

J.J. COLLEGE OF ARTS AND SCIENCE (Autonomous)

PUDUKKOTTAI – 622422

DEPARTMENT OF COMPUTER SCIENCE

M.Sc. COMPUTER SCIENCE

Proposed Course Structure based on UGC - LOCF and TANSCH

(Choice Based Credit System)

(Applicable for the candidates admitted from the academic year 2022-2023 onwards)

	Programme Educational Objectives
PO – 1	To give learners a broader and deeper perspective on their chosen core areas
PO – 2	To promote application-oriented learning through Elective Courses
PO – 3	To initiate learners in Research Work
PO – 4	To develop Library and Reference skills through Assignments and Term Papers
PO – 5	To promote oratorical and rhetorical skills through participation in seminars, conferences, public viva and debates
PO – 6	To prepare learners for competitive examinations like NET, SLET, TRB and Civil Services
PO – 7	To cultivate leadership quality through training in event management

	Programme Outcomes
PO – 1	Adequate domain knowledge and critical thinking to enrich it further by self-study
PO – 2	Developed discipline specific skills in reasoning, analysis and communication
PO – 3	Acquired an aptitude for research in mono-disciplinary and multi-disciplinary areas
PO – 4	Become employable in specific areas involving expertise
PO – 5	Developed a keen sense of professional and social ethics

	Programme Specific Outcomes
PSO – 1	Ability to model, analyse, design, visualize and realize computational systems of varying size and complexity
PSO – 2	Ability to learn and use new development tools, software framework, middleware, programming language or methodology to aid in the development of software projects
PSO – 3	Ability to be an effective member of a multi-disciplinary software project development team with an awareness of individual, professional and ethical responsibilities
PSO – 4	Understand the contemporary research needs in the different areas of computer science
PSO – 5	Ability to develop technical and managerial skills needed to be an effective leader as an entrepreneur or in a software concern

M.Sc. COMPUTER SCIENCE

Sem.	Course Code	Course Title	Hrs / Week	Credit	Exam Hrs	Marks		Total
						Int.	Ext.	
I	P1R2CSCC1	Advanced Java Programming	6	5	3	25	75	100
	P1R2CSCC2P	Advanced Java Practical	6	5	3	40	60	100
	P1R2CSCC3	Advanced Web Technology	6	5	3	25	75	100
	P1R2CSCC4P	Advanced Web Technology Practical	6	5	3	40	60	100
	P1R2CSDSE1: 1/1:2	Any one from the List	6	3	3	25	75	100
TOTAL			30	23				500
II	P2R2CSCC5	Internet of Things	5	5	3	25	75	100
	P2R2CSCC6	Digital Image Processing	5	5	3	25	75	100
	P2R2CSCC7P	Image Processing Practical	5	5	3	40	60	100
	P2R2CSCC8	Data Science and Big data Analytics	5	5	3	25	75	100
	P2R2CSCC9	Mobile Computing	5	5	3	25	75	100
	P2R2CSDSE2: 1/2:2	Any one from the List	5	3	3	25	75	100
TOTAL			30	28				600
III	P3R2CSCC10	Design and Analysis of Algorithms	5	5	3	25	75	100
	P3R2CSCC11P	Design and Analysis of Algorithms Practical	5	5	3	40	60	100
	P3R2CSCC12	Machine Learning	5	5	3	25	75	100
	P3R2CSCC13	Advanced Database Management Systems	5	5	3	25	75	100
	P3R2CSCC14	Cloud Computing	5	5	3	25	75	100
	P3R2CSSEC1: 1/1:2	Any one from the List	5	3	3	25	75	100
TOTAL			30	28				600
IV	P4R2**GEC1	Generic Elective Course – To be chosen from other department	6	3	3	25	75	100
	P4R2CSCC15P W	Project Work	24	8		20	80	100
TOTAL			30	11				200
GRAND TOTAL			120	90				1900

- CC** – **Core Course**
DSE – **Discipline Specific Elective Course**
SEC – **Skill Enhancement Course**
GEC – **Generic Elective Course**

DISCIPLINE SPECIFIC ELECTIVE COURSES OFFERED

Discipline Specific Elective Course I : (Any one from the list)

1. WAP & XML
2. Cryptography and Network Security

Discipline Specific Elective Course II : (Any one from the list)

1. Data Mining and Data Warehousing
2. Object Oriented System Development

SKILL ENHANCEMENT ELECTIVE COURSES OFFERED

Skill Enhancement Elective Courses : (Any one from the list)

1. Soft Computing
2. Compiler Design

GENERIC ELECTIVE COURSES

Generic Elective Courses: (Any one from the list)

1. Ethical Hacking
2. Digital marketing

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Core Course I - Advanced Java Programming

SEMESTER	CREDITS	INSTRUCTION HOURS	COURSE CODE	MARKS			PURPOSE OF THE COURSE
				INT	EXT	TOTAL	
I	5	72	P1R2CSCC1	25	75	100	EMPLOYABILITY

COURSE OBJECTIVES

- To communicate between processes using network sockets
- To give details about the effective use of Applet and Swing
- To provide knowledge about JDBC and its classes
- To develop web pages using advance server-side programming through servlets
- To inculcate knowledge about Java Lambda Expression

UNIT-I: Networking

HOURS: 15

Structured - TCP / IP client sockets - TCP / IP server sockets - URL - URL Connection - Datagrams - Client / Server application using RMI.

UNIT-II: Applet Fundamentals

HOURS: 14

Applet Fundamentals- Applet Class - Applet lifecycle- Steps for Developing Applet Programs- Passing Values through Parameters- Graphics in Applets- GUI Application - Dialog Boxes - Creating Windows - Layout Managers – AWT Component classes – Swing component classes- Borders – Event handling with AWT components - AWT Graphics classes - File Choosers - Color Choosers – Tree – Table –Tabbed panels–Progressive bar - Sliders.

UNIT-III: JDBC

HOURS: 14

JDBC -Introduction - JDBC Architecture - JDBC Classes and Interfaces – Database Access with MySQL -Steps in Developing JDBC application - Creating a New Database and Table with JDBC -Working with Database Metadata; Java Networking Basics of Networking - Networking in Java- Socket Program using TCP/IP - Socket Program using UDP- URL and Inet address classes.

UNIT-IV: Servlet

HOURS: 15

Servlet: Advantages over Applets - Servlet Alternatives - Servlet Strengths - Servlet Architecture - Servlet Life Cycle – Generic Servlet, Http Servlet - First Servlet - Invoking Servlet - Passing Parameters to Servlets - Retrieving Parameters - Server-Side Include – Cookies- JSP Engines - Working with JSP - JSP and Servlet - Anatomy of a JSP Page- Database Connectivity using Servlets and JSP.

UNIT-V: Lambda Expressions

HOURS: 14

Lambda Expressions- Method Reference- Functional Interface-Streams API, Filters- Optional Class- Nashorn- Base 64 EncodeDecode- JShell(RPEL)- Collection Factory Methods- Private Interface Methods- Inner Class Diamond Operator- Multiresolution Image API.

TEXTBOOKS

1. Herbert Schildt, “Java: A Beginner Guide”, Oracle Press-Seventh Edition. (1st, 2nd and 3rd Units).

2. Murach's, "Java Servlets and JSP", 2nd Edition, Mike Murach & Associates Publishers; 3rd Edition. (4th Unit).
3. Warburton Richard, "Java 8 Lambdas", Shroff Publishers & Distributors Pvt Ltd. (5th Unit).

REFERENCE BOOKS

1. Paul Deitel and Harvey Deitel, "Java: How to Program", PrenticeHall Publishers; 9th Edition.
2. Jan Graba, "An Introduction to Network Programming with Java-Java 7 Compatible", 3rd Edition, Springer.

WEB REFERENCES

1. <https://www.w3schools.blog/java-networking-tutorial#:~:text=Java%20network%20programming%20provides%20the,classes%20for%20java%20network%20programming.>
2. <https://www.w3schools.in/java/java-applets>
3. <https://www.w3schools.blog/servlet-tutorial>
4. https://www.w3schools.com/java/java_lambda.asp

COURSE OUTCOMES

On successful completion of this course, the students would be able to

	COURSE OUTCOMES	KNOWLEDGE LEVEL
CO: 1	Demonstrate the basics of networking and Develop Java client/server applications	K2
CO: 2	Able to develop a Graphical User Interface (GUI) with Applet and Swing.	K3
CO: 3	Analyze about JDBC and its classes and able to connect with back end resources.	K4
CO: 4	Develop servlets, handle cookies and session tracking	K2
CO: 5	Adapt to run, debug Lambda expression	K6

CO – PO MAPPING

RELATIONSHIP MATRIX FOR CO, PO & PSO											
	Program Outcomes					Program Specific Outcomes					Mean Relationship
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	
CO 1	2	1	3	1	2	2	2	2	1	1	1.7
CO 2	3	3	2	3	3	3	3	3	3	2	2.8
CO 3	2	2	3	3	3	3	3	3	2	2	2.6
CO 4	1	2	3	3	3	3	3	3	3	3	2.7
CO 5	2	2	2	3	3	2	2	3	3	3	2.5

Mean Relationship value is **2.46** which is **HIGH**

Core Course II - Advanced Java Programming Practical

SEMESTER	CREDITS	COURSE CODE	MARKS			PURPOSE OF THE COURSE
			INT	EXT	TOTAL	
I	3	P1R2CSCC2P	40	60	100	EMPLOYABILITY

COURSE OBJECTIVES

- To train the students to work on applets
- To make practice swing controls
- To train the students create Cookie and its methods
- Servlets are also created and worked on
- To encourage the students to create Java bean

1. Applet which will play two sound notes in a sequence continuously use the play() methods available in the applet class and the methods in the Audio clip interface.
2. JApplet using swing control, which will create the layout shown below and handle necessary events.

Enter your Name:

Enter your Age:

Select your s/w: * Oracle *Visual Basic *Java

Select your city: *Delhi *Mumbai *Chennai

OK Cancel

3. Create Table, insert and update data.
4. Client/Server application using RMI.
5. Cookie and set the expiry time of the same.
6. Servlet to count the number of visitors to a web page.
7. Form and validate a password using Servlet.
8. Perform common stream operation
 - a) A function that adds up numbers (i.e) int
addUp(Stream<Integer> numbers)
 - b) A function that takes in artists and returns a list of strings with names and places of origin
9. Convert an image in RGB to a Gray scale image.
10. Chat Server using Java.

COURSE OUTCOMES:

On successful completion of this course, the students would be able to:

	COURSE OUTCOMES	KNOWLEDGE LEVEL
CO: 1	Experiment with applets	K3
CO: 2	Develop applications using swing controls.	K3
CO: 3	Construct Cookies.	K6
CO: 4	Make use of Servlets and work on it	K3
CO: 5	Formulate Lambda Expressions	K6

CO – PO MAPPING

RELATIONSHIP MATRIX FOR CO, PO & PSO											
	Program Outcomes					Program Specific Outcomes					Mean Relationship
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	
CO 1	3	3	3	2	2	3	3	3	2	1	2.5
CO 2	2	3	3	3	3	3	3	3	2	2	2.7
CO 3	3	3	3	2	3	3	3	2	2	2	2.6
CO 4	3	3	2	3	3	3	3	2	2	2	2.6
CO 5	3	3	2	3	2	3	3	3	2	2	2.6

Mean Relationship value is **2.6** which is **HIGH**

Core Course III - Advanced Web Technology

SEMESTER	CREDITS	INSTRUCTION HOURS	COURSE CODE	MARKS			PURPOSE OF THE COURSE
				INT	EXT	TOTAL	
I	5	72	P1R2CSCC3	25	75	100	EMPLOYABILITY

COURSE OBJECTIVES

- To explore the backbone of web page creation by developing .NET skill.
- To enrich knowledge about HTML control and web control classes
- To provide depth knowledge about ADO.NET
- To understand the need of usability, evaluation methods for webservice
- To know about the concepts of Component based programming

UNIT–I: Overview of ASP.NET

HOURS: 15

OVERVIEW OF ASP.NET - The .NET framework – Learning the .NET languages Data types – Declaring variables- Scope and Accessibility- Variable operations- Object Based manipulation- Conditional Structures- Loop Structures- Functions and Subroutines. Types, Objects and Namespaces : The Basics about Classes- Value types and Reference types- Advanced class programming- Understanding name spaces and assemblies. Setting Up ASP.NET and IIS.

UNIT– II: Developing ASP.NET

HOURS: 15

Developing ASP.NET Applications - ASP.NET Applications: ASP.NET applications– Code behind- The Global.asax application file- Understanding ASP.NET Classes- ASP.NET Configuration. Web Form fundamentals: A simple page applet- Improving the currency converter- HTML control classes- The page class- Accessing HTML server controls. Web controls: Web Control Classes – AutoPostBack and Web Control events- Accessing web controls. Using Visual Studio.NET: Starting a Visual Studio.NET Project- Web form Designer- Writing code- Visual studio.NET debugging. Validation and Rich Controls: Validation- A simple Validation example- Understanding regular expressions- A validated customer form. State management - Tracing, Logging, and Error Handling.

UNIT– III: ADO.NET

HOURS: 14

Working with Data - Overview of ADO.NET - ADO.NET and data management- Characteristics of ADO.NET-ADO.NET object model. ADO.NET data access : SQL basics– Select , Update, Insert, Delete statements- Accessing data- Creating a connection- Using a command with a DataReader - Accessing Disconnected data - Selecting multiple tables – Updating Disconnected data. Data binding: Single value Data Binding- Repeated value data binding- Data binding with data bases. Data list – Data grid – Repeater – Files, Streams and Email – Using XML

UNIT– IV: Web Services

HOURS:14

Web Services - Web services Architecture : Internet programming then and now- WSDL– SOAP- Communicating with a web service-Web service discovery and UDDI. Creating Web

services : Web service basics- The StockQuote web service – Documenting the web service- Testing the web service- Web service Data types- ASP.NET intrinsic objects. Using web services: Consuming a web service- Using the proxy class- An example with TerraService.

UNIT – V: Advanced ASP.NET

HOURS:14

Advanced ASP.NET - Component Based Programming: Creating a simple component – Properties and state- Database components- Using COM components. Custom controls: User Controls- Deriving Custom controls. Caching and Performance Tuning: Designing and scalability– Profiling- Catching- Output catching- Data catching. Implementing security: Determining security requirements- The ASP.NET security model- Forms authentication- Windows authentication.

TEXT BOOK

1. Mathew Mac Donald, “ASP.NET Complete Reference”, TMH2005.

REFERENCE BOOKS:

1. Crouch Matt J, “ASP.NET and VB.NET Web Programming”, Addison Wesley 2002.
2. J.Liberty, D.Hurwitz, “Programming ASP.NET”, Third Edition, O’REILLY, 2006.

WEB REFERENCES

1. <https://www.w3schools.com/asp/>
2. https://www.w3schools.com/asp/ado_intro.asp
3. https://www.w3schools.com/xml/xml_services.asp

COURSE OUTCOMES

On the successful completion of this course, students would be able to:

	COURSE OUTCOMES	KNOWLEDGE LEVEL
CO: 1	Design a web page with Web form fundamentals and web control classes	K6
CO: 2	Identify the importance of validation control, cookies and session	K3
CO: 3	Apply the knowledge of ASP.NET object, ADO.NET data access and SQL to develop a client server model.	K3
CO: 4	Distinguish Data list and Data grid controls in accessing data.	K4
CO: 5	Explain the concepts of Component based programming	K5

CO – PO MAPPING

RELATIONSHIP MATRIX FOR CO, PO & PSO											
	Program Outcomes					Program Specific Outcomes					Mean Relationship
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	
CO 1	3	3	3	2	2	2	2	2	3	2	2.4
CO 2	2	3	1	3	3	3	3	3	3	3	2.7
CO 3	2	2	2	2	1	2	2	2	3	2	2.0
CO 4	2	2	2	2	2	3	3	3	3	3	2.5
CO 5	3	3	3	3	3	3	3	3	2	3	2.9

Mean Relationship value is 2.5 which is **HIGH**

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## Core Course IV - Advanced Web Technology

| SEMESTER | CREDITS | COURSE CODE | MARKS |     |       | PURPOSE OF THE COURSE |
|----------|---------|-------------|-------|-----|-------|-----------------------|
|          |         |             | INT   | EXT | TOTAL |                       |
| I        | 5       | P1R2CSCC4P  | 40    | 60  | 100   | EMPLOYABILITY         |

### COURSE OBJECTIVES

- To explore the backbone of web page creation by developing .NET skill.
- To enrich knowledge about HTML control and web control classes
- To provide depth knowledge about ADO.NET
- To understand the need of usability, evaluation methods for webservice
- To know about the concepts of Component based programming

1. Create an ASP. Net application of your own to carry out loop structures and control structures.
2. Create an an ASP. Net application for e mail registration using html controls.
3. Create an an ASP. Net application for ticket reservation using web controls.
4. Develop an ASP. Net application for any online registration and use validation controls.
5. Implement an application using ADO. net for displaying the back end data through grid view.
6. Create an application for implementing create and insert on Front end .Net using ADO. Net.
7. Develop a web application using ADO. Net for performing all data manipulations on the. Net application.
8. Develop an an ASP. Net application for exception handling.
9. Create an online shopping site for web services.
10. Create an application for Employee details and use form authentication model.

### COURSE OUTCOMES

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

|       | COURSE OUTCOMES                                                                                      | KNOWLEDGE LEVEL |
|-------|------------------------------------------------------------------------------------------------------|-----------------|
| CO: 1 | Design a web page with Web form fundamentals and web control classes                                 | K6              |
| CO: 2 | Identify the importance of validation control, cookies and session                                   | K3              |
| CO: 3 | Apply the knowledge of ASP.NET object, ADO.NET data access and SQL to develop a client server model. | K3              |
| CO: 4 | Create an online shopping site for web services                                                      | K4              |
| CO: 5 | Explain the concepts of Component based programming                                                  | K5              |

CO – PO MAPPING

| RELATIONSHIP MATRIX FOR CO, PO & PSO |                  |      |      |      |      |                           |       |       |       |       |              |
|--------------------------------------|------------------|------|------|------|------|---------------------------|-------|-------|-------|-------|--------------|
|                                      | Program Outcomes |      |      |      |      | Program Specific Outcomes |       |       |       |       | Mean         |
|                                      | PO 1             | PO 2 | PO 3 | PO 4 | PO 5 | PSO 1                     | PSO 2 | PSO 3 | PSO 4 | PSO 5 | Relationship |
| CO 1                                 | 3                | 2    | 2    | 3    | 3    | 3                         | 3     | 3     | 2     | 3     | 2.7          |
| CO 2                                 | 2                | 2    | 3    | 3    | 3    | 2                         | 2     | 2     | 2     | 2     | 2.3          |
| CO 3                                 | 3                | 3    | 3    | 3    | 2    | 3                         | 3     | 3     | 3     | 3     | 2.9          |
| CO 4                                 | 2                | 2    | 2    | 2    | 3    | 3                         | 2     | 3     | 3     | 2     | 2.4          |
| CO 5                                 | 3                | 3    | 3    | 3    | 3    | 3                         | 3     | 3     | 3     | 3     | 3.0          |

Mean Relationship value is **2.66** which is **HIGH**

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## Core Course V – Internet of Things

| SEMESTER | CREDITS | INSTRUCTION HOURS | COURSE CODE | MARKS |     |       | PURPOSE OF THE COURSE |
|----------|---------|-------------------|-------------|-------|-----|-------|-----------------------|
|          |         |                   |             | INT   | EXT | TOTAL |                       |
| II       | 5       | 60                | P2R2CSCC5   | 25    | 75  | 100   | SKILL DEVELOPMENT     |

### COURSE OBJECTIVES

- To assess the vision and introduction of IoT
- To understand IoT Market perspective
- To implement data and knowledge management and use of Devices in IoT Technology
- To apply Map-Reduce concept of applications and classify Real World IoT Design Constraints, Industrial Automation in IoT
- To introduce the applications of IoT

### UNIT- I Introduction to IoT

**HOURS: 12**

INTRODUCTION To IoT: Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels and Deployment Templates - Domain Specific IoTs - IoT and M2M - IoT System Management with NETCONF-YANG- IoT Platforms DesignMethodology.

### UNIT II IoT Architecture

**HOURS: 12**

IoT ARCHITECTURE: M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - information model - functional model - communication model - IoT reference architecture

### UNIT III IoT PROTOCOLS

**HOURS: 12**

IoT PROTOCOLS: Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LowPAN - CoAP - Security

### UNIT IV WEB OF THINGS

**HOURS: 12**

WEB OF THINGS: Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence. Cloud of Things: Grid/SOA and Cloud Computing – Cloud Middleware – Cloud Standards – Cloud Providers and Systems – Mobile Cloud Computing – The Cloud of Things Architecture.

### UNIT V APPLICATIONS

**HOURS: 12**

APPLICATIONS: The Role of the Internet of Things for Increased Autonomy and Agility in Collaborative Production Environments - Resource Management in the Internet of Things: Clustering, Synchronisation and Software Agents. Applications - Smart Grid – Electrical Vehicle Charging.

### TEXT BOOKS

1. Arshdeep Bahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2015.

2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.
3. Jan Ho" ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to- Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
4. Networks, Crowds, and Markets: Reasoning About a Highly Connected World - David Easley and Jon Kleinberg, Cambridge University Press - 2010.
5. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012.

## WEB REFERENCES

1. [https://www.tutorialspoint.com/internet\\_of\\_things/index.htm](https://www.tutorialspoint.com/internet_of_things/index.htm)
2. <https://www.geeksforgeeks.org/introduction-to-internet-of-things-iot-set-1/>
3. <https://www.w3.org/WoT/>

## COURSE OUTCOMES

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

|       | COURSE OUTCOMES                                                                 | KNOWLEDGE LEVEL |
|-------|---------------------------------------------------------------------------------|-----------------|
| CO: 1 | Interpret the state of Art architecture in IoT                                  | K2              |
| CO: 2 | Determine the market perspective of IoT                                         | K5              |
| CO: 3 | Develop knowledge about the use of Devices, Gateways and Data management in IoT | K6              |
| CO: 4 | Interpret the vision of IoT from a global context                               | K2              |
| CO: 5 | Analyze the applications of IoT                                                 | K4              |

## CO – PO MAPPING

| RELATIONSHIP MATRIX FOR CO, PO & PSO |                  |      |      |      |      |                           |       |       |       |       |                   |
|--------------------------------------|------------------|------|------|------|------|---------------------------|-------|-------|-------|-------|-------------------|
|                                      | Program Outcomes |      |      |      |      | Program Specific Outcomes |       |       |       |       | Mean Relationship |
|                                      | PO 1             | PO 2 | PO 3 | PO 4 | PO 5 | PSO 1                     | PSO 2 | PSO 3 | PSO 4 | PSO 5 |                   |
| CO 1                                 | 2                | 3    | 2    | 3    | 3    | 3                         | 3     | 3     | 3     | 3     | 2.8               |
| CO 2                                 | 2                | 2    | 2    | 2    | 2    | 3                         | 3     | 3     | 2     | 3     | 2.4               |
| CO 3                                 | 3                | 3    | 3    | 3    | 3    | 3                         | 3     | 3     | 2     | 3     | 2.9               |
| CO 4                                 | 3                | 2    | 3    | 3    | 2    | 3                         | 3     | 3     | 2     | 3     | 2.7               |
| CO 5                                 | 3                | 2    | 3    | 2    | 3    | 2                         | 2     | 2     | 3     | 2     | 2.4               |

Mean Relationship value is **2.64** which is **HIGH**

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Core Course VI – Digital Image Processing

SEMESTER	CREDITS	INSTRUCTION HOURS	COURSE CODE	MARKS			PURPOSE OF THE COURSE
				INT	EXT	TOTAL	
II	5	60	P2R2CSCC6	25	75	100	SKILL DEVELOPMENT

COURSE OBJECTIVES

- To explore the algorithms and techniques involved in Digital Image Processing
- To learn advanced image enhancement techniques
- To study the image compression techniques
- To study the technique of image restoration
- To learn the techniques of segmentation

UNIT-I: Fundamentals

HOURS: 12

Fundamentals: Image Sensing and Acquisition, Image Sampling and Quantization, relationship between Pixels; Random noise; Gaussian Markov Random Field, σ -field, Linear and Non-linear Operations; Image processing models: Causal, Semi-causal, Non-causal models.

Color Models: Color Fundamentals, Color Models, Pseudo-color Image Processing, Full Color Image Processing, Color Transformation, Noise in Color Images.

UNIT-II: Spatial Domain

HOURS: 12

Spatial Domain: Enhancement in spatial domain: Point processing; Mask processing; Smoothing Spatial Filters; Sharpening Spatial Filters; Combining Spatial Enhancement Methods.

Frequency Domain: Image transforms: FFT, DCT, Karhunen-Loeve transform, Hotelling's T² transform, Wavelet transforms and their properties. Image filtering in frequency domain.

UNIT-III: Edge Detection

HOURS: 12

Edge Detection: Types of edges; threshold; zero-crossing; Gradient operators: Roberts, Prewitt, and Sobel operators; residual analysis based technique; Canny edge detection. Edge features and their applications.

UNIT-IV: Image Compression

HOURS: 12

Image Compression: Fundamentals, Image Compression Models, Elements of Information Theory. Error Free Compression: Huff-man coding; Arithmetic coding; Wavelet transform based coding; Lossy Compression: FFT; DCT; KLT; DPCM; MRFM based compression; Wavelet transform based; Image Compression standards.

UNIT-V: Image Segmentation

HOURS: 12

Image Segmentation: Detection and Discontinuities: Edge Linking and Boundary Deduction; Threshold; Region-Based Segmentation. Segmentation by Morphological watersheds. The use of motion in segmentation, Image Segmentation based on Color. **Morphological Image**

Processing: Erosion and Dilation, Opening and Closing, Hit-Or-Miss Transformation, Basic Morphological Algorithms, Gray-Scale Morphology.

TEXT BOOKS

1. Rafael Gonzalez, Richard E. Woods, “Digital Image Processing”, Fourth Edition, PHI/Pearson Education, 2013.
2. A. K. Jain, Fundamentals of Image Processing, Second Ed., PHI, New Delhi, 2015.

REFERENCE BOOKS

1. B. Chan la, D. Dutta Majumder, “Digital Image Processing and Analysis”, PHI, 2003.
2. Nick Elford, “Digital Image Processing a practical introducing using Java”, Pearson Education, 2004.
3. Todd R. Reed, “Digital Image Sequence Processing, Compression, and Analysis”, CRC Press, 2015.
4. L. Prasad, S.S. Iyengar, “Wavelet Analysis with Applications to Image Processing”, CRC Press, 2015.

WEB REFERENCES

1. <https://www.tutorialspoint.com/dip/index.htm>
2. https://homepages.inf.ed.ac.uk/rbf/CVonline/LOCAL_COPIES/OWENS/LECT5/node3.html
3. <https://www.geeksforgeeks.org/image-edge-detection-operators-in-digital-image-processing/>

COURSE OUTCOMES

On the successful completion of this course, students would be able to:

	COURSE OUTCOMES	KNOWLEDGE LEVEL
CO: 1	Examine the fundamental concepts of a digital image processing system and Analyze images in the frequency domain using various transforms	K4
CO: 2	Evaluate the techniques for image enhancement and image restoration. Categorize various compression techniques	K5
CO: 3	Interpret Image compression standards, and Interpret image segmentation and representation techniques	K2
CO: 4	Apply the techniques of Image Restoration	K3
CO: 5	Develop knowledge on Image Segmentation a Apply Basic Morphological Algorithms	K6

CO – PO MAPPING

RELATIONSHIP MATRIX FOR CO, PO & PSO											
	Program Outcomes					Program Specific Outcomes					Mean
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	Relationship
CO 1	3	3	3	2	2	3	3	3	3	3	2.8
CO 2	3	3	3	2	3	3	3	3	2	3	2.8
CO 3	2	2	2	3	2	2	2	2	3	2	2.2
CO 4	2	3	3	3	3	3	3	3	2	3	2.8
CO 5	3	3	3	3	3	3	3	3	2	3	2.9

Mean Relationship value is 2.7 which is **HIGH**

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## Core Course VII –Image Processing Practical

| SEMESTER | CREDIT | COURSE CODE | MARKS |     |       | PURPOSE OF THE COURSE |
|----------|--------|-------------|-------|-----|-------|-----------------------|
|          |        |             | INT   | EXT | TOTAL |                       |
| II       | 3      | P2R2CSCC7P  | 40    | 60  | 100   | SKILL DEVELOPMENT     |

### COURSE OBJECTIVES

- To understand the algorithms and techniques involved in Digital Image Processing
  - To learn advanced image enhancement techniques
  - To study the image compression techniques
  - To study the technique of image restoration
  - To learn the techniques of segmentation
- 
1. Simulation and Display of an Image, Negative of an Image(Binary & Gray Scale)
  2. Implementation of Relationships between Pixels
  3. Implementation of Transformations of an Image
  4. Contrast stretching of a low contrast image, Histogram, and Histogram Equalization
  5. Display of bit planes of an Image
  6. Display of FFT(1-D & 2-D) of an image
  7. Computation of Mean, Standard Deviation, Correlation coefficient of the given Image
  8. Implementation of Image Smoothing Filters(Mean and Median filtering of an Image)
  9. Implementation of image sharpening filters and Edge Detection using Gradient Filters
  10. Image Compression by DCT,DPCM, HUFFMAN coding
  11. Implementation of image restoring techniques
  12. Implementation of Image Intensity slicing technique for image enhancement
  13. Canny edge detection Algorithm

## COURSE OUTCOMES

On the successful completion of this course, students would be able to:

|       | COURSE OUTCOMES                                                               | KNOWLEDGE LEVEL |
|-------|-------------------------------------------------------------------------------|-----------------|
| CO: 1 | Illustrate the algorithms and techniques involved in Digital Image Processing | K2              |
| CO: 2 | Experiment the advanced image enhancement techniques                          | K3              |
| CO: 3 | Categories the image compression techniques                                   | K2              |
| CO: 4 | Apply the techniques of image restoration                                     | K3              |
| CO: 5 | Analyze and apply the techniques of segmentation                              | K3, K4          |

## CO – PO MAPPING

| RELATIONSHIP MATRIX FOR CO, PO & PSO |                  |      |      |      |      |                           |       |       |       |       |                   |
|--------------------------------------|------------------|------|------|------|------|---------------------------|-------|-------|-------|-------|-------------------|
|                                      | Program Outcomes |      |      |      |      | Program Specific Outcomes |       |       |       |       | Mean Relationship |
|                                      | PO 1             | PO 2 | PO 3 | PO 4 | PO 5 | PSO 1                     | PSO 2 | PSO 3 | PSO 4 | PSO 5 |                   |
| CO 1                                 | 2                | 2    | 2    | 3    | 2    | 3                         | 3     | 3     | 2     | 2     | 2.4               |
| CO 2                                 | 3                | 3    | 3    | 3    | 2    | 3                         | 2     | 2     | 3     | 2     | 2.6               |
| CO 3                                 | 2                | 2    | 2    | 2    | 2    | 2                         | 2     | 2     | 2     | 2     | 2.0               |
| CO 4                                 | 3                | 2    | 3    | 1    | 2    | 3                         | 3     | 2     | 3     | 2     | 2.4               |
| CO 5                                 | 2                | 2    | 2    | 2    | 2    | 2                         | 2     | 3     | 3     | 2     | 2.2               |

Mean Relationship value is **2.32** which is **HIGH**

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Core Course VIII – Data Science and Big Data Analytics

SEMESTER	CREDITS	INSTRUCTION HOURS	COURSE CODE	MARKS			PURPOSE OF THE COURSE
				INT	EXT	TOTAL	
II	5	60	P2R2CSCC8	25	75	100	SKILL DEVELOPMENT

COURSE OBJECTIVES

- To understand Big data structure and analyze Big data
- To learn about different analytical methods using R
- To understand how to implement advanced analytical theory and methods
- To acquire knowledge on classification techniques
- To know about the advanced analytics- Technology and tools

UNIT – I: Big Data Analytics

HOURS: 12

Introduction to Big Data Analytics : Big Data Overview – Data Structures – Analyst Perspective on Data Repositories - State of the Practice in Analytics – BI Versus Data Science - Current Analytical Architecture – Drivers of Big Data – Big Data Ecosystem - Data Analytics Lifecycle – Data Discovery – Data Preparation – Model Planning – Model Building – Communicate Results – Operationalize.

UNIT – II: Basic Data Analytic Methods Using R

HOURS: 12

Basic Data Analytic Methods Using R : Introduction to R programming – R Graphical User Interfaces – Data Import and Export Attribute and Data Types – Descriptive Statistics Exploratory Data Analysis : Visualization Before Analysis – Dirty Data – Visualizing a Single Variable – Examining Multiple Variables Data Exploration Versus Presentation -- Statistical Methods of Evaluation : Hypothesis Testing – Difference of Means – Wilcoxon Rank-Sum Test – Type I and Type II Errors – Power and Sample Size – ANOVA..

UNIT – III: Advanced Analytical Theory and Methods

HOURS: 12

Advanced Analytical Theory and Methods: Clustering – K Means – Use Cases – Overview – Determining number of clusters – Diagnostics Reasons to choose and cautions – Additional Algorithms - Association Rules : A Priori Algorithm – Evaluation of Candidate Rules Applications of Association Rules – Validation and Testing – Diagnostics. Regression : Linear Regression and Logistic Regression :- Use cases – Model Description – Diagnostics - Additional Regression Models.

UNIT – IV: Classification

HOURS: 12

Classification : Decision Trees – Overview – Genetic Algorithm – Decision Tree Algorithms – Evaluating Decision Tree – Decision Trees in R - Naïve Bayes – Bayes Theorem – Naïve Bayes Classifier – Smoothing – Diagnostics – Naïve Bayes in R – Diagnostics of Classifiers – Additional Classification Methods - Time Series Analysis : Overview – Box – Jenkins Methodology – ARIMA Model – Autocorrelation Function – Autoregressive Models – Moving Average Models – ARMA and ARIMA Models – Building and Evaluating and ARIMA Model - Text Analysis : Text Analysis Steps – Example – Collecting –

Representing Term Frequency – Categorizing – Determining Sentiments – Gaining Insights.

UNIT – V: Advanced Analytics-Technology and Tools

HOURS: 12

Advanced Analytics-Technology and Tools: MapReduce and Hadoop : Analytics for Unstructured Data :- UseCases - MapReduce - Apache Hadoop – The Hadoop Ecosystem – pig – Hive – Hbase – Manout – NoSQL - Tools in Database Analytics : SQL Essentials – Joins – Set operations – Grouping Extensions – In Database Text Analysis - Advanced SQL – Windows Functions – User Defined Functions and Aggregates – ordered aggregates- MADiib – Analytics Reports Consolidation – Communicating and operationalizing and Analytics Project – Creating the Final Deliverables : Developing Core Material for Multiple Audiences – Project Goals – Main Findings – Approach Model Description – Key points support with Data - Model details – Recommendations – Data Visualization

TEXT BOOK

1. Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data”, EMC Education Services Published by John Wiley & Sons, Inc. 2015

REFERENCE BOOKS

1. Noreen Burlingame , “The little book on Big Data”, New Streetpublishers, 2012.
2. Anil Maheshwari, “ Data Analytics”, McGraw Hill Education, 2017.
3. Norman Matloff, “The Art of R Programming: A Tour of Statistical Software Design”, Starch Press; 1 edition , 2011.
4. Sandip Rakshit, “R for Beginners”, McGraw Hill Education, 2017

E – LINKS

1. http://www.johndcook.com/R_language_for_programmers.html.
2. <http://bigdatauniversity.com/>.
3. <http://home.ubalt.edu/ntsbarsh/stat-data/topics.htm#rintroduction>.

COURSE OUTCOMES

On the successful completion of this course, students would be able to:

	COURSE OUTCOMES	KNOWLEDGE LEVEL
CO: 1	Interpret Big data and its analytics in real world	K5
CO: 2	Apply Hadoop ecosystem components	K3
CO: 3	Build statistical models suitable for real time applications	K3
CO: 4	Survey on standard data visualization and formal inference procedures and can comment on the results	K4
CO: 5	Design more complex algorithms involving more complex data structures and can implement their solutions in multiple languages	K6

CO – PO MAPPING

RELATIONSHIP MATRIX FOR CO, PO & PSO											
	Program Outcomes					Program Specific Outcomes					Mean Relationship
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	
CO 1	3	3	3	3	2	3	3	3	2	3	2.8
CO 2	2	2	2	3	3	3	2	3	2	2	2.4
CO 3	3	3	3	3	3	2	3	2	2	3	2.7
CO 4	2	2	2	3	2	3	3	3	3	2	2.5
CO 5	3	3	2	3	3	3	3	3	3	2	2.8

Mean Relationship value is **2.64** which is **HIGH**

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## Core Course IX – MOBILE COMPUTING

| SEMESTER | CREDITS | INSTRUCTION HOURS | COURSE CODE | MARKS |     |       | PURPOSE OF THE COURSE |
|----------|---------|-------------------|-------------|-------|-----|-------|-----------------------|
|          |         |                   |             | INT   | EXT | TOTAL |                       |
| II       | 5       | 60                | P2R2CSCC9   | 25    | 75  | 100   | SKILL DEVELOPMENT     |

### COURSE OBJECTIVES

- To understand the basic concepts of mobile
- To be familiar with GPRS Technology
- To gain knowledge about different mobile platforms and application development
- To be exposed to Ad-Hoc networks
- To know the principles of security and hacking

#### UNIT – I: Basics of mobile

**HOURS: 12**

Basics of mobile - Mobile device profiles - Middleware and gateways - Wireless Internet - Smart clients - Three-tier Architecture- Design considerations for mobile computing-- Mobility and Location based services.

#### UNIT – II: Mobile computing through Internet

**HOURS: 12**

Mobile computing through Internet - Mobile-enabled Applications - Developing Mobile GUIs – VUIs and Mobile Applications – Characteristics and benefits -Multichannel and Multi modal user interfaces – Synchronization and replication of Mobile Data - SMS architecture – GPRS – Mobile Computing through Telephony.

#### UNIT – III: Mobile Application Development

**HOURS: 12**

Mobile Application Development - Android- wi-fi –GPS – Camera – Movement – orientation - event based programming – iOS/ windows CE - Blackberry – windows phone – M-Commerce- structure – pros & cons – Mobile payment system - J2ME

#### UNIT – IV: ADHOC Wireless Network

**HOURS: 12**

ADHOC Wireless Network - Ad Hoc Wireless Network –MAC protocol  
Routing protocols - Transport Layer Protocol - QoS – Energy Management – application design – work flow – composing applications – Dynamic linking – Intents and Services – Communication via the web.

#### UNIT – V: Security and Hacking

**HOURS: 12**

Security and Hacking - Password security – Network security – web security – Database security - Wireless Sensor Network - Architecture and Design – Medium Access Control – Routing – Transport Layer – Energy model.

### TEXT BOOKS

1. Jochen Schiller, Mobile Communications, Second Edition, 2012.
2. William Stallings, "Wireless Communications & Networks", Pearson Education, 2009.

## REFERENCE BOOKS

1. C.Siva Ram Murthy, B.S. Manoj, "Ad Hoc Wireless Networks – Architectures and Protocols", 2nd Edition, Pearson Education. 2004
2. Ashok K Talukder, Roopa R Yavagal, "Mobile Computing", Tata McGraw Hill, 2005.
3. Jochen Burkhardt Dr.Horst Henn, Klaus Rintdoff,Thomas Schack, "Pervasive Computing", Pearson, 2009.
4. Fei Hu , Xiaojun Cao, " Wireless Sensor Networks Principles and Practice " CRC Press, 2010.

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1. <https://developer.android.com/>
2. <https://www.techtarget.com/searchmobilecomputing/definition/ad-hoc-network>
3. [https://www.w3schools.com/cybersecurity/cybersecurity\\_network\\_layer.php](https://www.w3schools.com/cybersecurity/cybersecurity_network_layer.php)

## COURSE OUTCOMES

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

|       | COURSE OUTCOMES                                      | KNOWLEDGE LEVEL |
|-------|------------------------------------------------------|-----------------|
| CO: 1 | Explain the basics of mobile system                  | K2              |
| CO: 2 | Construct Application using GPRS Technology          | K3              |
| CO: 3 | Develop Mobile Application                           | K6              |
| CO: 4 | Interpret the Mobile Ad hoc networks and its routing | K5              |
| CO: 5 | Classify the different types of security features    | K2              |

## CO – PO MAPPING

| RELATIONSHIP MATRIX FOR CO, PO & PSO |                  |      |      |      |      |                           |       |       |       |       |                   |
|--------------------------------------|------------------|------|------|------|------|---------------------------|-------|-------|-------|-------|-------------------|
|                                      | Program Outcomes |      |      |      |      | Program Specific Outcomes |       |       |       |       | Mean Relationship |
|                                      | PO 1             | PO 2 | PO 3 | PO 4 | PO 5 | PSO 1                     | PSO 2 | PSO 3 | PSO 4 | PSO 5 |                   |
| CO 1                                 | 3                | 3    | 2    | 2    | 1    | 2                         | 3     | 3     | 2     | 3     | 2.4               |
| CO 2                                 | 3                | 3    | 3    | 3    | 2    | 3                         | 3     | 3     | 3     | 2     | 2.8               |
| CO 3                                 | 3                | 3    | 3    | 3    | 2    | 3                         | 3     | 3     | 3     | 2     | 2.8               |
| CO 4                                 | 2                | 2    | 3    | 3    | 2    | 3                         | 3     | 2     | 3     | 2     | 2.5               |
| CO 5                                 | 3                | 3    | 3    | 3    | 2    | 3                         | 3     | 3     | 3     | 2     | 2.8               |

Mean Relationship value is **2.66** which is **HIGH**

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Core Course X – Design and Analysis of Algorithms

SEMESTER	CREDITS	INSTRUCTION HOURS	COURSE CODE	MARKS			PURPOSE OF THE COURSE
				INT	EXT	TOTAL	
III	5	60	P3R2CSCC10	25	75	100	SKILL DEVELOPMENT

COURSE OBJECTIVES

- To learn effective problem solving in Computing applications
- To learn the paradigms of divide and conquer technique
- To analyze the algorithmic procedure to determine the computational complexity of algorithms.
- To illustrate efficiency of dynamic programming and its related problems
- To provide understanding about backtracking

UNIT – I: Algorithm Definition

HOURS: 12

Introduction: Algorithm Definition – Algorithm Specification – Performance Analysis- Asymptotic Notations. Elementary Data Structures: Stacks and Queues – Trees – Dictionaries – Priority Queues – Sets and Disjoint Set Union – Graphs

UNIT – II: Divide and Conquer

HOURS: 12

Divide and Conquer: The General Method – Defective Chessboard – Binary Search – Finding The Maximum And Minimum – Merge Sort – Quick Sort – Selection - Strassen's Matrix Multiplication.

UNIT – III: The Greedy Method

HOURS: 12

The Greedy Method: General Method - Container Loading - Knapsack Problem - Tree Vertex Splitting – Job Sequencing With Deadlines - Minimum Cost Spanning Trees - Optimal Storage On Tapes – Optimal Merge Patterns - Single Source Shortest Paths.

UNIT – IV: Dynamic Programming

HOURS: 12

Dynamic Programming: The General Method – Multistage Graphs – All-Pairs Shortest Paths – Single-Source Shortest Paths - Optimal Binary Search Trees - String Editing - 0/1 Knapsack - Reliability Design - The Traveling Salesperson Problem - Flow Shop Scheduling. Basic Traversal and Search Techniques: Techniques for Binary Trees – Techniques for Graphs – Connected Components and Spanning Trees – Biconnected Components and DFS.

UNIT – V: Backtracking

HOURS: 12

Backtracking: The General Method – The 8-Queens Problem – Sum of Subsets – Graph Coloring – Hamiltonian Cycles – Knapsack Problem Branch and Bound: Least Cost searchhod - 0/1 Knapsack Problem.

TEXT BOOK

1. Ellis Horowitz, Satraj Sahni and Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, Universities Press, Second Edition, Reprint 2009.

REFERENCE BOOKS

1. Data Structures Using C - Langsam, Augenstein, Tenenbaum, PHI
2. Data structures and Algorithms, V.Aho, Hopcroft, Ullman , LPE
3. Introduction to design and Analysis of Algorithms - S.E.Goodman, ST. Hedetniemi-TMH.
4. Carlos A.Coello Coello, Gary B.Lamont, David A.Van Veldhuizen,“Evolutionary Algorithms for Solving Multi-Objective Problems”, Springer 2nd Edition, 2007.

WEB REFERENCES:

1. <http://www.personal.kent.edu/~rmuhamma/Algorithms/algorithm.html>
2. <http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms>
3. <http://www.facweb.iitkgp.ernet.in/~sourav/daa.html>

COURSE OUTCOMES

On the successful completion of this course, students would be able to:

	COURSE OUTCOMES	KNOWLEDGE LEVEL
CO: 1	Interpret the fundamental of algorithms	K2
CO: 2	Analyze the performance of algorithms	K4
CO: 3	Select appropriate algorithm design techniques for solving problems	K3
CO: 4	Find solutions for problems using dynamic programming	K1
CO: 5	Analyze the complexities of various problems in different domains	K4

CO – PO MAPPING

RELATIONSHIP MATRIX FOR CO, PO & PSO											
	Program Outcomes					Program Specific Outcomes					Mean Relationship
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	
CO 1	3	3	2	2	2	2	2	2	2	1	2.1
CO 2	3	3	2	2	2	2	2	2	2	1	2.1
CO 3	3	2	2	3	1	3	3	2	2	2	2.3
CO 4	3	2	2	3	1	2	2	1	2	2	2.0
CO 5	2	2	3	3	2	3	3	3	2	2	2.5

Mean Relationship value is 2.2 which is **HIGH**

Core Course XI – Design and Analysis of Algorithms Practical

SEMESTER	CREDITS	COURSE CODE	MARKS			PURPOSE OF THE COURSE
			INT	EXT	TOTAL	
III	3	P3R2CSCC11P	40	60	100	EMPLOYABILITY

COURSE OBJECTIVES

- To study the problem solving techniques effectively
- To learn the paradigms of divide and conquer technique
- To analyze the algorithmic procedure to determine the computational complexity of algorithms.
- To illustrate the efficiency of dynamic programming and its related problems
- To provide knowledge about backtracking

1. QUICK SORT

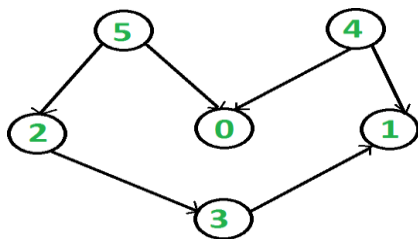
Sort a given set of elements using the quick sort method and determine the time required to sort the elements. Repeat the experiment for different values of n , the number of elements in the 1st to be sorted and plot a graph of the time taken versus n . The elements can be read from a file or can be generated using the random number generator.

2. MERGE SORT

Implement merge sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n , the number of elements in the list to be sorted and plot a graph of the time taken versus n . The elements can be read from a file or can be generated using the random number generator.

3. WARSHALL'S ALGORITHM

Obtain the Topological ordering of vertices in a given digraph.



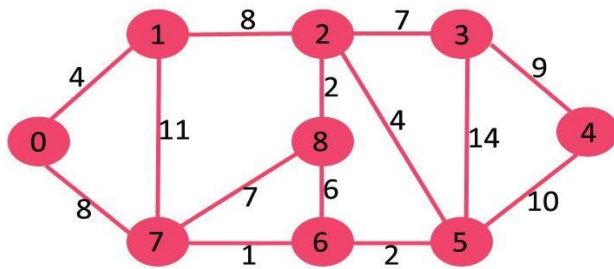
Compute the transitive closure of a given directed graph using Warshall's algorithm.

4. KNAPSACK PROBLEM

Implement 0/1 Knapsack problem using Dynamic Programming.

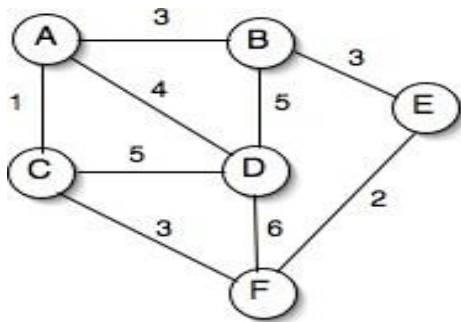
5. SHORTEST PATHS ALGORITHM

From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.



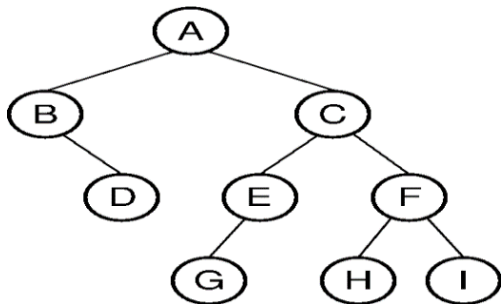
6. MINIMUM COST SPANNING TREE

Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.
Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.



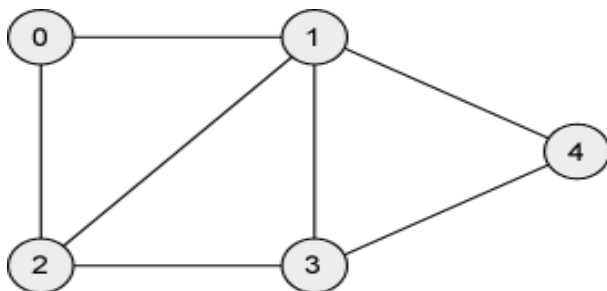
7. TREE TRAVERSALS

Perform various tree traversal algorithms for a given tree.

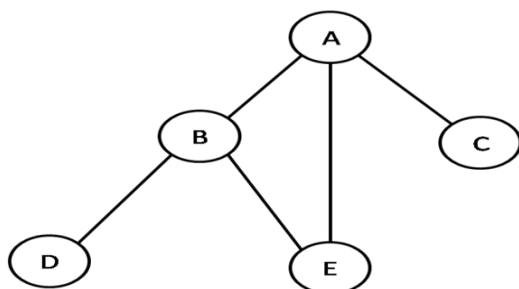


8. GRAPH TRAVERSALS

Print all the nodes reachable from a given starting node in a digraph using BFS method.



Check whether a given graph is connected or not using DFS method.



9. SUM OF SUB SETS PROBLEM

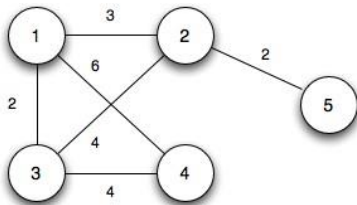
Find a subset of a given set $S = \{s_1, s_2, \dots, s_n\}$ of n positive integers whose sum is equal to a given positive integer d . For example, if $S = \{1, 2, 5, 6, 8\}$ and $d = 9$ there are two solutions $\{1, 2, 6\}$ and $\{1, 8\}$. A suitable message is to be displayed if the given problem instance doesn't have a solution.

10. TRAVELLING SALES PERSON PROBLEM

Implement any scheme to find the optimal solution for the Traveling Sales Person problem and then solve the same problem instance using any approximation algorithm and determine the error in the approximation.

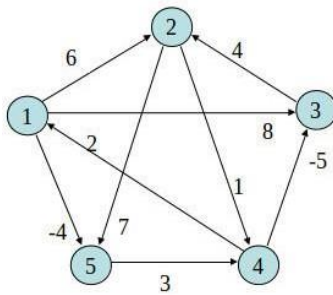
11. MINIMUM COST SPANNING TREE

Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm



12. ALL PAIRS SHORTEST PATHS

Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.



	1	2	3	4	5
1	0	6	8	∞	-4
2	∞	0	∞	1	7
3	∞	4	0	∞	∞
4	2	∞	-5	0	∞
5	∞	∞	∞	3	0

13. N QUEENS PROBLEM

Implement N Queen's problem using Back Tracking.

COURSE OUTCOMES

On the successful completion of this course, students would be able to:

	COURSE OUTCOMES	KNOWLEDGE LEVEL
CO: 1	Explain the problem solving techniques effectively	K2
CO: 2	Analyse the paradigms of divide and conquer technique	K4
CO: 3	Determine the computational complexity of algorithms.	K5
CO: 4	illustrate the efficiency of dynamic programming and its related problems	K2
CO: 5	Experiment with backtracking algorithms	K3

CO – PO MAPPING

RELATIONSHIP MATRIX FOR CO, PO & PSO											
	Program Outcomes					Program Specific Outcomes					Mean
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	Relationship
CO 1	2	2	2	1	2	3	3	3	2	2	2.2
CO 2	2	2	2	1	2	3	2	2	2	1	1.9
CO 3	3	3	3	2	2	3	3	2	2	2	2.5
CO 4	2	2	2	3	2	2	3	3	2	2	2.3
CO 5	3	3	3	2	2	2	2	3	2	3	2.5

Mean Relationship value is **2.28** which is **HIGH**

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## Core Course XII – Machine Learning

| SEMESTER | CREDITS | INSTRUCTION<br>HOURS | COURSE<br>CODE | MARKS |     |       | PURPOSE OF THE<br>COURSE |
|----------|---------|----------------------|----------------|-------|-----|-------|--------------------------|
|          |         |                      |                | INT   | EXT | TOTAL |                          |
| III      | 5       | 60                   | P3R2CSCC12     | 25    | 75  | 100   | SKILL<br>DEVELOPMENT     |

### OBJECTIVES

- To know about Machine Intelligence and Machine Learning applications
- To implement and apply machine learning algorithms to real-world applications.
- To identify and apply the appropriate machine learning techniques to classification, pattern recognition, optimization and decision problems.
- To analyze and interpret the concepts of Instance based learning
- To understand how to perform evaluation of learning algorithms and model selection.

### UNIT – I: Learning Problems

**HOURS: 12**

INTRODUCTION: Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.

### UNIT – II: Neural Networks and Genetic Algorithms

**HOURS: 12**

Neural Network

Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms  
– Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.

### UNIT – III: Bayesian and Computational Learning

**HOURS: 12**

Bayes Theorem –

Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

### UNIT – IV: Instance Based Learning

**HOURS: 12**

K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning.

### UNIT – V: Advanced Learning

**HOURS: 12**

Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning

### TEXT BOOK

1. Tom M. Mitchell, —Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.

## REFERENCE BOOKS

1. EthemAlpaydin, —Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.
2. Stephen Marsland, —Machine Learning: An AlgorithmicPerspective, CRC Press, 2009.
3. Michael Affenzeller, Stephan Winkler, Stefan Wagner, Andreas Beham, “Genetic Algorithms and Genetic Programming”, CRC Press Taylor and Francis Group.

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2. [https://www.w3schools.com/ai/ai\\_machine\\_learning.asp](https://www.w3schools.com/ai/ai_machine_learning.asp)
3. [https://www.w3schools.com/python/python\\_ml\\_getting\\_started.asp](https://www.w3schools.com/python/python_ml_getting_started.asp)

## COURSE OUTCOMES

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

|       | COURSE OUTCOMES                                                                                                                                            | KNOWLEDGE LEVEL |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| CO: 1 | Demonstrate the fundamental issues and challenges of machine learning                                                                                      | K2              |
| CO: 2 | Identify and apply machine learning algorithms to real-world applications                                                                                  | K3              |
| CO: 3 | Justify the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning | K5              |
| CO: 4 | Improve knowledge on Instant based learning and its techniques                                                                                             | K6              |
| CO: 5 | Design and implement various machine learning algorithms                                                                                                   | K6              |

## CO – PO MAPPING

| RELATIONSHIP MATRIX FOR CO, PO & PSO |                  |      |      |      |      |                           |       |       |       |       |                   |
|--------------------------------------|------------------|------|------|------|------|---------------------------|-------|-------|-------|-------|-------------------|
|                                      | Program Outcomes |      |      |      |      | Program Specific Outcomes |       |       |       |       | Mean Relationship |
|                                      | PO 1             | PO 2 | PO 3 | PO 4 | PO 5 | PSO 1                     | PSO 2 | PSO 3 | PSO 4 | PSO 5 |                   |
| CO 1                                 | 3                | 3    | 2    | 3    | 3    | 3                         | 3     | 3     | 3     | 2     | 2.8               |
| CO 2                                 | 3                | 3    | 2    | 3    | 2    | 3                         | 3     | 3     | 2     | 2     | 2.6               |
| CO 3                                 | 3                | 3    | 3    | 3    | 2    | 2                         | 2     | 3     | 3     | 1     | 2.5               |
| CO 4                                 | 2                | 2    | 2    | 3    | 2    | 2                         | 3     | 2     | 3     | 2     | 2.3               |
| CO 5                                 | 2                | 2    | 2    | 3    | 1    | 3                         | 3     | 3     | 2     | 2     | 2.3               |

Mean Relationship value is 2.5 which is **HIGH**

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Core Course XIII – Advanced Database Management Systems

SEMESTER	CREDITS	INSTRUCTION HOURS	COURSE CODE	MARKS			PURPOSE OF THE COURSE
				INT	EXT	TOTAL	
III	5	60	P3R2CSCC13	25	75	100	SKILL DEVELOPMENT

COURSE OBJECTIVES

- To have a thorough knowledge about Relational and Parallel databases
- To understand Distributed and object based databases
- To acquire knowledge on Database models, Applications of Database models
- To acquire knowledge on XML databases
- To know about Temporal databases and Multimedia database applications

UNIT – I: Relational and parallel Database Design

HOURS: 12

Relational and parallel Database Design: Basics, Entity Types, Relationship Types, ER Model, ER-to-Relational Mapping algorithm. Normalization: Functional Dependency, 1NF, 2NF, 3NF, BCNF, 4NF and 5NF. Architecture, I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Intraoperation Parallelism, Interoperation Parallelism.

UNIT – II: Distributed and Object based Databases

HOURS: 12

Distributed and Object based Databases: Architecture, Distributed data storage, Distributed transactions, Commit protocols, Concurrency control, Query Processing. Complex Data Types, Structured Types and Inheritance, Table Inheritance, array and Multiset, Object Identity and Reference Types, Object Oriented versus Object Relational.

UNIT – III: Spatial Database

HOURS: 12

Spatial Database: Spatial Database Characteristics, Spatial Data Model, Spatial Database Queries, Techniques of Spatial Database Query, Logic based Databases: Introduction, Overview, Propositional Calculus, Predicate Calculus, Deductive Database Systems, Recursive Query Processing.

UNIT – IV: XML Databases

HOURS: 12

XML Databases: XML Hierarchical data model, XML Documents, DTD, XML Schema, XML Querying, XHTML, Illustrative Experiments.

UNIT – V: Temporal Databases

HOURS: 12

Temporal Databases: Introduction, Intervals, Packing and Unpacking Relations, Generalizing the relational Operators, Database Design, Integrity Constraints, Multimedia Databases: Multimedia Sources, Multimedia Database Queries, Multimedia Database Applications.

TEXT BOOK

1. Abraham Silberschatz, Henry F Korth , S Sudarshan, “Database System Concepts”, 6th edition , McGraw-Hill International Edition , 2011
2. C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, 8th Edition, Pearson Education Reprint 2016.

REFERENCE BOOK

1. Ramez Elmasri, Shamkant B Navathe, “Fundamental of Database Systems”, Pearson, 7th edition 2016.

WEB REFERENCES

1. https://www.w3schools.com/mysql/mysql_rdbms.asp
2. https://www.w3schools.com/php/php_mysql_intro.asp
3. https://www.w3schools.com/python/scipy/scipy_spatial_data.php
4. https://www.w3schools.com/js/js_ajax_applications.asp

COURSE OUTCOMES

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

	COURSE OUTCOMES	KNOWLEDGE LEVEL
CO: 1	Classify the various data models and work on Database architecture	K2
CO: 2	Improve knowledge on patterns and object oriented databases	K6
CO: 3	Demonstrate Predicate calculus and Deductive database systems	K2
CO: 4	Analyze and implement XML databases	K4
CO: 5	Examine the issues related to Temporal and Multimedia databases	K4

CO – PO MAPPING

RELATIONSHIP MATRIX FOR CO, PO & PSO											
	Program Outcomes					Program Specific Outcomes					Mean Relationship
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	
CO 1	3	3	2	3	2	3	3	3	3	1	2.6
CO 2	3	2	3	2	2	2	2	2	3	2	2.3
CO 3	2	2	3	3	2	3	3	3	3	2	2.6
CO 4	2	2	2	3	2	2	2	2	3	2	2.2
CO 5	3	3	3	3	2	2	2	2	3	2	2.4

Mean Relationship value is **2.42** which is **HIGH**

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## Core Course XIV – Cloud Computing

| SEMESTER | CREDITS | INSTRUCTION HOURS | COURSE CODE | MARKS |     |       | PURPOSE OF THE COURSE |
|----------|---------|-------------------|-------------|-------|-----|-------|-----------------------|
|          |         |                   |             | INT   | EXT | TOTAL |                       |
| III      | 5       | 60                | P3R2CSCC14  | 25    | 75  | 100   | SKILL DEVELOPMENT     |

### COURSE OBJECTIVES

- To learn the basics of cloud computing
- To implement the key concept of virtualization.
- To apply Map-Reduce concept of applications
- To know the key components of Amazon web services
- To understand how to migrate the applications in cloud

### UNIT – I: Computing Basics

**HOURS: 12**

Cloud computing definition- Characteristics- Benefit-Challenges- Distributed Systems- Virtualization-Service-oriented computing- Utility-oriented computing- Building Cloud Computing environments- computing platforms & technologies - Cloud Models – Cloud Service Examples - Cloud Based Services & Applications - Cloud concepts and Technologies.

### UNIT – II: Virtualization, Cloud Services And Platforms

**HOURS: 12**

Virtualization:Virtualization- Characteristics- taxonomy-types- Pros and Cons- Examples Architecture: Reference model- types of clouds- Compute Service - Storage Services - Cloud Database Services - Application Services - Content Delivery Services - Analytics Services - Deployment And Management Service - Identity And Access Management Services - Open Source Private Cloud Software.

### UNIT – III: Cloud Application Design And Development

**HOURS: 12**

Design consideration- Reference Architecture for Cloud Application - Cloud Application Design Methodologies - Data Storage Approaches- Development in Python: Design Approaches – Application: Image Processing - Document Storage - Map Reduce - Social Media Analytics.

### UNIT – IV: Python For Cloud

**HOURS: 12**

Introduction- Installing Python- Data types & Data Structures- Control Flow- Functions- Modules- Packages- File Handling- Date/Time Operations – Classes- Python for Cloud: Amazon Web Services –Google Cloud Platform - Windows Azure –Map Reduced – Packages of Interest – Designing a RESTful Web API.

### UNIT – V: Big Data Analytics, Multimedia Cloud & Cloud Security HOURS: 12

Big Data Analytics: Clustering Big data - Classification of Big Data – Recommendation systems. Multimedia Cloud: Case Study: Live Video Stream App - Streaming Protocols – Case Study: Video Transcoding App-Cloud Security: CSA Cloud Security Architecture – Authentication Authorization - Identity and Access management - Data Security - Key Management- Auditing- Cloud for Industry, Healthcare & Education.

## TEXT BOOKS

1. Buyya, Vecciola and Selvi, Mastering Cloud Computing: Foundations and Applications Programming, Tata McGraw Hill, 2013.
2. ArshdeepBahga, Vijay Madiseti, “Cloud Computing: A Hands – On Approach” Universities press (India) Pvt. limited 2016.

## REFERENCE BOOKS

1. Rittinghouse and Ransome, Cloud Computing: Implementation, Management, and Security, CRC Press, 2016.
2. Michael Miller “Cloud Computing Web based application that change the way you work and collaborate online”. Pearson edition, 2008.
3. Kris Jamsa, Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business
4. Models, Mobile, Security and More, Jones & Bartlett Learning, 2012.

## WEB REFERENCES

1. <https://www.w3schools.in/cloud-computing>
2. [https://www.w3schools.com/aws/aws\\_cloudessentials\\_cloudcomputing.php](https://www.w3schools.com/aws/aws_cloudessentials_cloudcomputing.php)
3. [https://www.w3schools.com/python/python\\_ml\\_getting\\_started.asp](https://www.w3schools.com/python/python_ml_getting_started.asp)

## COURSE OUTCOMES

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

|       | COURSE OUTCOMES                                                                                              | KNOWLEDGE LEVEL |
|-------|--------------------------------------------------------------------------------------------------------------|-----------------|
| CO: 1 | Define cloud computing and memorize the different cloud service and deployment models                        | K1              |
| CO: 2 | Apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms | K3, K6          |
| CO: 3 | Utilize and Examine different cloud computing services                                                       | K3, K4          |
| CO: 4 | Design different workflows according to requirements and apply Map-Reduce programming model                  | K3              |
| CO: 5 | Analyze the components of open stack& Google cloud platform                                                  | K4              |

## CO – PO MAPPING

| RELATIONSHIP MATRIX FOR CO, PO & PSO |                  |      |      |      |      |                           |       |       |       |       |                   |
|--------------------------------------|------------------|------|------|------|------|---------------------------|-------|-------|-------|-------|-------------------|
|                                      | Program Outcomes |      |      |      |      | Program Specific Outcomes |       |       |       |       | Mean Relationship |
|                                      | PO 1             | PO 2 | PO 3 | PO 4 | PO 5 | PSO 1                     | PSO 2 | PSO 3 | PSO 4 | PSO 5 |                   |
| CO 1                                 | 2                | 2    | 2    | 2    | 2    | 2                         | 2     | 2     | 3     | 2     | 2.1               |
| CO 2                                 | 3                | 3    | 3    | 3    | 2    | 3                         | 3     | 3     | 3     | 2     | 2.8               |
| CO 3                                 | 2                | 2    | 2    | 3    | 2    | 3                         | 3     | 3     | 3     | 2     | 2.5               |
| CO 4                                 | 3                | 3    | 3    | 3    | 2    | 2                         | 2     | 2     | 3     | 2     | 2.5               |
| CO 5                                 | 2                | 2    | 2    | 3    | 2    | 3                         | 3     | 3     | 3     | 2     | 2.5               |

Mean Relationship value is **2.48** which is **HIGH**

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## **DISCIPLINE SPECIFIC ELECTIVE COURSES**

### **Discipline Specific Elective Course – I**

#### **1. WAP and XML**

| SEMESTER | CREDITS | INSTRUCTION HOURS | COURSE CODE  | MARKS |     |       | PURPOSE OF THE COURSE |
|----------|---------|-------------------|--------------|-------|-----|-------|-----------------------|
|          |         |                   |              | INT   | EXT | TOTAL |                       |
| I        | 5       | 60                | P1R2CSDSE1:1 | 25    | 75  | 100   | SKILL DEVELOPMENT     |

#### **COURSE OBJECTIVES**

- To provide the students with setting up of WAP
- To inculcate the knowledge of WAP gateways and WML basics
- To give them the exposure of using WML scripts
- To educate the students about XML scripts
- To teach the students about the rules, attributes of XML tags

#### **UNIT – I: Overview of WAP**

**HOURS: 12**

Overview of WAP: WAP and the wireless world – WAP application architecture – WAP internal structure – WAP versus the Web – WAP

1.2 – WTA and push features. Setting up WAP: Available software products – WAP resources – The Development Toolkits.

#### **UNIT – II: WAP gateways**

**HOURS: 12**

WAP gateways: Definition – Functionality of a WAP gateway – The Web model versus the WAP model – Positioning of a WAP gateway in the network – Selecting a WAP gateway Basic WML: Extensible markup language – WML structure – A basic WML card – Text formatting – navigation – Advanced display features.

#### **UNIT – III: Interacting with the user**

**HOURS: 12**

Interacting with the user: Making a selection – Events – Variables – Input and parameter passing. WML Script: Need for WML script – Lexical Structure – Variables and literals – Operators – Automatic data type conversion – Control Constructs Functions – Using the standard libraries – programs – Dealing with Errors.

#### **UNIT – IV: XML**

**HOURS: 12**

XML: Introduction XML: An Eagle's Eye view of XML – XML Definition

List of an XML Document – Related Technologies – An introduction to XML Applications – XML Applications – XML for XML – First XML Documents Structuring Data: Examining the Data XMLizing the data – The advantages of the XML format – Preparing a style sheet for Document Display.

#### **UNIT – V: Attributes, Empty Tags and XSL**

**HOURS: 12**

Attributes, Empty Tags and XSL: Attributes – Attributes Versus Elements – Empty Tags – XSL – Well formed XML documents – Foreign Languages and Non Roman Text – Non Roman Scripts on the Web Scripts, Character sets, Fonts and Glyphs – Legacy character sets– The Unicode Character set – Procedure to Write XML Unicode.

## TEXT BOOKS

### 1. For Unit I, II, III

- a. Charles Arehart and Others. "Professional WAP with WML, WML script, ASP, JSP, XML, XSLT, WTA Push and Voice XML" Shroff Publishers and Distributors Pvt. Ltd 2000.

### 2. For Unit IV & V

- a. Eliotte Rusty Harlod "XML TM Bible", Books India (P) Ltd, 2000

## REFERENCE BOOKS

1. Heather Williamson, "XML: The Complete Reference ", TataMcGraw-Hill Education India.
2. Thomas Connolly, Carolyn Begg., "Database Systems a practical approach to Design , Implementation and Management ", Pearson Education, 2014.

## WEB REFERENCES

1. <https://devepaper.com/wap-tutorial-1-introduction-to-wap-xml-xslt/>
2. [https://docstore.mik.ua/orelly/web2/wdesign/ch32\\_01.htm](https://docstore.mik.ua/orelly/web2/wdesign/ch32_01.htm)
3. <http://xml.coverpages.org/wap-wml.html>

## COURSE OUTCOMES

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

|       | COURSE OUTCOMES                                                | KNOWLEDGE LEVEL |
|-------|----------------------------------------------------------------|-----------------|
| CO: 1 | Apply XML concepts to develop Web application Use WAP gateways | K3              |
| CO: 2 | Develop SOA application using XML and Web Services             | K3              |
| CO: 3 | Define XML and WML elements efficiently                        | K1              |
| CO: 4 | Construct their own WML scripts                                | K2              |
| CO: 5 | Analyze and Interpret XML scripts                              | K4, k5          |

## CO – PO MAPPING

| RELATIONSHIP MATRIX FOR CO, PO & PSO |                  |      |      |      |      |                           |       |       |       |       |                   |
|--------------------------------------|------------------|------|------|------|------|---------------------------|-------|-------|-------|-------|-------------------|
|                                      | Program Outcomes |      |      |      |      | Program Specific Outcomes |       |       |       |       | Mean Relationship |
|                                      | PO 1             | PO 2 | PO 3 | PO 4 | PO 5 | PSO 1                     | PSO 2 | PSO 3 | PSO 4 | PSO 5 |                   |
| CO 1                                 | 3                | 3    | 3    | 3    | 2    | 3                         | 3     | 3     | 2     | 1     | 2.6               |
| CO 2                                 | 3                | 3    | 2    | 3    | 2    | 3                         | 3     | 3     | 2     | 2     | 2.6               |
| CO 3                                 | 2                | 2    | 3    | 2    | 2    | 2                         | 2     | 2     | 2     | 2     | 2.1               |
| CO 4                                 | 3                | 3    | 3    | 3    | 2    | 3                         | 3     | 3     | 3     | 3     | 2.9               |
| CO 5                                 | 3                | 3    | 3    | 3    | 3    | 3                         | 3     | 3     | 3     | 2     | 2.9               |

Mean Relationship value is **2.62** which is **HIGH**

## 2. Cryptography and Network Security

| SEMESTER | CREDITS | INSTRUCTION HOURS | COURSE CODE  | MARKS |     |       | PURPOSE OF THE COURSE |
|----------|---------|-------------------|--------------|-------|-----|-------|-----------------------|
|          |         |                   |              | INT   | EXT | TOTAL |                       |
| I        | 5       | 60                | P1R2CSDSE1:2 | 25    | 75  | 100   | SKILL DEVELOPMENT     |

### COURSE OBJECTIVES

- To understand the basics of cryptography
- To build protection mechanisms in order to secure computer networks
- To provide strong foundation in Authentication applications
- To understand necessary approaches and techniques related to IP security
- To know about the malicious software and firewalls

### UNIT – I: Security trends

**HOURS: 12**

Introduction - Security trends – Legal, Ethical and Professional Aspects of Security, Need for Security at Multiple levels, Security Policies – Model of network security – Security attacks, services and mechanisms – OSI security architecture – Classical encryption techniques: substitution techniques, transposition techniques, steganography- Foundations of modern cryptography: perfect security– information theory – product cryptosystem – cryptanalysis.

### UNIT – II: Symmetric Encryption and Message Confidentiality

**HOURS: 12**

Symmetric Encryption and Message Confidentiality - Symmetric Encryption Principles, Symmetric Block Encryption Algorithms, Stream Ciphers and RC4, Cipher Block Modes of Operation, Location of Encryption Devices, Key Distribution. Public-key Cryptography and Message Authentication: Approaches to Message Authentication, Secure Hash Functions and HMAC, Public-Key Cryptography Principles, Public-Key Cryptography Algorithms, Digital Signatures, Key Management.

### UNIT – III: Authentication Applications

**HOURS: 12**

Authentication Applications - Kerberos, x.509 Authentication Service, Public-Key Infrastructure. Electronic Mail Security: Pretty Good Privacy (PGP), S/MIME.

### UNIT – IV: IP Security

**HOURS: 12**

IP Security - IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations. Web Security: Web Security Considerations, Secure Socket Layer(SSL) and Transport Layer Security(TLS), Secure Electronic Transaction(SET).Network Management Security: Basic Concepts of SNMP, SNMPv1 Community Facility, SNMPv3.

### UNIT – V: Intruders

**HOURS: 12**

Intruders - Intruders, Intrusion Detection, Password Management. Malicious Software: Virus and Related Threats, Virus Countermeasures, Distributed Denial of Service Attacks. Firewalls: Firewall Design Principles, Trusted Systems, Common Criteria for Information Technology Security Evaluation.

### TEXT BOOKS

1. Behrouz A. Ferouzan, “Cryptography & Network Security”, Tata Mc Graw Hill, 2007, Reprint 2015.
2. Stallings William, “Cryptography and Network Security - Principles and Practice 2017.

- William Stallings, "Network Security Essentials Applications and Standards "Third Edition, Pearson Education, 2008.

## REFERENCE BOOKS

- Man Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms And Protocols", Wiley Publications, 2003.
- Charles Pfleeger, "Security In Computing", 4th Edition, Prentice Hall Of India, 2006.
- Ulysess Black, "Internet Security Protocols", Pearson Education Asia, 2000.
- Charlie Kaufman And Radia Perlman, Mike Speciner, "Network Security, Second Edition, Private Communication In Public World", PHI 2002.
- Bruce Schneier And Neils Ferguson, "Practical Cryptography", First Edition, Wiley Dreamtech India Pvt Ltd, 2003.
- Douglas R Simson "Cryptography – Theory And Practice", First Edition, CRC Press, 1995.

## WEB REFERENCES

- <https://www.ecpi.edu/blog/cryptography-and-network-security>
- <https://techjournal.org/need-of-cryptography-in-network-security/>
- <https://eezytutorials.com/Cryptography-And-Network-Security/Basic-Terminology.php#.Yo8UJbpFzIU>

## COURSE OUTCOMES

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

|       | COURSE OUTCOMES                                                                                     | KNOWLEDGE LEVEL |
|-------|-----------------------------------------------------------------------------------------------------|-----------------|
| CO: 1 | Interpret the fundamentals of networks security, security architecture, threats and vulnerabilities | K2              |
| CO: 2 | Apply different cryptographic operations of symmetric cryptographic algorithms                      | K3              |
| CO: 3 | Apply the different cryptographic operations of public key cryptography                             | K3              |
| CO: 4 | Analyze the various Authentication schemes to simulate different applications                       | K4              |
| CO: 5 | Develop various Security practices and System security standards                                    | K6              |

## CO – PO MAPPING

| RELATIONSHIP MATRIX FOR CO, PO & PSO |                  |      |      |      |      |                           |       |       |       |       |                   |
|--------------------------------------|------------------|------|------|------|------|---------------------------|-------|-------|-------|-------|-------------------|
|                                      | Program Outcomes |      |      |      |      | Program Specific Outcomes |       |       |       |       | Mean Relationship |
|                                      | PO 1             | PO 2 | PO 3 | PO 4 | PO 5 | PSO 1                     | PSO 2 | PSO 3 | PSO 4 | PSO 5 |                   |
| CO 1                                 | 2                | 2    | 3    | 3    | 2    | 2                         | 3     | 2     | 2     | 3     | 2.4               |
| CO 2                                 | 3                | 2    | 3    | 2    | 3    | 3                         | 2     | 3     | 2     | 3     | 2.6               |
| CO 3                                 | 2                | 2    | 2    | 3    | 1    | 2                         | 2     | 2     | 3     | 1     | 2.0               |
| CO 4                                 | 2                | 2    | 3    | 2    | 1    | 2                         | 2     | 3     | 2     | 1     | 2.0               |
| CO 5                                 | 3                | 3    | 3    | 2    | 2    | 3                         | 3     | 3     | 2     | 2     | 2.6               |

Mean Relationship value is **2.32** which is **HIGH**

## Discipline Specific Elective Course – II

### 1. Data Mining and Data Warehousing

| SEMESTER | CREDITS | INSTRUCTION HOURS | COURSE CODE  | MARKS |     |       | PURPOSE OF THE COURSE |
|----------|---------|-------------------|--------------|-------|-----|-------|-----------------------|
|          |         |                   |              | INT   | EXT | TOTAL |                       |
| II       | 5       | 60                | P2R2CSDSE2:1 | 25    | 75  | 100   | SKILL DEVELOPMENT     |

#### COURSE OBJECTIVES

- To introduce the fundamental concepts of Data Mining and data Preprocessing
- To familiarize with data models and data warehouse.
- To make students well versed in all mining algorithms, methods of evaluations
- To impart knowledge on clustering techniques
- To know about spatial, text and web mining

#### UNIT – I: Data Mining And Data Preprocessing

**HOURS: 12**

Data Mining And Data Preprocessing: Data Mining – Motivation – Definition – Data Mining on Kind of Data –Functionalities – Classification – Data Mining Task Primitives – Major Issues in Data Mining – Data Preprocessing – Definition – Data Clearing – Integration and Transformation – Data Reduction.

#### UNIT – II: Data Warehousing

**HOURS: 12**

Data Warehousing: Multidimensional Data Model –Data Warehouse Architecture – Data Warehouse Implementation –From data Warehousing to Data Mining – On Line Analytical Processing - On Line Analytical Mining.

#### UNIT – III: Frequent Patterns, Associations and Classification

**HOURS: 12**

Frequent Patterns, Associations And Classification: The Apriori Algorithm – Definition of Classification and Prediction – Classification by Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Lazy Learners – K-Nearest Neighbor – Other Classification Methods.

#### UNIT – IV: Cluster Analysis

**HOURS: 12**

Cluster Analysis: Definition – Types of data in Cluster Analysis – Categorization of major Clustering Techniques – Partitioning Methods  
Hierarchical Clustering – BIRCH - ROCK – Grid Based Methods – Model Based Clustering Methods – Outlier Analysis.

#### UNIT – V: Spatial, Multimedia, Text And Web Data

**HOURS: 12**

Spatial, Multimedia, Text And Web Data: Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web – Data Mining Applications – Trends in Data Mining.

## TEXT BOOKS

1. Jiawei Han and Micheline Kamber, “Data Mining: Concepts and Techniques (The Morgan Kaufmann Series in Data Management Systems) 3rd Edition, July 6, 2011.
2. Ian H. Witten, Eibe Frank, Mark A. Hall, “Data Mining: Practical Machine Learning Tools and Techniques”, Elsevier; Third edition, 2014.

## REFERENCE BOOKS

1. Margret H. Dunham, “Data Mining: Introductory and Advanced Topics”, Pearson Education, 2003.
2. M. Awad, Latifur Khan, Bhavani Thuraisingham, Lei Wang, “Design and Implementation of Data Mining Tools”, CRC Press-Taylor & Francis Group, 2015.
3. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, “Introduction to Data Mining- Instructor’s Solution Manual”, Pearson Education, First Edition, 2016.
4. Mohammed J. Zaki, Wagner Meira JR, “Data Mining and Analysis: Fundamental Concepts and Algorithms”, Cambridge India, 2016.

## WEB REFERENCES

1. <https://panoply.io/data-warehouse-guide/data-warehousing-and-data-mining-101/>
2. [https://www.tutorialspoint.com/dwh/dwh\\_overview.htm](https://www.tutorialspoint.com/dwh/dwh_overview.htm)
3. <https://www.topcoder.com/thrive/articles/data-warehousing-and-data-mining>

## COURSE OUTCOMES

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

|       | COURSE OUTCOMES                                               | KNOWLEDGE LEVEL |
|-------|---------------------------------------------------------------|-----------------|
| CO: 1 | Demonstrate basic data mining algorithms, methods, and tools. | K2              |
| CO: 2 | Analyze and Interpret data models for real world applications | K4, K5          |
| CO: 3 | Experiment with classification algorithms                     | K3              |
| CO: 4 | Improve knowledge on clustering techniques                    | K6              |
| CO: 5 | Know the importance of spatial, text and web mining           | K5              |

## CO – PO MAPPING

| RELATIONSHIP MATRIX FOR CO, PO & PSO |                  |      |      |      |      |                           |       |       |       |       |                   |
|--------------------------------------|------------------|------|------|------|------|---------------------------|-------|-------|-------|-------|-------------------|
|                                      | Program Outcomes |      |      |      |      | Program Specific Outcomes |       |       |       |       | Mean Relationship |
|                                      | PO 1             | PO 2 | PO 3 | PO 4 | PO 5 | PSO 1                     | PSO 2 | PSO 3 | PSO 4 | PSO 5 |                   |
| CO 1                                 | 2                | 3    | 3    | 3    | 2    | 2                         | 3     | 3     | 3     | 2     | 2.6               |
| CO 2                                 | 3                | 3    | 3    | 2    | 3    | 3                         | 3     | 3     | 2     | 3     | 2.8               |
| CO 3                                 | 2                | 3    | 2    | 3    | 2    | 2                         | 3     | 2     | 3     | 2     | 2.4               |
| CO 4                                 | 3                | 3    | 3    | 2    | 2    | 3                         | 3     | 3     | 2     | 2     | 2.6               |
| CO 5                                 | 2                | 2    | 2    | 3    | 2    | 2                         | 2     | 2     | 3     | 2     | 2.2               |

Mean Relationship value is **2.52** which is **HIGH**

## 2. OBJECT ORIENTED SYSTEMS DEVELOPMENT

| SEMESTER | CREDITS | INSTRUCTION<br>HOURS | COURSE<br>CODE | MARKS |     |       | PURPOSE OF<br>THE COURSE |
|----------|---------|----------------------|----------------|-------|-----|-------|--------------------------|
|          |         |                      |                | INT   | EXT | TOTAL |                          |
| II       | 5       | 60                   | P2R2CSDSE2:2   | 25    | 75  | 100   | SKILL<br>DEVELOPMENT     |

### COURSE OBJECTIVES

- To introduce the concept of Object-oriented design and understand the fundamentals of OOSD life cycle.
- To familiar with evolution of object-oriented model, classes and its notations
- To practice UML in order to express the design of software projects.
- To Specify, analyze and design the use case driven requirements for a particular system.
- To enrich knowledge about DBMS, designing classes and object oriented testing.

### UNIT – I: Fundamentals of OOSD

**HOURS: 12**

Fundamentals of OOSD - Overview of Object Oriented Systems Development : Two orthogonal view of the software - OOSD methodology - Why an object Object orientation. Object basics: Object Oriented Philosophy- Objects – Attributes – Object respond to messages – Encapsulation and information hiding – class hierarchy – Polymorphism – Object relationship and associations. OOSD life cycle  
: Software development process – OOSD Use case Driven Approach – Reusability.

### UNIT – II: Methodology, Modeling and UML

**HOURS: 12**

Methodology, Modeling and UML - Object Oriented Methodologies: Rumbaugh et al.'s object modeling technique – The Booch methodology – The Jacobson et al. methodology – Patterns – Frameworks - The Unified approach. Unified Modeling Language : Static and dynamic models – Why modeling - UML diagrams – UML class diagram – Use case diagram - UML dynamic modeling – packages and model organization.

### UNIT – III: Object Oriented Analysis

**HOURS: 12**

Object Oriented Analysis - Object Oriented Analysis process : Business Object Analysis - Use case driven object oriented analysis – Business process modeling – Use-Case model – Developing effective documentation . Classification : Classifications theory – Approaches for identifying classes – Noun phrase approach – Common class patterns approach – Use-Case Driven approach – Classes, Responsibilities, and Collaborators - Naming classes. Identifying object relationships, attributes, and methods : Association – Super- Sub class relationship – Aggregation – Class responsibility – Object responsibility.

### UNIT – IV: Object Oriented Design

**HOURS: 12**

Object Oriented Design - Object Oriented Design Process and Design Axioms - OOD process- OOD axioms – Corollaries – Design patterns. Designing classes : Designing classes – Class visibility – Refining attributes – Designing methods and protocols – Packages and managing classes. Access layer: Object Store and persistence – DBMS  
Logical and physical Database Organization and access control – Distributed Databases and Client Server Computing — Multidatabase Systems – Designing Access layer classes. View Layer : Designing view layer classes – Macro level process – Micro level process – The purpose of view layer interface – Prototyping the user interface.

## UNIT – V: Software Quality

**HOURS: 12**

Software Quality - Software Quality Assurance : Quality assurance tests – Testing strategies – Impact of Object Orientation on Testing - Test Cases- Test Plan – Continuous testing. System Usability and Measuring User satisfaction: Usability Testing – User satisfaction test A tool for analyzing user satisfaction. System Usability and Measuring User satisfaction : Introduction – Usability Testing.

### TEXT BOOK

1. Ali Bahrami, “Object Oriented Systems Development using UML”, McGraw-Hill, 2008

### REFERENCE BOOKS

1. Booch Grady, Rumbaugh James, Jacobson Ivar, “The Unified modeling Language – User Guide, Pearson Education, 2006
2. Brahma Dathan, Sarnath Ramnath, “Object Oriented Analysis, Design and Implementation”, Universities Press, 2010.
3. Mahesh P. Matha, “Object-Oriented Analysis and Design Using UML”, PHI Learning Private Limited, 2012.
4. Rachita Misra, Chhabi Rani Panigrahi, Bijayalaxmi Panda, “Principles of Software Engineering and System Design”, Yesdee Publishing 2019.

### WEB REFERENCES

1. <https://edutechlearners.com/object-oriented-system-development-by-ali-bahrami/>
2. [https://www.academia.edu/6908711/Object\\_Oriented\\_System\\_Design](https://www.academia.edu/6908711/Object_Oriented_System_Design)
3. [https://www.tutorialspoint.com/object\\_oriented\\_analysis\\_design/ooad\\_object\\_oriented\\_system.htm](https://www.tutorialspoint.com/object_oriented_analysis_design/ooad_object_oriented_system.htm)

### COURSE OUTCOMES

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

|       | COURSE OUTCOMES                                                                                                                                      | KNOWLEDGE LEVEL |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| CO: 1 | Distinguish object-oriented approach from the traditional approach to systems analysis and design                                                    | K4              |
| CO: 2 | Analyze, design, document the requirements through use case driven approach                                                                          | K4              |
| CO: 3 | Explain the importance of modeling and how the Unified Modeling Language (UML) represents an object-oriented system using a number of modeling views | K2              |
| CO: 4 | Identify the difference between various object relationships: inheritance, association and aggregation                                               | K3              |
| CO: 5 | Illustrate the role and function of test cases, testing strategies and test plans in developing object-oriented software                             | K2              |

CO – PO MAPPING

| RELATIONSHIP MATRIX FOR CO, PO & PSO |                  |      |      |      |      |                           |       |       |       |       |                   |
|--------------------------------------|------------------|------|------|------|------|---------------------------|-------|-------|-------|-------|-------------------|
|                                      | Program Outcomes |      |      |      |      | Program Specific Outcomes |       |       |       |       | Mean Relationship |
|                                      | PO 1             | PO 2 | PO 3 | PO 4 | PO 5 | PSO 1                     | PSO 2 | PSO 3 | PSO 4 | PSO 5 |                   |
| CO 1                                 | 3                | 3    | 2    | 2    | 2    | 3                         | 3     | 3     | 2     | 3     | 2.6               |
| CO 2                                 | 3                | 3    | 3    | 2    | 3    | 3                         | 2     | 2     | 3     | 2     | 2.6               |
| CO 3                                 | 2                | 2    | 3    | 2    | 2    | 3                         | 3     | 3     | 2     | 2     | 2.4               |
| CO 4                                 | 3                | 3    | 2    | 3    | 2    | 3                         | 3     | 3     | 3     | 2     | 2.7               |
| CO 5                                 | 3                | 3    | 2    | 2    | 2    | 3                         | 3     | 3     | 3     | 3     | 2.7               |

Mean Relationship value is **2.6** which is **HIGH**

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SKILL ENHANCEMENT ELECTIVE COURSES

1. SOFT COMPUTING

SEMESTER	CREDITS	INSTRUCTION HOURS	COURSE CODE	MARKS			PURPOSE OF THE COURSE
				INT	EXT	TOTAL	
III	5	60	P3R2CSSEC1:1	25	75	100	SKILL DEVELOPMENT

COURSE OBJECTIVES

- To develop the skills to gain a basic understanding of neural network
- To learn about supervised learning networks
- To understand the basics concepts of fuzzy sets
- Introduce students about fuzzy theory from an Engineering perspective
- To acquire knowledge on Genetic algorithms and its applications

UNIT – I: Soft Computing Constituents

HOURS: 12

Introduction: Soft Computing Constituents – Soft Computing Vs Hard Computing – Characteristics - Applications - Artificial Neural Network (ANN): Fundamental Concept – Application Scope - Basic Terminologies – Neural Network Architecture – Learning Process – Basic Models of ANN: McCulloch-Pitts Model – Hebb Network – Linear Separability.

UNIT – II: Perceptron Networks

HOURS: 12

Supervised Learning Networks: Perceptron Networks – Adaline and Madaline Networks – Back Propagation Network – Radial Basis Function Network. Associative Memory Networks – BAM - Hopfield Network - Boltzmann Machine. Unsupervised Learning Networks: Kohonen Self Organizing Network – Counter Propagation Network – ART Network.

UNIT – III: Fuzzy Sets

HOURS: 12

Fuzzy Sets: Basic Concept – Crisp Set Vs Fuzzy Set - Operations on Fuzzy Set – Properties of Fuzzy Sets – Fuzzy Relations: Concept – Fuzzy Composition – Fuzzy Equivalence and Tolerance Relation - Membership Functions: Features – Fuzzification – Methods of Membership value assignments – Defuzzification – Methods.

UNIT – IV: Fuzzy Arithmetic

HOURS: 12

Fuzzy Arithmetic – Extension Principle – Fuzzy Measures – Fuzzy Rules and Fuzzy Reasoning: Fuzzy Propositions – Formation of Rules – Decomposition of Rules – Aggregation of Rules – Approximate Reasoning – Fuzzy Inference and Expert Systems – Fuzzy Decision Making – Fuzzy Logic Control Systems.

UNIT – V: Genetic Algorithm

HOURS: 12

Genetic Algorithm: Fundamental Concept – Basic Terminologies – Traditional Vs Genetic Algorithm - Elements of GA - Encoding - Fitness Function – Genetic Operators: Selection – Cross Over - Inversion and Deletion - Mutation – Simple and General GA – The Schema Theorem - Classification of Genetic Algorithm – Genetic Programming – Applications of GA.

TEXT BOOK

1. S.N. Sivanandam, S.N. Deepa, “Principles of Soft Computing”, Wiley India, 2007.

REFERENCE BOOK

1. S. Rajasekaran, G.A.V. Pai, “Neural Networks, Fuzzy Logic, Genetic Algorithms”, Prentice Hall India, 2004.

WEB REFERENCES

1. <https://www.javatpoint.com/what-is-soft-computing>
2. <https://www.elprocus.com/soft-computing/>
3. <https://www.slideshare.net/ganeshpaul6/soft-computing-14879490>

COURSE OUTCOMES

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

	COURSE OUTCOMES	KNOWLEDGE LEVEL
CO: 1	Apply the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory	K3
CO: 2	Interpret the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic	K5
CO: 3	Interpret the fundamental theory and concepts of neural networks, Identify different neural network architectures, algorithms, applications and their limitations	K5
CO: 4	Interpret appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications	K5
CO: 5	Explain different applications of these models to solve engineering and other problems	K5

CO – PO MAPPING

RELATIONSHIP MATRIX FOR CO, PO & PSO											
	Program Outcomes					Program Specific Outcomes					Mean Relationship
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	
CO 1	3	3	3	3	3	3	3	3	3	2	2.9
CO 2	3	2	3	3	2	3	2	3	2	3	2.6
CO 3	3	2	3	3	2	2	3	3	3	2	2.6
CO 4	3	2	3	3	2	3	2	3	2	2	2.5
CO 5	3	2	3	3	2	3	3	3	2	3	2.7

Mean Relationship value is **2.66** which is **HIGH**

2. Compiler Design

SEMESTER	CREDITS	INSTRUCTION HOURS	COURSE CODE	MARKS			PURPOSE OF THE COURSE
				INT	EXT	TOTAL	
III	5	60	P3R2CSSEC1:2	25	75	100	SKILL DEVELOPMENT

COURSE OBJECTIVES

- Discover principles, algorithms and techniques that can be used to construct various phases of compiler.
- Acquire knowledge about finite automata and regular expressions
- Learn context free grammars, compiler parsing techniques.
- Explore knowledge about Syntax Directed definitions and translation scheme
- Understand intermediate machine representations and actual code generation

UNIT – I: Lexical analysis

HOURS: 12

Lexical analysis - Language Processors, The Structure of a Compiler, Parameter passing mechanism – Symbol table - The role of the lexical analyzer - Input buffering - Specification of tokens - Recognition of tokens – Finite automata - Regular expression to automata.

UNIT – II: Syntax Analysis

HOURS: 12

Syntax Analysis - The role of the parser - Context-free grammars - Writing a grammar - Top down Parsing - Bottom-up Parsing - LR parsers- LALR parsers.

UNIT – III: Semantic Analysis

HOURS: 12

Semantic Analysis - Inherited and Synthesized attributes – Dependency graphs – Ordering the evaluation of attributes – S- attributed definitions – L-attributed definitions – Applications of Syntax Directed translation – Syntax Directed translations schemes - Storage organization – Stack allocation of space.

UNIT – IV: Intermediate Code Generation

HOURS: 12

Intermediate Code Generation - Variants of Syntax trees – Three Address code – Types and Declarations - Translation of Expressions – Type checking - Control flow - Back patching - Switch Statements - Procedure calls.

UNIT – V: Code Generation and Code Optimization

HOURS: 12

Code Generation and Code Optimization - Issues in the design of a code generator - The target language – Address in the Target Code – Basic Block and Flow graphs – Optimization of Basic Blocks - A simple code generator – Peephole Optimization.

TEXT BOOK

1. Alfred V. Aho, Monica S.Lam, Ravi Sethi and Jeffrey D. Ullman, “Compilers- Principles, Techniques and Tools”, Second Edition, Pearson Education Asia, 2009.

REFERENCE BOOKS

1. A.V. Aho, Ravi Sethi, J.D. Ullman, Compilers- Principles, Techniques and Tools, Addison- Wesley, 2003.
2. Fischer Leblanc, Crafting Compiler, Benjamin Cummings, Menlo Park, 1988.
3. Kenneth C.Louden, Compiler Construction Principles and Practice, Vikas publishing House, 2004.
4. Allen I. Holub, Compiler Design in C, Prentice Hall of India, 2001.
5. S.Godfrey Winster, S.Arana Devi, R.Sujatha, “Compiler Design”, yesdee Publishers, Third Reprint 2019.

WEB REFERENCES

1. <https://www.geeksforgeeks.org/introduction-of-compiler-design/>
2. <https://www.guru99.com/compiler-design-tutorial.html>
3. <https://www.section.io/engineering-education/an-overview-of-compiler-design/>

COURSE OUTCOMES

On the successful completion of this course, students would be able to:

	COURSE OUTCOMES	KNOWLEDGE LEVEL
CO: 1	List the various phases of compiler and its use	K1
CO: 2	Demonstrate compilation of coding	K2
CO: 3	Construct the steps in Intermediate code generation	K3
CO: 4	Develop the various code optimization techniques, and machine code generation	K6
CO: 5	Determine various parsing Technique	K6

CO – PO MAPPING

RELATIONSHIP MATRIX FOR CO, PO & PSO											
	Program Outcomes					Program Specific Outcomes					Mean Relationship
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	
CO 1	3	2	2	1	2	3	3	3	2	2	2.3
CO 2	3	3	2	3	2	3	3	3	2	2	2.6
CO 3	3	2	2	3	2	2	2	3	2	3	2.4
CO 4	3	3	3	3	2	3	3	2	3	2	2.7
CO 5	3	2	2	3	2	2	2	3	3	2	2.4

Mean Relationship value is **2.48** which is **HIGH**

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## GENERIC ELECTIVE COURSES

### 1. Ethical Hacking

| SEMESTER | CREDITS | INSTRUCTION HOURS | COURSE CODE  | MARKS |     |       | PURPOSE OF THE COURSE |
|----------|---------|-------------------|--------------|-------|-----|-------|-----------------------|
|          |         |                   |              | INT   | EXT | TOTAL |                       |
| IV       | 5       | 60                | P4R2CSGEC1:1 | 25    | 75  | 100   | SKILL DEVELOPMENT     |

#### COURSE OBJECTIVES

- To know about digital marketing strategies
- To have an understanding about the concepts of advanced digital advertising
- To acquire knowledge on social media such as face book, twitter etc
- To know the concept of Search Engines
- To study data collection

#### UNIT-I: Introduction to Hacking

**HOURS: 12**

Importance of Security – Elements of Security – Phases of an Attack – Types of Hacker Attacks – Hacktivism – Vulnerability Research.

#### UNIT -II: Foot Printing

**HOURS: 12**

Introduction to Foot printing – Information Gathering Methodology – Foot printing Tools – WHOIS Tools – DNS Information Tools – Locating the Network Range.

#### UNIT -III: Scanning

**HOURS: 12**

Objectives – Scanning Methodology – Tools – Introduction to Enumeration – Enumeration Techniques – Enumeration Procedure – Tools.

#### UNIT -IV: Cracking Passwords

**HOURS: 12**

Password Cracking Websites – Password Guessing – Password - Cracking Tools – Password Cracking – Counter measures – Escalating Privileges – Executing Applications – Keyloggers and Spyware

#### UNIT-V: Penetration Testing

**HOURS: 12**

Introduction to Penetration Testing, Phases of penetration testing, tools.

#### TEXT BOOK

1. Ec-Council, Ethical Hacking and Countermeasures: Attack Phases, Delmar Cengage Learning, USA, 2009.

**Unit I** Chapter 1 (Sec: 1.1 to 1.10)

**Unit II** Chapter 2 (Sec: 2.1 to 2.29)

**Unit III** Chapter 3 (Sec: 3.1 to 3.46), Chapter 4 (Sec: 4.1 to 4.35)

**Unit IV** Chapter 5 (Sec: 5.1 to 5.37)

**Unit V** Chapter 6 (Sec: 6.1 to 6.27)

## REFERENCE BOOKS

1. Gary Hall, Hacking, Computer Hacking, Security Testing, Penetration Testing, and Basic Security, Kindle Edition, Kindle Direct Publishing, USA, 2016.
2. Alan T. Norman, Computer Hacking Beginners Guide, Kindle Edition, Kindle Direct Publishing, USA, 2016.
3. Andrew Huang, The Hardware Hacker, 1<sup>st</sup> Edition No Starch Press, USA, 2017.

## WEB REFERENCES

1. <https://www.synopsys.com/glossary/what-is-ethical-hacking.html>
2. <https://www.eccouncil.org/ethical-hacking/>
3. <https://www.javatpoint.com/ethical-hacking-tutorial>

## COURSE OUTCOMES

On successful completion of this course, students would be able to

|       | COURSE OUTCOMES                                                                                                          | KNOWLEDGE LEVEL |
|-------|--------------------------------------------------------------------------------------------------------------------------|-----------------|
| CO: 1 | Recall the basic knowledge of security and various attacks to protect the user's data effectively in a real time         | K1              |
| CO: 2 | Explain the various foot printing tools to be aware the problems involved in daily lives and ensure protect environment. | K2              |
| CO: 3 | Apply the safe ethical techniques in the World Wide Web to be beneficial to the society.                                 | K3              |
| CO: 4 | Examine various techniques of Keyloggers and Spyware for protect the private and public data in a real time.             | K4              |
| CO: 5 | Evaluate the concept of penetration testing and improve testing techniques to solve problems and promote social harmony  | K5, K6          |

## CO – PO MAPPING

| RELATIONSHIP MATRIX FOR CO, PO & PSO |                  |      |      |      |      |                           |       |       |       |       |                   |
|--------------------------------------|------------------|------|------|------|------|---------------------------|-------|-------|-------|-------|-------------------|
|                                      | Program Outcomes |      |      |      |      | Program Specific Outcomes |       |       |       |       | Mean Relationship |
|                                      | PO 1             | PO 2 | PO 3 | PO 4 | PO 5 | PSO 1                     | PSO 2 | PSO 3 | PSO 4 | PSO 5 |                   |
| CO 1                                 | 2                | 3    | 2    | 2    | 2    | 3                         | 3     | 3     | 2     | 2     | 2.4               |
| CO 2                                 | 3                | 2    | 2    | 3    | 2    | 3                         | 3     | 3     | 2     | 2     | 2.5               |
| CO 3                                 | 3                | 2    | 2    | 2    | 3    | 3                         | 3     | 3     | 2     | 2     | 2.5               |
| CO 4                                 | 3                | 2    | 3    | 1    | 2    | 3                         | 3     | 2     | 3     | 2     | 2.4               |
| CO 5                                 | 3                | 2    | 3    | 2    | 3    | 3                         | 3     | 3     | 3     | 3     | 2.8               |

Mean Relationship value is **2.52** which is **HIGH**

## 2. DIGITAL MARKETING

| SEMESTER | CREDITS | INSTRUCTION HOURS | COURSE CODE  | MARKS |     |       | PURPOSE OF THE COURSE |
|----------|---------|-------------------|--------------|-------|-----|-------|-----------------------|
|          |         |                   |              | INT   | EXT | TOTAL |                       |
| IV       | 5       | 60                | P4R2CSGEC1:2 | 25    | 75  | 100   | SKILL DEVELOPMENT     |

### COURSE OBJECTIVES

- To know about digital marketing strategies
- To have an understanding about the concepts of advanced digital advertising
- To acquire knowledge on social media such as face book, twitter etc
- To know the concept of Search Engines
- To study data collection

### UNIT – I: Digital Marketing

**HOURS: 12**

Introduction to Digital Marketing: Internet Users – Digital Marketing Strategies – Skills Required in Digital Marketing – Digital Marketing Plan. Display Advertising: Introduction – Concept of Display Advertising – Types of Display Ads – Buying Models – Display Plan – Targeting – Make a Good Ad.

### UNIT – II: Programmatic Digital Advertising

**HOURS: 12**

Programmatic Digital Advertising – Analytics Tools – YouTube Advertising. Search Engine Advertising: Introduction – Pay for Search Advertising – Understanding Ad Placement – Understanding AdRanks. Social Media Marketing: Introduction – To build a Successful Strategy.

### UNIT – III: Facebook for Business

**HOURS: 12**

Introduction – Facebook for Business- Anatomy of an Ad Campaign – Adverts - Other Marketing Tools - Other Essentials. Twitter Marketing: Introduction – Getting Started with Twitter – Building a Context Strategy – Twitter Usage - Twitter Ads – Twitter Analytics – Twitter Tools and Tips for Marketers. Instagram and Snapchat: Introduction – Instagram-snapchat

### UNIT – IV: Search Engine

**HOURS: 12**

Introduction – Search Engine - Concept of Search Engine Optimisation- SEO Phases – On page Optimisation- Off page Optimisation- Social Media Reach – Maintenance.

### UNIT – V: Data Collection

**HOURS: 12**

Introduction – Data Collection - Key Metrics - Marketing Web Analytics Actionable – Types of Tracking codes – Mobile Analytics.

### TEXT BOOK

1. Seema Gupta, Digital Marketing, First Edition, Mc-Graw Hill, New Delhi, 2017.

**Unit I** - Chapter 1, Chapter 2(pg.26-51)

**Unit II** - Chapter 2 (pg.52- 66), Chapter 3 (pg.73- 83), Chapter 4 (pg.108- 132)

**Unit III** - Chapter 5(pg.139- 183), Chapter 7 (pg.221 - 254), Chapter 8 (pg.259-268),

**Unit IV**- Chapter 10

**Unit V** - Chapter 11(353-382)

## REFERENCE BOOKS

1. Ian Dodson, The Art of Digital Marketing, Wiley, New Jersey, USA, 2018.
2. Prof. Nitin C. Kamat, Mr.Chinmay NitinKamat, Digital Social Media Marketing,Himalaya Publishing House Pvt. Ltd., India, 2018.
3. Ryan Deiss & Russ Henneberry, *Digital Marketing for Dummies*, 2<sup>nd</sup> Edition, John Wiley& Sons, Inc., New Jersey, 2020.

## WEB REFERENCES

1. <https://www.marketo.com/digital-marketing/>
2. <https://www.investopedia.com/terms/d/digital-marketing.asp>
3. <https://mailchimp.com/marketing-glossary/digital-marketing/>

## COURSE OUTCOMES

On the successful completion of this course, students would be able to:

|       | COURSE OUTCOMES                                                                    | KNOWLEDGE LEVEL |
|-------|------------------------------------------------------------------------------------|-----------------|
| CO: 1 | Show the acquaintance of the concepts of Digital Marketing and Display Advertising | K1, K2          |
| CO: 2 | Identify the concepts of Search Engine Advertising.                                | K3              |
| CO: 3 | Classify the knowledge of Facebook Marketing and Twitter Marketing.                | K4              |
| CO: 4 | Distinguish various applications of Search Engine Optimization and social media.   | K5              |
| CO: 5 | Elaborate various techniques of Web Analytics.                                     | K6              |

## CO – PO MAPPING

| RELATIONSHIP MATRIX FOR CO, PO & PSO |                  |      |      |      |      |                           |       |       |       |       |                   |
|--------------------------------------|------------------|------|------|------|------|---------------------------|-------|-------|-------|-------|-------------------|
|                                      | Program Outcomes |      |      |      |      | Program Specific Outcomes |       |       |       |       | Mean Relationship |
|                                      | PO 1             | PO 2 | PO 3 | PO 4 | PO 5 | PSO 1                     | PSO 2 | PSO 3 | PSO 4 | PSO 5 |                   |
| CO 1                                 | 2                | 3    | 2    | 2    | 2    | 3                         | 3     | 3     | 2     | 2     | 2.4               |
| CO 2                                 | 3                | 2    | 2    | 3    | 2    | 3                         | 3     | 3     | 2     | 2     | 2.5               |
| CO 3                                 | 3                | 2    | 2    | 2    | 3    | 3                         | 3     | 3     | 2     | 2     | 2.5               |
| CO 4                                 | 3                | 2    | 3    | 1    | 2    | 3                         | 3     | 2     | 3     | 2     | 2.4               |
| CO 5                                 | 3                | 2    | 3    | 2    | 3    | 3                         | 3     | 3     | 3     | 3     | 2.8               |

Mean Relationship value is **2.52** which is **HIGH**