Reilly Media, Inc., 1<sup>st</sup> Edition 2012.

2. Luca Massaron and John Paul Mueller. *Python for Data Science for dummies*. John Wiley & Sons, 2019.

3. Davy Cielen, Arno D.B. Meysman and Mohamed Ali. *Introducing Data Science: Big Data, Machine Learning, and More, using Python Tools.* Manning Publications, 2016.

SEMESTER – III			
CORE XII - RESEARCH METHODOLOGY			
Course Code : 21PCSC34	Hrs / Week : 4	Hrs / Sem : 60	Credits : 4

- To achieve outstanding scientific research in various areas of knowledge.
- To encourage distinguished research work through the creation of an attractive and stimulating environment to achieve goals.

## **Course Outcomes:**

CO.No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	demonstrate knowledge of research processes	8	An
CO-2	compare between methodologies and methods used in research work	8	An
CO-3	understand the fundamental concepts of research problem and research design	8	Un
CO-4	explain the concepts and procedures of sampling, data collection, analysis and reporting	3	Ap
CO-5	assess the basic function and working of analytical research tools used in computer science research	3	Re
CO-6	discuss different methodologies and techniques used in research work	8	An
CO-7	prepare a research report and examine the plagiarism and its types.	8	Ap
CO-8	apply the knowledge of teaching methods for its wide applicability.	8	Ap

# Unit - I

Research Methodology– Introduction - Meaning of research – Objectives of research – Types of Research – Research Approaches – Significance of Research – Research Methods versus Methodology – Research and Scientific Method – Research Process - Criteria of Good Research.

# Unit – II

Research Problem – Selecting the Problem – Necessity of Defining the Problem – Technique involved in defining a problem – Meaning of Research Design – Features of a good design.

# Unit – III

Sampling Design - Methods of Data Collection - Research Tools: Introduction - SPSS -

 $MATLAB-LaTeX-NS2-R \ tool \ - \ Case \ Study: \ Presentation \ by \ students \ on \ their \ area \ of \ research$ 

## Unit – IV

Report writing and Thesis writing – Citations – Plagiarism – Types of Plagiarism – Tools for detecting Plagiarism – Ethical Issues within the research process – Intellectual Property Rights

## Unit – V

Methodology of teaching – Objectives for teaching – Structure of teaching – Phases of teaching - Various teaching methods.

## **Text Book:**

1. Kothari, C.R. *Research Methodology: Methods and Techniques*. New Delhi, New Age International, 2<sup>nd</sup> Edition, 2012.

- 1. Janathan Anderson, Berry H. Durston and Millicent Poole. *Thesis and Assignment Writing*. Wiley Eastern Limited, 1992.
- 2. EhtiramRaza Khan and Huma Anwar. *Research Methods of Computer Science*. University Science Press, 1<sup>st</sup> Edition, 2016.
- 3. Dr.Prabhat Pandey and Dr.Meenu Mishra Pandey. *Research Methodology: Tools and Techniques*. Bridge Center, 1<sup>st</sup> Edition, 2015.

SEMESTER –I			
CORE PRACTICAL I - DESIGN AND ANALYSIS OF ALGORITHMS LAB			
Course Code:21PCSCR1	Hrs/week: 4	Hrs/Semester:60	Credits:2

Using C++ programming write programs for the following:

- 1. Sorting
- 2. Graph traversal
- 3. Prim's Algorithm-Greedy Method
- 4. N queen problem
- 5. Knapsack problem
- 6. Single Source Shortest Path
- 7. Sum of Subsets
- 8. Binary Search Tree
- 9. Graph Coloring
- 10. BiConnected Components
- 11. Travelling Salesman Problem

# SEMESTER –I

# CORE PRACTICAL II – DIGITAL IMAGE PROCESSING USING

# MATLAB LAB

Course Code:21PCSCR2 Hrs/week:4 Hrs/Semester:60 Credits:2

Using MATLAB write programs for the following:

- 1. Resizing and Rotating Images
- 2. To extract different attributes of an Image.
- 3. Image Enhancement- Contrast and Brightness
- 4. Image Enhancement- Calculate Histogram
- 5. Blurring and Smoothing
- 6. Edge Detection
- 7. Image Sharpening
- 8. Object Segmentation via Thresholding
- 9. Noise Filtering
- 10. Image Negation

SEMESTER – II			
CORE PRACTICAL - III - J2EE LAB			
Course Code : 21PCSCR3	Hrs / Week : 4	Hrs / Sem : 60	Credits : 2

- 1. Write a Servlet to display all the headers available from request.
- 2. Write a Servlet to display parameters available on request
- 3. Write a Servlet to display all the attributes available from request and context
- 4. Write a Servlet which displays a message and also displays how many times the message has been displayed (how many times the page has been visited).
- 5. Assume that the information regarding the marks for all the subjects of a student in the last exam are available in a database, Develop a Servlet which takes the enrollment number of a student as a request parameter and displays the mark sheet for the student
- 6. Develop a Servlet which looks for cookies for username and password, and forwards to a home.jsp in case the cookies are valid and forwards to login.jsp, in case the cookies are not found or the cookies are not valid.
- 7. Develop a Servlet to authenticate a user, where the loginid and password are available as request parameters. In case the authentication is successful, it should setup a new session and store the user's information in the session before forwarding to home.jsp, which displays the user's information like full name, address, etc.
- 8. Write a simple JSP page to display a simple message (It may be a simple html page).
- 9. Write a JSP page, which uses the include directive to show its header and footer.
- 10. Create a Java class called Product with the following properties: name, description, price. Create a listener that notifies (through System.out) whenever a user adds a product to a shopping cart (i.e. adds an object to the session object) or removes it again. Hint: check out the class HttpSessionAttributeListener. Make it print the name and price of the object (hint: access the session through the HttpBindingEvent object). Also, let the listener print the total price of all objects saved in the session so far (one way to accomplish this could be to keep a collection of all objects saved to the session or just their keys in the listener or an associated class).
- 11. Create a servlet filter that logs all access to and from servlets in an application and prints the following to System.out:
  - a. the time the request was received
  - b. the time the response was sent
  - c. how much time it took to process the request
  - d. the URL of the resource requested e. the IP address of the visitor
- 12. Develop a interest calculation application in which user will provide all FACULTY OF COMPUTER APPLICATIONS information in HTML form and that will be processed by servlet and response will be generated back to the user.
- 13. Develop an application to demonstrate how the client (browser) can remember the last time it visited a page and displays the duration of time since its last visit. (Hint: use Cookie)
- 14. Develop an application to keep track of one user across several servlet invocations within the same browser session.

SEMESTER- II			
CORE - PRACTICAL IV - DATA MINING LAB (R LAB)			
Course Code: 21PCSCR4	Hrs / week :4	Hrs / Semester:	Credits :2
		60	

Using R programming language write programs for the following concepts:

- 1. Vectorization
- 2. Data frames and Matrices.
- 3. Functions-Calculator Designing
- 4. Scoping Rules
- 5. Loop functions
- 6. Basic statistics and graphics
- 7. Grammar of data manipulation (dplyr and related tools)
- 8. Debugging/profiling
- 9. Subsetting R objects

SEMESTER – III			
CORE PRACTICAL V DATA SCIENCE USING PYTHON LAB			
Course Code : 21PCSCR5	Hrs / Week : 4	Hrs / Sem : 60	Credits : 2

- 1. Given two NumPy arrays as matrices, output the result of multiplying the two matrices and its transpose of a matrix (as a NumPy array).
- 2. Calculate the difference between the maximum and the minimum values of a given NumPy array along the second axis.
- 3. Calculate the Average, Variance and Standard Deviation using NumPy.
- 4. Using a NumPy module create array and check the following:
  - Reshape 3x4 array to 2x2x3 array
  - Sequence of integers from 0 to 30 with steps of 5
  - Join two Arrays.
  - Split two Arrays.
- 5. Write a NumPy program that allows you to read and convert written data in a file into an array.
- 6. Create a Data Frame and List the attributes of a Data Frame.
- 7. Create a Data frame and list the functions that help in selecting the subset of the Data Frame.
- 8. Write a program to read .CSV file into the Data Frame and then convert it into Pandas Series.
- 9. Write a Pandas program for Handling Missing Data, i.e. is NaN.
- 10. Write a program to create data frame for 3 student including name and roll numbers. and add new columns for 5 subjects and 1 column to calculate percentage. It should include random numbers in marks of all subjects.
- 11. Draw the histogram based on the Production of Wheat in different Years Year:2000,2002,2004,2006,2008,2010,2012,2014,2016,2018 Production:4,6,7,15,24,2,19,5,16,
- 12. Write Panda function for Data Analysis and Manipulation.

SEMESTER – I			
ELECTIVE I A- ADVANCED COMPUTER ARCHITECTURE			
Course Code : 21PCSE11	Hrs / Week : 4	Hrs / Sem : 60	Credits : 4

## **Objectives:**

- To give the students a deep insight on the hardware organisation of a computer system.
- To understand various addressing modes.
- Learn the computer arithmetic principles and super scalar techniques
- Understand data storage and memory organisation

## **Course Outcomes:**

CO. No	Upon Completion of this course, students will be able to	PSOs	CL
		Addressed	
CO-1	understand the fundamental of computer structure.	3	Un
CO-2	perform computer arithmetic operations.	3,2	Ap
CO-3	apply the concept of cache mapping techniques.	3,1	Ap
CO-4	correlate the performance of I/O device	3	An
CO-5	conceptualize instruction level parallelism	3	An
CO-6	analyze different types of pipeline hazard	3	An
CO-7	apply various data transfer techniques in digital computer.	3,1	Ар
CO-8	analyze performance issues in processor and memory design of a digital computer.	5	An

## UNIT I: Review of basics and ISA design

CISC vs RISC - Performance measure of a computer: Performance measures, Performance parameters –Measuring the performance –Amdahl's Law and CPU performance. Benchmarks for evaluating the performance.

Design factors - operand and opcode types – Instruction formats and addressing modes – compiler Issues – structure of modern compilers.

## **UNIT II: Pipelining**

Pipelining: Definition – Basic characteristics of pipelined processing – Functional structure of pipelined computer – pipelined processor design principles - Performance issues-different types of Pipeline hazards.

#### **UNIT III: Parallelism**

Definition and types of parallelisms – Instruction level parallelism – Different typed of dependencies in programs. – Dynamic scheduling –Score boarding– Tomasulo''s approach-Branch prediction. Software Solution to ILP: Super Scalar architecture – static and dynamic scheduling on a super scalar architecture. VLIW architecture

## **UNIT IV: Shared Memory Architecture and Memory Organization**

Parallel processing Configurations – Flynn's classification – Centralized and distributed memory models. Communication models and memory architectures – Performance metrics for communication mechanisms- challenge- Cache coherence – Directory based cache coherence protocols. Memory hierarchy –strategies of Cache write – cache performance and improvements –Main Memory performance issues –Interleaved memory- Virtual Memory

#### UNIT V: Buses and I/O issues

I/O: Storage types, Busses –Bus transactions – I/O device Performance metrics – Queuing theory –Bus Standards –I/O transfer using memory bus -Connecting bus to Cache – **Net Exam Related Problems** 

## **Text Book:**

1. K.A.Parthasarathy. *Advanced Computer Architecture*. Thomson Learning, Indian 2<sup>nd</sup> Edition, 2006.

- 1. K. Hwang & F. A. Briggs. *Computer Architecture and Parallel Processing*. TMH, New Delhi 2004.
- 2. Kai Hwang & Naresh Jotwani. Advanced Computer Architecture Parallelism, Scalability, Programmability. McGraw Hill, 2<sup>nd</sup> Edition,2011
- 3. D. Sima, T. Fountain & P. Kacsuk. *Advanced Computer Architectures*. Pearson Education.

SEMESTER- I			
ELECTIVE I B- CRYPTOGRAPHY AND NETWORK SECURITY			
Course Code: 21PCSE12	Hrs / week :4	Hrs / Sem: 60	Credits :4

## **Objectives:**

- To make the students to learn the fundamental concepts of cryptography and network security and utilize these techniques in computing system.
- To understand cryptography and network security concepts
- To develop the knowledge in cryptography theories, algorithms and systems

# **Course Outcomes:**

CO. No.	Upon Completion of this course, students will be able to	PSOs	CL
		Addressed	
CO-1	understand the fundamental concepts of various encryption techniques	1,2	Un
CO-2	demonstrate the process to maintain the Confidentiality, Integrity and Availability of data	7	Ар
CO-3	distinguish between various algorithms for network security to protect against the threats in the networks	7	An
CO-4	apply the concept of Public key cryptography	1,7	Ар
CO-5	analyze solutions for effective key management and distribution	2,7	An
CO-6	apply and manage to secure a message over insecure channel by various means	7	Ар
CO-7	identify and apply the functional IP network security to protect against the threats in the networks	7	Ар
CO-8	explain the configuration of simple firewall architectures	7	Ap

# UNIT - I

Introduction: Information OSI Security Architecture - Security Attacks-Passive Attacks-Active Attacks-Security Services – Authentication-Access Control-Data Confidentiality-DataIntegrity-Nonrepudiation-AvailabilityService-Security Mechanisms- Model for Network security

# UNIT - II

Classical Encryption Techniques -Symmetric Cipher Model- Substitution Techniques - Transposition Techniques - Block Ciphers and the Data Encryption Standard-Block Cipher Principles - The Data Encryption Standard -Strength of DES-Advanced Encryption Standard -Evaluation Criteria for AES- The AES Cipher

## UNIT- III

Public-Key Cryptography and RSA: Principles of Public-Key Cryptosystems -The RSA Algorithm- Key Management - Diffie-Hellman Key Exchange- Message Authentication and Hash Functions: Authentication Requirements-Authentication Functions -Message Authentication Codes - Hash Functions

## UNIT - IV

IP Security: IP security overview, IP security architecture, Authentication header, Encapsulating security pay load, combining security association, Key management-Web security considerations, Secure socket layer, Secure electronic transaction.

## UNIT - V

System Security: Intruders - Intrusion Detection - Password Management-Malicious software, Viruses and related threats, virus counter measures-Firewalls: Firewall Design Principles-Trusted Systems - Common Criteria for Information Technology Security Evaluation

#### **Text Book:**

1. William Stallings. *Cryptography and Network Security Principles and Practices*. 6<sup>th</sup> Edition, 2013.

#### **References Books:**

1. Behrouz A. Ferouzan. *Cryptography & Network Security*, Tata McGraw Hill, 2007.

2. Charlie Kaufman, Radia Perlman and Mike Speciner. *Network Security*. Prentice Hall of India, 2002.

SEMESTER- II			
ELECTIVE II A – ADVANCED COMPUTER NETWORKS			
Course Code: 21PCSE21	Hrs / week :4	Hrs / Semester: 60	Credits :4

- To understand modern computer networks
- To familiarize routing algorithms
- To detect the technical problems in networking

## **Course Outcomes:**

CO.	Upon Completion of this course, students will be	PSOs	CL
No.	able to	Addressed	
CO-1	describe the evolution and History of Wireless	7	Un
	technology		
CO-2	analyse the wireless propagation channels.	7	An
CO-3	examine the Performance of ARQ Protocols, Ethernet	7	Ар
	LAN, Token Ring, RIP, TCP and UDP.		-
CO-4	identify the networking technologies and associated	7	An
	network standards.		
CO-5	solve technical problems in ARQ protocols, MAC	3,7	Ap
	protocols and Routing Algorithm.		
CO-6	construct the route discovery algorithm to determine the	2,7	Ар
	shortest path in an internet represented as a weighted		
	graph.		
CO-7	design and implement network architecture	7	An
CO-8	implementation of protocols like TCP, UDP and IP	7	Ар
	using OPNET and NS-2		

## UNIT- I: Wireless Services and Technical Challenges

Types of Services- Requirements for the services,-Multipath propagation-Spectrum Limitations-Noise and Interference limited systems-Principles of Cellular networks,-Multiple Access Schemes.

# UNIT- II: Wireless Propagation Channels

Propagation Mechanisms (Qualitative treatment)- Propagation effects with mobile radio- Channel Classification- Link calculations-Narrowband and Wideband models.

# Unit III: Internetworking devices and Data Link Layer

Repeaters – Hubs – Switches – Bridges: Transparent and Source Routing– Routers-Logical Link Control – Error Detection Techniques – ARQ protocols – Framing – HDLC – Point to Point protocol. Medium Access Control – Random access Protocols – Scheduling approaches to MAC.

# Unit IV: Local Area Networks& Wide Area Networks and Network Layer:

Ethernet- Token Bus/Ring , FDDI – Virtual LAN ,WAN Technologies – Frame Relay, ATM, Wireless LAN. Internetworking – IP Addressing – Subnetting – IPv4 and IPv6– Routing – Distance Vector and Link State Routing – Routing Protocols.

# Unit V: Transport Layer and Application Layer

Connection oriented and Connectionless Service – User Datagram Protocol – Transmission Control Protocol – Congestion Control –Domain Name System – Simple Mail Transfer Protocol – File Transfer Protocol – Hypertext Transfer Protocol .

# **Text Books:**

- 1. Andreas.F. Molisch. Wireless Communications. John Wiley India, 2006.
- 2. Alberto Leon-Garcia. Communication Networks. Tata McGraw-Hill, 2012.

- 1. Simon Haykin and Michael Moher. *Modern Wireless Communications*. Pearson Education, 2007.
- 2. Rappaport. T.S. Wireless communications. Pearson Education, 2003.
- 3. W. Stallings. Data and Computer Communications. Prentice Hall, 2007.
- 4. Fred Halsall. *Data communications, Computer Networks and Open systems*. Addis Wesley 2006.
- 5. Behrouz A. Forouzan .*Data Communications and Networking*.McGraw Hill Companies, Inc., 4<sup>th</sup> Edition ,2007.

SEMESTER- II			
ELECTIVE II B - SOFT COMPUTING			
Course Code: 21PCSE22	Hrs / week :4	Hrs / Sem: 60	Credits :4

- To solve real-world problems by providing approximate results that conventional and analytical models cannot solve.
- To understand the features, advantages and applications of Artificial Intelligence.
- To realize the revolution of artificial intelligence to develop hybrid systems for the industrial problems.

## **Course Outcomes:**

CO. No.	Upon Completion of this course, students will be able to	PSOs Addressed	CL
CO-1	understand the concepts of Artificial Intelligence and neural networks,	1	Un
CO-2	categorize different learning algorithms	3	An
CO-3	analyze the classification taxonomy of NN	3	An
CO-4	compare different network models	7	An
CO-5	comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.	2	Ар
CO-6	implement the concepts of fuzzy sets, knowledge representation using fuzzy rules	2	An
CO-7	identify and define approximate reasoning, fuzzy inference systems, and fuzzy logic	1	An
CO-8	analyze the genetic algorithms and their applications	3	An

## **UNIT – I: NEURAL NETWORKS FUNDAMENTALS**

Fundamentals of ANN: The Biological Neural Network, Artificial Neural Networks -Building Blocks of ANN and ANN terminologies: Architecture, setting of weights, activation functions-McCulloch-pitts Neuron Model-Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules – Hebbian Learning rule- Perceptron learning rule-Delta Learning Rule.

## **UNIT – II: CATEGORIES OF NEURAL NETWORKS**

Models of ANN: Single layer perceptron- Architecture, Algorithm, application procedure. Feedback Networks: Hopfield Net and BAM - Feed Forward Networks: Back propagation Network (BPN) and Radial Basis Function Network (RBFN) - Self Organizing Feature Maps: SOM and LVQ.

#### UNIT - III: BASIC CONCEPTS OF FUZZY SET

Fuzzy Sets, properties and operations - Fuzzy relations, cardinality, operations and properties of fuzzy relations, fuzzy composition

#### **UNIT – IV: MEMBERSHIP FUNCTION & FIS**

Fuzzy variables - Types of membership functions - fuzzy rules: Takagi and Mamdani - fuzzy inference systems: fuzzification, inference, rule base, defuzzification.

#### **UNIT-V: GENETIC ALGORITHMS**

Genetic Algorithm (GA): Biological terminology – elements of GA: encoding, types of selection, types of crossover, mutation, reinsertion – a simple genetic algorithm –General Genetic algorithm -The Schema Theorem - Classification of Genetic Algorithm - Applications of Genetic Algorithm.

#### **Text Books:**

- 1. S. N. Sivanandam, S. Sumathi and S.N. Deepa. Introduction to Neural Networks using MATLAB 6.0. Tata McGraw-Hill, New Delhi, 2006.
- 2. S. N. Sivanandam and S.N. Deepa. Principles of Soft Computing. Wiley-India, 2008.

- 1. Simon Haykin. Neural networks A Comprehensive Foundation. Pearson Prentice Hall, 2005
- 2. S.Rajasekaran and G.A.V.Pai. *Neural Networks, Fuzzy Logic and Genetic Algorithms*. PHI, 2004.
- 3. S.N.Sivanandam and S.N.Deepa. Introduction to Genetic Algorithms. Springer, 2007.
- 4. Timothy J.Ross. Fuzzy Logic with Engineering Application. McGraw Hill, 2000.
- 5. Davis E.Goldberg. *Genetic Algorithms: Search, Optimization and Machine Learning.* Addison Wesley, N.Y., 2003.

SEMESTER- III			
ELECTIVE I A- ORGANIZATIONAL BEHAVIOUR			
Course Code: 21PCSE31	Hrs / week :4	Hrs / Sem: 60	Credits :4

- To develop a basic understanding of individual behaviour and organisational change.
- To help the students to develop cognizance of the importance of human behaviour.
- To provide the students with the tools to understand and evaluate individual, group and organizational processes.

## **Course Outcomes:**

CO.No	Upon Completion of this course, students will be able to	PSO addressed	CL
CO-1	analyse the behaviour of individuals and groups in organisations in terms of the key factors that influence organizational behaviour	7	An
CO-2	evaluate personality types, perception and learning process on human behavior	7	Ар
CO-3	analyze the importance of Attitudes, Values, Job satisfaction	7	An
CO-4	describe the key components of Group formation and Group behaviour	7	An
CO-5	identify different motivational theories and evaluate motivational strategies used in a variety of organizational settings	7	Un
CO-6	analyze about human stress and the consequences of stress in an organization	7	An
CO-7	identify the various leadership styles and the role of leaders in a decision making process	7	Un
CO-8	assess the potential effects of organizational-level factors (structure and culture) on organizational behaviour	7	An

# UNIT – I

Introduction: Definition – Key Elements of OB – Nature and Scope of OB – Need for studying Organisational Behaviour – Evolution of OB – Development of OB – Foundations of Individual Behaviour – Personality

# UNIT – II

Perception: Introduction – Perception – Perception Differs from Sensation – Perceptual Process – Factors Affecting Perception – Impression Management – Attitudes: Concept – Formation – Types – Measurements – Change – Values: Concept – Types – Formation – Values and Behaviour – Job Satisfaction: Concept – Determinants – Measuring – Effects – Job Dissatisfaction – Learning

## UNIT – III

Motivation: Meaning –Nature – Motivation Cycle or Process – Need – Theories - Foundation of Group Behaviour: Definition and Characteristics of Group – Types of Groups – Stages of Group formation – Group Behaviour – Group Decision-Making – Organisational Conflicts

## $\mathbf{UNIT} - \mathbf{IV}$

Stress Management: Stress – Symptoms of Stress – Measurement of Stress – Causes or Sources of Stress – Consequences of Stress – Communication – Nature and Need for Communication – Process of Communication – Channels of Communication – Communication Networks – Leadership – Power and Politics

## $\mathbf{UNIT} - \mathbf{V}$

Organisation: Organisational Structure – Organisational Theory – Organisational Culture – Organisational Development – Organisational Effectiveness – Quality of Working Life

## **Text Book:**

1. S. S. Khanka. Organisational Behaviour. S. Chand Publishing, 2003.

- 1. Stephen P. Robins. *Organisational Behavior*. PHI Learning / Pearson Education, 11<sup>th</sup> edition, 2008.
- 2. Aswathappa, K. Organisational Behaviour. Himalaya Publication, 7th Edition, 2007.
- 3. Mrs. Amruta S. Oke, Sunil P. Ujagare, Mrs. Gauri M. Kulkarni and Vilas D. Nandavadekar. *Principles & Practice of Management&Organizational Behaviour*.Nirali publication, 2015.
- 4. Fred Luthans. Organisational Behavior.McGraw Hill, 11th Edition, 2001.

SEMESTER – III			
ELECTIVE I B - OBJECT ORIENTED SOFTWARE ENGINEERING			
Course Code : 21PCSE32	Hrs / Week : 4	Hrs / Sem : 60	Credits : 4

- To be a professional developer of software products
- To understand different conventions in software modelling
- To perform software testing and validation

## **Course Outcomes:**

CO.No	Upon Completion of this course, students will be able to	PSOs Addressed	CL
CO-1	design and implement a software system to meet desired needs.	3,6	Cr
CO-2	identify requirements of systems and applications.	3	An
CO-3	use modern software systems and tools.	3	Ар
CO-4	understand different software life cycle concept.	3	Un
CO-5	study and design SRS documents for software projects.	3	An
CO-6	study and model software projects using different modelling techniques.	3	An
CO-7	understand different techniques to map models to code	7	Un
CO-8	discuss about project organisation and communication	7	Ev

## UNIT I Software Life Cycle Models

System concepts – Project Organisation – Life cycle models – Unified Process – Iterative and Incremental – Workflow – Agile Processes-Project Planning and Estimation.

## UNIT II SRS Documentation and UML Diagram

Requirements Elicitation – Requirement Documentation – Use Cases – Unified Modeling language-Introduction.

Class diagrams – Sequence diagrams – Object diagrams – Deployment diagrams – Use case diagrams –State diagrams, Activity diagram, Component diagrams, Case Study, Identifying Classes – Noun Phrase Approach, Common class Pattern Approach, Use- Case Driven Approach, CRC.

## UNIT III Analysis Phase and Design Phase

Analysis Object Model (Domain Model)- Analysis Dynamic Models- Non-functional requirements – Analysis Patterns.

System Design Architecture – Design Principles – Design Concepts – Design Patterns – Architectural Styles – Dynamic Object Modeling – Static Object Modeling – Interface Specification – Object Constraint Language.

## UNIT IV Mapping and Testing & Implementation

Mapping Design(Models) to Code – Model Transformation – Refactoring – Mapping Associations – Mapping Activities.

Testing – Configuration Management – Maintenance process – System documentation – program evolution dynamics.

## UNIT V: Project Organization and Communication & Methodologies

Introduction: A Rocket Example - An Overview of Projects - Project Organization Concepts - Project Communication Concepts - Organizational Activities.-Introduction: The First Ascent of K2 - Project Environment - Methodology Issues - A Spectrum of Methodologies - Case Studies.

## **Text Book:**

1. Bernd Bruegge, Allen H. Dutoit .*Object-Oriented Software Engineering Using UML, Patterns, and Java,* 3rd Edition ,Pearson.

- 1. Bernd Bruegge and Alan H Dutoit. *Object Oriented Software Engineering*. Pearson Education, 2nd edition ,2004.
- 2. Craig Larman. Applying UML and Patterns. Pearson Education, 3rd edition 2005.
- 3. Stephen Schach. Software Engineering. McGraw-Hill, 7th edition 2007.
- 4. Ivar Jacobson, GrandyBooch and James Rumbaugh. *The Unified Software development Process.* Pearson Education, 1999.

Semester III			
SELF-STUDY COURSE – COURSE ON COMPETITIVE EXAMS			
Course Code: 21PCSSS1	Credits: 2		

- To provide a platform to the students for building the fundamentals of basic mathematics for competitive examinations preparation strategy
- Establish a framework to help students acquire knowledge and expertise necessary to secure employment opportunities in the government sector

CO. No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	Solve real life problems requiring interpretation and comparison of various representations of ratios.	2,6	Ap
CO-2	Distinguish between proportional and non-proportional situations and when appropriate apply proportional reasoning	6	An
CO-3	Solve problems applying probabilistic reasoning to make decisions	2	Ар
CO-4	Evaluate claims based on empirical, theoretical and subjective probabilities	6,4	Re
CO-5	Create and use visual displays of data	4	Cr
CO-6	Solve problems using high speed mental calculations	6	Ар
CO-7	Understand the basic concepts of logical reasoning skills.	1,4	Un
CO-8	Acquire satisfactory competency in use of data analysis	7	Un

#### **Course Outcomes:**

## UNIT - I

Number System (Including divisibility) – HCF and LCM (Including Factors, Multiples and Prime Factorization) (Chapter: 1&2, pages 1 – 46)

## UNIT - II

Fractions and Decimals – Square and Square roots, Cube and Cube Roots, Indices and Surds. (Chapter: 3 &4, pages 47 – 94)

# UNIT - III

Time, Work and Wages (Including Pipes & Cistern) – Time, Speed and Distance (Including Trains, Boats and Stream, Circular Motion, Races and Games. (Chapter: 15 & 16, pages 317 - 374)

## UNIT - IV

Permutations & combinations and Probability. (Chapter: 18, pages 391 - 416)

## UNIT - V

Set Theory (Including Venn Diagram) – Data Analysis and Data Interpretation (Including Caselet, Table, Line Graph, Bar Graph, Mixed Bar) (Chapter: 24 & 27, pages 559 – 570, 615 – 648)

#### **Text Book:**

1. Er.Deepak Agarwal and Mr.D.P.Gupta:Rapid Quantitative Aptitude with Shortcuts and Tricks for Competitive Exam, Disha Publication.

- 1. Dr.R.S.Aggarwal: Quantitative Aptitude for Competitive Examinations, S.Chand Publication.
- 2. Rajesh Verma, Fast Track Objective Arithemetic, Arihant Publication.