



INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)  
(Deemed to be University Estd. as/3 of the UGC Act, 1956)  
PALLAVARAM - CHENNAI

ACCREDITED BY **NAAC** WITH '**A**' GRADE  
*Marching Beyond 30 Years Successfully*  
INSTITUTION WITH **UGC 12B** STATUS

## **POSTGRADUATE DEGREE PROGRAMME**

### **M.Sc., Computer Science**

**(1 Year for PG Degree / 2 Years for PG Degree)**

### **CURRICULUM & SYLLABUS**

### **REGULATION 2024**

**Choice Based Credit System (CBCS)**

**&**

**Learning Outcomes Based Curriculum Framework (LOCF)**

**Effective from the Academic Year**

**2024 -2025**

**Department of Computer Science**

**School of Computing Sciences**



INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)  
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## DEPARTMENT OF COMPUTER SCIENCE

### VISION OF THE DEPARTMENT

Aims to provide quality education in the field of Computer science with state of art facilities and handle quality research in association with industry and other Universities to produce well trained IT professionals in Computer Science domain.

### MISSION OF THE DEPARTMENT

<b>M1</b>	To Provide knowledge through teaching and training in the field of Computer Science.
<b>M2</b>	To concentrate on teaching-learning, research, project and consultancy help to increase the growth of IT and IT Enabled Services.
<b>M3</b>	To train students to get best opportunities and tackle challenges in IT industry.
<b>M4</b>	To equip students with communication skill, Leadership quality, ability to work with team help to improve the society.
<b>M5</b>	To provide value based and technical oriented related students help to build the nation.

### PROGRAMME EDUCATIONAL OUTCOMES (PEO)

<b>PEO1</b>	Graduates are prepared to be employed in IT industries by providing expected Domain Knowledge.
<b>PEO2</b>	Graduates are provided with practical training, hands-on and project experience to meet the industrial needs.
<b>PEO3</b>	Graduates are motivated in career and entrepreneurial skill development to become global leaders.
<b>PEO4</b>	Graduates are trained to demonstrate creativity, develop innovative ideas and to work in teams to accomplish a common goal.
<b>PEO5</b>	Graduates are addressed with social issues and guided to operate problems with Solution.

### PROGRAMME OUTCOMES (PO)

<b>PO1</b>	<b>Critical Thinking:</b> Apply knowledge of Computer Science to identify, analyse problems and to provide effective solution in the area of Computing.
<b>PO2</b>	<b>Computing Skills and Ethics:</b> Analyse a problem, and identify and define the computing requirements appropriate to its solution.
<b>PO3</b>	<b>Analytical skill:</b> Ability to design, develop algorithms and provide software solutions to cater the industrial needs.
<b>PO4</b>	<b>Modern Tool Usage:</b> Use current techniques, skills, and tools necessary for computing practices
<b>PO5</b>	<b>Employability Skills:</b> Inculcate skills to excel in the fields of Information Technology and its Enabled services, Government and Private sectors, Teaching and Research.
<b>PO6</b>	<b>Ethics:</b> Insists ethical responsibilities, human and professional values and make their contribution to the society.
<b>PO7</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or a leader in diverse team and multidisciplinary settings.
<b>PO8</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or a leader in diverse team and multidisciplinary settings.

<b>PO9</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO10</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the problem and management principles and apply these to one's own work, as a member and engineering and management principles and apply these to one's own work, as a member.
<b>PO11</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO12</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

### **PROGRAMME SPECIFIC OUTCOMES (PSO)**

<b>PSO1</b>	Professionally trained in the areas of programming, multimedia, animation, web Designing, networking and to acquire knowledge in various domain-based electives.
<b>PSO2</b>	Abet students to communicate effectively and to improve their competency skills to solve real time problems.
<b>PSO3</b>	The ability to employ modern computer languages and applications for their successful career, to create platforms to become an entrepreneur and a relish for higher studies.

## **BOARD OF STUDIES**

### **List of Members**

#### **Department of Computer Science**

<b>S. No</b>	<b>Name &amp; Designation</b>	<b>Address</b>	<b>Role</b>
1.	Dr. P. Magesh Kumar	Director, School of Computing Sciences, VISTAS	Chairperson
2.	Dr. R. Ganesan	Professor and Dean, School of CSE, VIT, Chennai Campus, Vandalur, Kelambakkam, Main Road, Chennai-600127	Academic Expert (External Member)
3.	Mr.D.Rajkumar	Program Manager, Birla Soft, Prince Infocity Chennai	Industrial Expert (External Member)
4.	Dr. R. Parameswari	Professor and Head Department of Computer Science, VISTAS	Internal Member
5.	Dr. S. Perumal	Professor, Department of Computer Science, VISTAS	Internal Member
6.	Dr. G. Thailambal	Associate Professor, Department of Computer Science, VISTAS	Internal Member
7.	Dr. S. Mangaiyarkarasi	Associate Professor, Department of Computer Science, VISTAS	Internal Member
8.	Mr. R. Balamurugan	Assistant Professor, Department of Computer Science, VISTAS	Internal Member
9.	Ms. R. Padma	Assistant Professor, Department of Computer Science, VISTAS	Internal Member
10.	Mr. K. Thirumurugan	Milestone Internet Marketing Private Limited, Team Lead-DX, Chennai	Alumni Member (External Member)

## **CREDIT DISTRIBUTION**

**M.Sc., Computer Science**

**Minimum credits to be earned: 90**

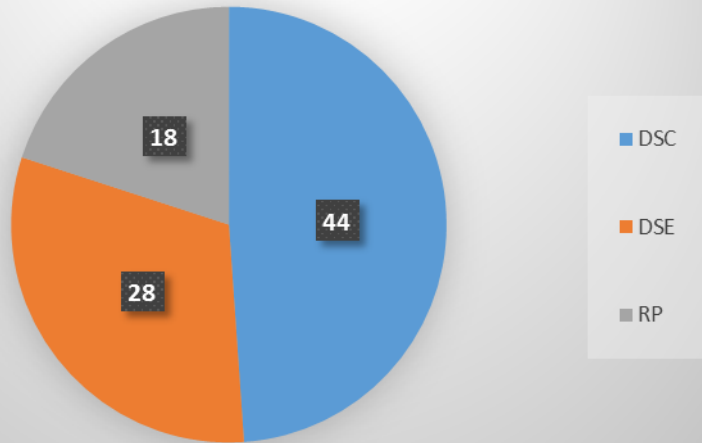
**(1 Year for PG Degree / 2 Years for PG Degree)**

<b>Component</b>	<b>I Sem</b>	<b>II Sem</b>	<b>III Sem</b>	<b>IV Sem</b>	<b>2 Yrs. Total Credits</b>
<b>DSC</b>	<b>16</b>	<b>10</b>	<b>14</b>	<b>4</b>	<b>44</b>
<b>DSE</b>	<b>8</b>	<b>8</b>	<b>8</b>	<b>4</b>	<b>28</b>
<b>RP</b>	<b>-</b>	<b>4</b>	<b>2</b>	<b>12</b>	<b>18</b>
<b>Total Credits</b>	<b>24</b>	<b>22</b>	<b>24</b>	<b>20</b>	<b>90</b>

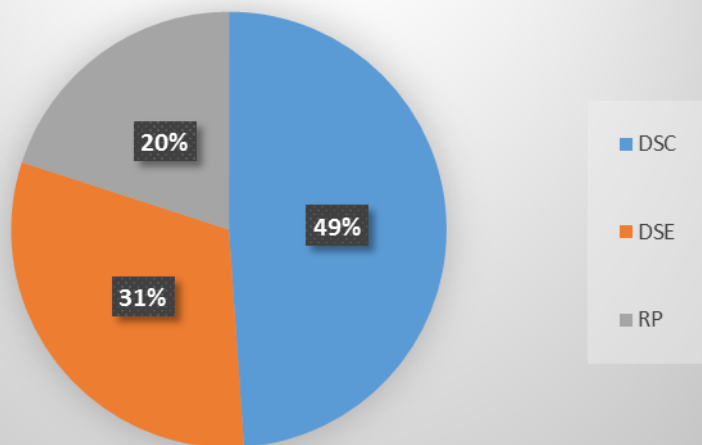
### **ABBREVIATIONS:**

<b>DSC</b>	Disciplinary Specific Core
<b>DSE</b>	Disciplinary Specific Elective
<b>RP</b>	Research Methodology, Internship, Mini Project, & Research Project

## CREDIT DISTRIBUTION



## CREDIT PERCENTAGE DISTRIBUTION



## CURRICULUM STRUCTURE

### M.Sc., Computer Science

**Total number of Credits: 90**

**M.Sc., Computer Science Minimum Credits to be earned :90**

#### SEMESTER 1

**Hours / Week**

**Maximum Marks**

Category	Code	Course	L	T	P	O	C	CIA	SEE	Total
DSC 1	24CMCS11	Design and Analysis of Algorithm	3	1	0	2	4	40	60	100
DSC 2	24CMCS12	Shell Programming using Linux	4	0	0	2	4	40	60	100
DSC 3	24CMCS13	Scripting Language	4	0	0	2	4	40	60	100
DSC 2 (Lab)	24PMCS11	Linux Programming Lab	0	0	4	1	2	40	60	100
DSC 3 (Lab)	24PMCS12	Scripting Language Lab	0	0	4	1	2	40	60	100
DSE 1	24DMCS1-	DSE 1	4	0	0	2	4	40	60	100
DSE 2	24DMCS1-	DSE 2	4	0	0	2	4	40	60	100
			19	1	8	-	24	-	-	-

**CIA - Continuous Internal Assessment**

**SEE - Semester End Examination**

**\*L – Lecture, \*T- Tutorial, \*P- Practical, \*O - Outside the class effort / self-study**



SEMESTER 2										
Category	Code	Course	Hours / Week					Maximum Marks		
			L	T	P	O	C	CIA	SEE	Total
DSC 4	24CMCS21	Advanced Database Management Systems	4	0	0	2	4	40	60	100
DSC 5	24CMCS22	Natural Language Processing	3	1	0	2	4	40	60	100
DSC 4 (Lab)	24PMCS21	Advanced Database Management Systems Lab	0	0	4	1	2	40	60	100
DSE 3	24DMCS2-	DSE 3	4	0	0	2	4	40	60	100
DSE 4	24DMCS2-	DSE 4	4	0	0	2	4	40	60	100
RP 1	24RMCS21	Research Methodology	4	0	0	2	4	40	60	100
			19	1	4	-	22	-	-	-

CIA - Continuous Internal Assessment

SEE - Semester End Examination

\*L – Lecture, \*T- Tutorial, \*P- Practical, \*O - Outside the class effort / self-study

SEMESTER 3										
Category	Code	Course	Hours / Week					Maximum Marks		
			L	T	P	O	C	CIA	SEE	Total
DSC 6	24CMCS31	Mobile Application Development	4	0	0	2	4	40	60	100
DSC 7	24CMCS32	Fundamentals of Data Science	3	0	0	2	3	40	60	100
DSC 8	24CMCS33	Neural Networks	3	0	0	2	3	40	60	100
DSC 6 (Lab)	24PMCS31	Mobile Application Development lab	0	0	4	0	2	40	60	100
DSC 7 (Lab)	24PMCS32	Data Science using R Lab	0	0	4	0	2	40	60	100
DSE 5	24DMCS3-	DSE 5	3	1	0	2	4	40	60	100
DSE 6	24DMCS3-	DSE 6	3	1	0	2	4	40	60	100
RP 2	24 RMCS31	Internship	0	0	0	12	2	-	100	100
			16	2	8	-	24	-	-	-

CIA - Continuous Internal Assessment

SEE - Semester End Examination

\*L - Lecture, \*T- Tutorial, \*P- Practical, \*O - Outside the class effort / self-study

SEMESTER 4										
Category	Code	Course	Hours / Week					Maximum Marks		
			L	T	P	O	C	CIA	SEE	Total
DSC 9	24CMCS41	Advanced Compiler Design	3	1	0	2	4	40	60	100
DSE 7	24DMCS4-	DSE 7	3	1	0	2	4	40	60	100
RP 3	24RMCS41	Research Project	-	-	12	10	12	40	60	100
			6	2	12	-	20	-	-	-

CIA - Continuous Internal Assessment

SEE - Semester End Examination

\*L - Lecture, \*T- Tutorial, \*P- Practical, \*O - Outside the class effort / self-study

### DISCIPLINARY SPECIFIC CORE COURSES

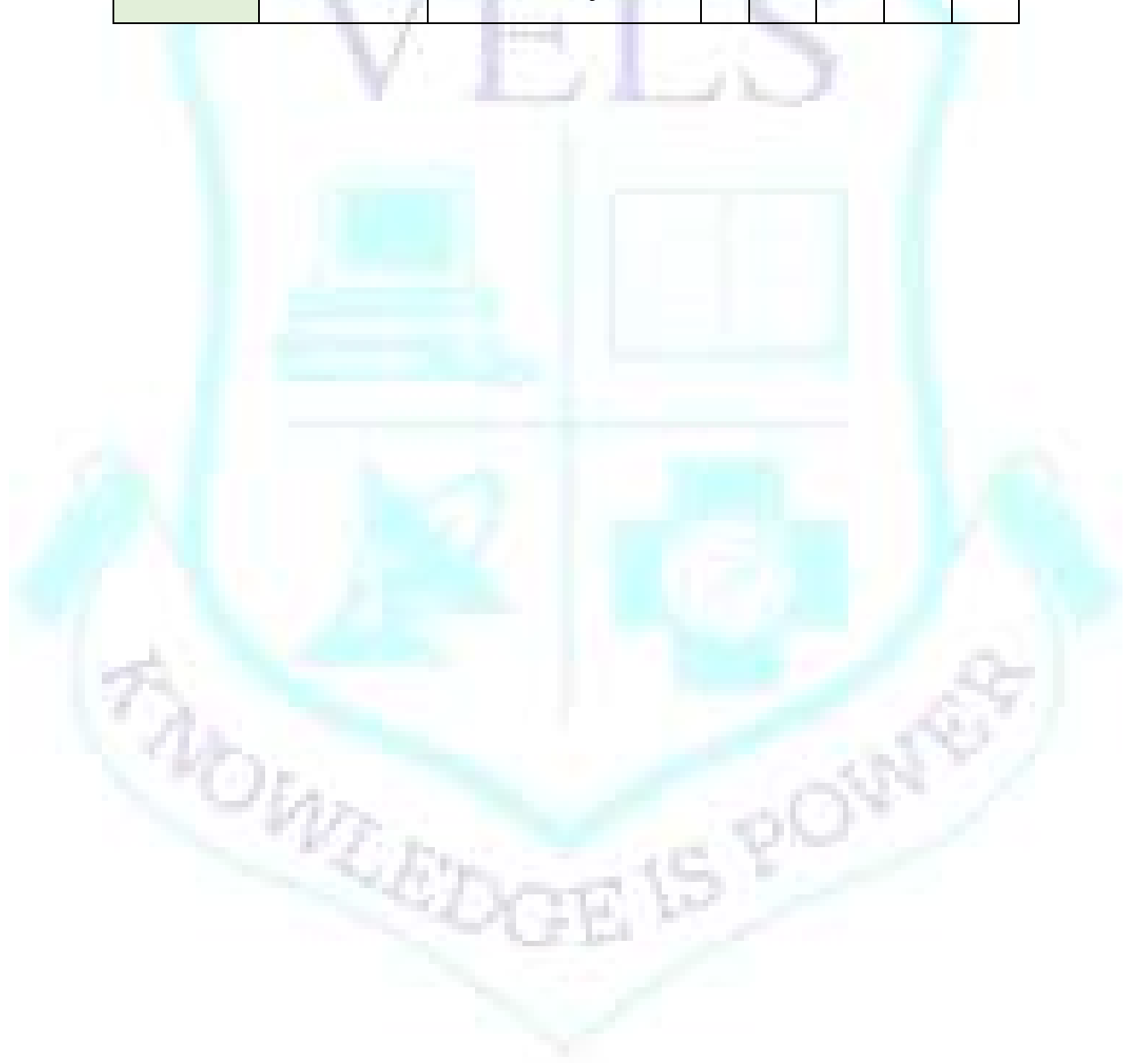
Category	Code	Course	L	T	P	O	C
DSC 1	24CMCS11	Design and Analysis of Algorithm	3	1	0	2	4
DSC 2	24CMCS12	Shell Programming using Linux	4	0	0	2	4
DSC 3	24CMCS13	Scripting Language	4	0	0	2	4
DSC 2 (Lab)	24PMCS11	Linux Programming Lab	0	0	4	0	2
DSC 3 (Lab)	24PMCS12	Scripting Language Lab	0	0	4	0	2
DSC 4	24CMCS21	Advanced Database Management Systems	4	0	0	2	4
DSC 5	24CMCS22	Natural Language Processing	3	1	0	2	4
DSC 4 (Lab)	24PMCS21	Advanced Database Management Systems Lab	0	0	4	0	2
DSC 6	24CMCS31	Mobile Application Development	4	0	0	2	4
DSC 7	24CMCS32	Fundamentals of Data Science	3	0	0	2	3
DSC 8	24CMCS33	Neural Networks	3	0	0	2	3
DSC 6 (Lab)	24PMCS31	Mobile Application Development lab	0	0	4	0	2
DSC 7 (Lab)	24PMCS32	Data Science using R Lab	0	0	4	0	2
DSC 9	24CMCS41	Advanced Compiler Design	3	1	0	2	4

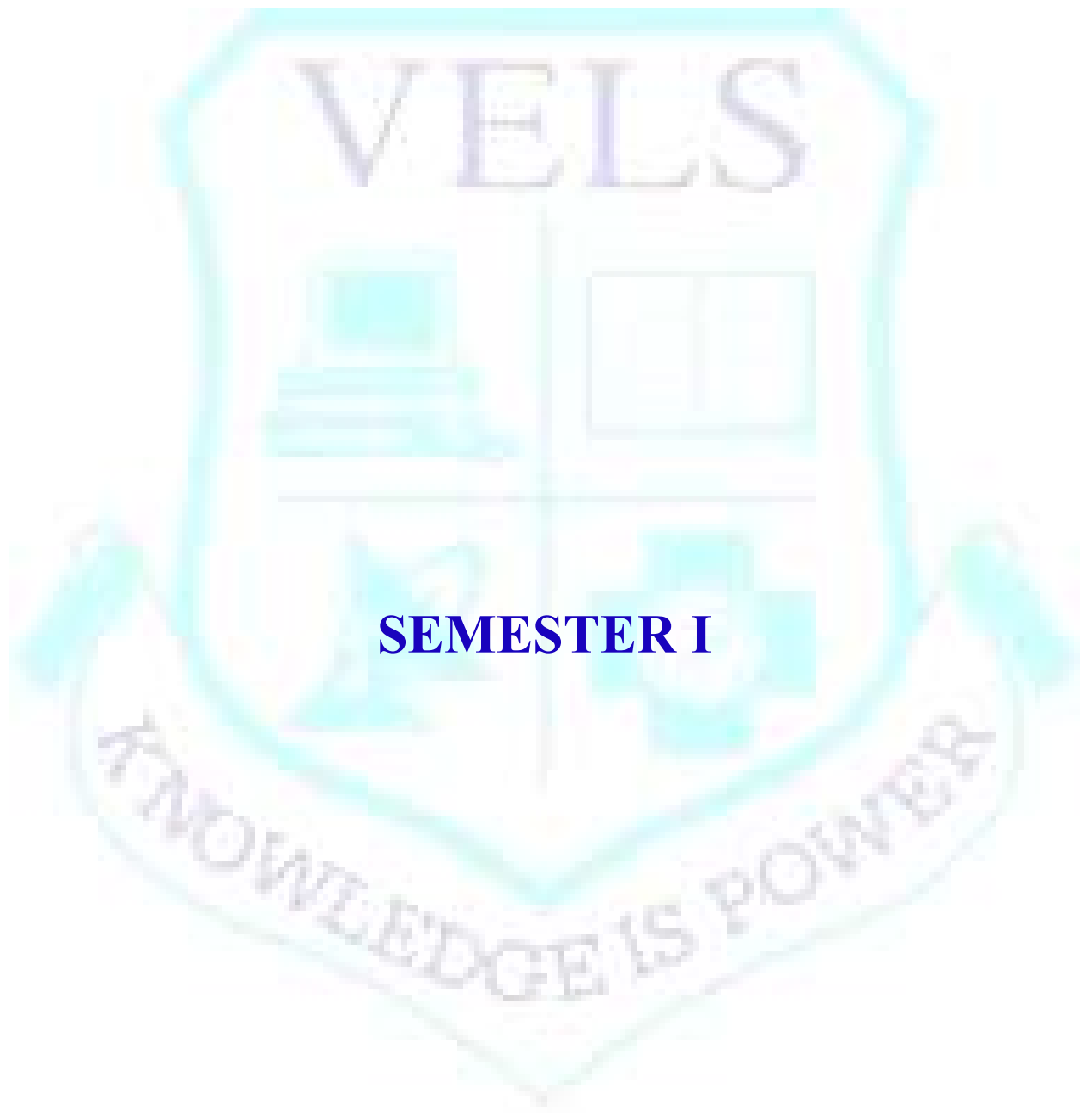
## DISCIPLINARY SPECIFIC ELECTIVE COURSES

Category	Code	Course	L	T	P	O	C
<b>DSE 1</b>	24DMCS11	Mobile Computing	4	0	0	2	4
	24DMCS12	Big Data Analytics	4	0	0	2	4
<b>DSE 2</b>	24DMCS13	Theory of Automata	4	0	0	2	4
	24DMCS14	Cloud Computing	4	0	0	2	4
<b>DSE 3</b>	24DMCS21	Theoretical Foundations of Computer Science	4	0	0	2	4
	24DMCS22	Digital Image Processing	4	0	0	2	4
<b>DSE 4</b>	24DMCS23	Artificial Intelligence	4	0	0	2	4
	24DMCS24	Embedded System	4	0	0	2	4
<b>DSE 5</b>	24DMCS31	Security Issues in Machine Learning	3	1	0	2	4
	24DMCS32	Parallel and Distributed Computing System	3	1	0	2	4
	24DMCS33	Data Mining and Data Warehousing	3	1	0	2	4
<b>DSE 6</b>	24DMCS34	Cryptography and its Applications	3	1	0	2	4
	24DMCS35	Block Chain Technology	3	1	0	2	4
	24DMCS36	Deep Learning and Neural Networks	3	1	0	2	4
<b>DSE 7</b>	24DMCS41	Cyber Security	3	1	0	2	4
	24DMCS42	Advanced Networks	3	1	0	2	4
	24DMCS43	R Programming	3	1	0	2	4

## RESEARCH PROJECT

Category	Code	Course	L	T	P	O	C
RP 1	24RMCS21	Research Methodology	4	0	0	2	4
RP 2	24RMCS31	Internship	0	0	0	12	2
RP 3	24RMCS41	Research Project	0	0	12	10	12





**SEMESTER I**

## 24CMCS11 DESIGN AND ANALYSIS OF ALGORITHM

L	T	P	O	C
3	1	0	2	4

### COURSE OBJECTIVES:

This course gives insight into the design and analysis for divide and conquer, sorting, dynamic programming, backtracking, Dynamic Programming, knapsack, tree vertex splitting, and bi-connected problems.

### **UNIT-I: INTRODUCTION**

**12**

Algorithm, pseudo code for expressing algorithms, performance analysis-space complexity, time complexity, asymptotic notation- big (O) notation, omega notation, theta notation and little (o) notation, recurrences, probabilistic analysis, disjoint set operations, union and find algorithms.

### **UNIT- II: DIVIDE & CONQUER AND GREEDY METHOD**

**12**

General method, applications-analysis of binary search, quick sort, merge sort, AND OR Graphs. GREEDY METHOD: General method, Applications-job sequencing with deadlines, Fractional knapsack problem, minimum cost spanning trees, Single source shortest path problem.

### **UNIT- III: DYNAMIC PROGRAMMING**

**12**

DYNAMIC PROGRAMMING: General method, applications - optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Traveling salesperson problem, Reliability design.

### **UNIT- IV: BASIC TRAVERSAL AND SEARCH TECHNIQUES**

**12**

Techniques for Binary Trees –Techniques for Graphs-Connected Components and Spanning Trees-Biconnected Components and DFS. Backtracking: General Method-8-Queen Problem, Sum of Subsets Graph Coloring : Hamiltonian Cycle.

The Method-0/1 Knapsack Problem. NP-Hard And NP - Complete Problem - Basic Concepts - Cook's Theorem -NP - HARD GRAPH Problems - Clique Decision Problem - Chromatic Number Decision Problem NP - HARD Scheduling Problems - Flow Shop Scheduling - Job shop scheduling: The Method-0/1 Knapsack Problem-Traveling Salesman Problem.

**Total: 60 Hours**

### **COURSE OUTCOMES:**

**At the End of the course, the Student will be able to:**

**CO-1:** Analyze the Complexity and performance of algorithms.

**CO-2:** Analyze Quick sort, Merge sort algorithm, BFS and DFS Algorithms.

**CO-3:** Apply appropriate algorithm design techniques for solving problems.

**CO-4:** Understand how the choice of data structures and the algorithm design methods impact the performance of programs.

**CO-5:** Understand the set of rules design methods in the Greedy Method.

### **Text Books:**

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran (2013) "Fundamentals of Computer Algorithms", Second Edition, University Press.

### **Reference Books:**

1. Manas Ranjan Kabat (2013), "Design And Analysis Of Algorithms", PHI Learning Pvt. Ltd.
2. Jean-Paul Trembley, Paul.G.Sorenson (2010 ),"Introduction to Data structures with Applications", Tata McGraw Hill, and Second Edition,.
3. G. Brassard and P. Bratley ( 1997), " Fundamentals of Algorithms", PHI, New Delhi
4. M.A.Weiss, (2013), "Data Structures and algorithm Analysis in C++", Pearson Education, Asia.
- 5.Sandeep Sen and Amit Kumar (2019), "Design and Analysis of Algorithms: A contemporary perspective", Cambridge University Press,

### **Web Sources:**

1. [www.guru99.com](http://www.guru99.com)
2. [www.youtube.com/watch?v=D6Q\\_wHrzdDs](https://www.youtube.com/watch?v=D6Q_wHrzdDs)



## **24CMCS12 SHELL PROGRAMMING USING LINUX**

L	T	P	O	C
4	0	0	2	4

### **COURSE OBJECTIVES:**

To familiarize students with the Linux environment, to learn the fundamentals of shell scripting/programming, to manage basic Linux administration, to explain execution procedure, debugging and kernel structure.

### **UNIT-I: LINUX OPERATING SYSTEMS 12**

Introduction – History of UNIX and Linux – System Features – Software Features – Differences between Linux and Other Operating System – hardware requirements - sources of Linux Information Linux Startup and Setup: User accounts – Accessing the Linux system – Linux Commands.

### **UNIT-II: THE SHELL AND FILTERS 12**

The command line – Command line Editing - Creating files using the vi editor: Text editors – The vi editor – Modes of operation in vi editor–Kernel – Shell –Types of Shells-Terminal – Command Line Shell – Graphical Shells – Filters –Pipes - Shell Scripting.

### **UNIT-III: THE SHELL PROGRAMMING 12**

Shell Programming-Shell Metacharacters - Shell Variables- Shell Scripts- Debugging Scripts – Operators -Integer Arithmetic and String Manipulation- Decision Making- Functions- I/O Redirection and Piping- Exception Handling- Creating Shell Programs for Automating Tasks - File Handling - Trapping Signals – Examples.

### **UNIT-IV: LINUX FILE STRUCTURE AND FILE MANAGEMENT 12**

Introduction to Linux File System- file descriptors –system calls and device drivers - File structures – managing Files - File Management Operation: File and Directory Permissions - System Calls for File Management - Managing Directories - Directory API.

### **UNIT-V: CASE STUDY 12**

Script that searches for a specific word in a file and counts its occurrences -Handle signals like Ctrl+C in a shell script - Checks for and removes duplicate lines in a text file - Generates

a secure random password - Calculates the total size of all files in a directory - Finds and lists all empty files in a directory.

**Total: 60 Hours**

### **COURSE OUTCOMES:**

At the end of this course, the student will be able to:

- CO-1:** Can execute Linux commands and installation process.
- CO-2:** Evaluate different types of editors in Linux using for shell programming.
- CO-3:** Understand about shell programming concepts and Write shell scripts to automate various tasks.
- CO-4:** Understand about Linux File Structures and Managing files.
- CO-5:** Apply necessary tools and methods for Linux application development and learn about the features and techniques that are unique to Linux.

### **Text Books:**

1. Richard Petersen (2008), “Linux: The Complete Reference”, Sixth Edition, Tata McGraw- Hill Publishing Company Limited, New Delhi
2. Neil Matthew, Richard stones, Alan Cox (2012), “Beginning Linux Programming”, Wrox Publication

### **Reference Books:**

1. NIIT (2006), “Operating System LINUX”, PHI, Eastern Economy Edition

### **Web Sources:**

1. <https://www.geeksforgeeks.org/introduction-linux-shell>
2. [www.javatpoint.com/linux](http://www.javatpoint.com/linux)

L	T	P	O	C
4	0	0	2	4

**COURSE OBJECTIVES:**

Students will understand Scripting languages and its purposes. The course will cover theoretical aspects of the subject with suitable programs through scheduled lectures. The course will cover the Client Side and Server-Side Scripting Languages.

**UNIT-I: HTML****12**

Internet Basics- Introduction to Scripting Languages- Client Side and Server Side Scripting Languages- - Introduction to HTML - List - Creating Table - Linking document - Frames - Graphics to HTML Doc - Style sheet - Style sheet basic - Add style to document - Creating Style sheet rules - Style sheet properties - Font - Text - List - Color and background color - Box - Display properties.

**UNIT-II: VB SCRIPT****12**

Introduction to VBScript - Adding VBScript Code to an HTML Page - VB Script Basics - VBScript Data Types - VBScript Variables - VBScript Constants -VBScript Operators – mathematical- comparison-logical - Using Conditional Statements - Looping Through Code - VBScript Procedures – type casting variables - math functions – date functions – string functions– other functions - VBScript Coding Conventions - Dictionary Object in VBScript - Err Object

**UNIT-III: JAVA SCRIPT****12**

Introduction to Javascript – Advantages of Javascript – Javascript syntax - Data type – Variable - Array – Operator & Expression – Looping – control structures - Constructor Function – user defined function Dialog Box.

**UNIT-IV: PERL****12**

Introduction to PERL and Scripting Scripts and Programs, Origin of Scripting , Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

CGI and Scripting languages: Introduction to CGI, Alternative Technologies, The Hypertext Transport Protocol, URLs, HTTP, Browser Requests, Server Responses, Proxies, Content Negotiation, The Common Gateway Interface, The CGI Environment, Environment Variables, CGI Output, Forms and CGI, Sending Data to the Server.

**Total: 60 Hours**

### **COURSE OUTCOMES:**

At the end of this course, the Student will be able to:

**CO-1:** Create applications by using concepts like Java Script, HTML, PERL.

**CO-2:** Create web scraping scripts to programmatically obtain data and content from web pages

**CO-3:** Evaluate techniques used to create scripts for automating system administrative tasks.

**CO-4:** Analyze many of the modern and way cool language features that show up frequently in scripting languages

**CO-5:** Have understanding of server side scripting with PERL & CGI language.

### **Text Books:**

1. Ivan Bayross (2006), "Web Enable Commercial Application Development Using HTML, DHTML, Java script, PERL and CGI", BPB Publications
2. Kathleen Kalata (2001), "Internet Programming with VBScript and JavaScript", Thomson learning
3. J.Jaworski (1999), "Mastering Java script", BPB Publications

### **Reference Books:**

1. Powell, Thomas; Schneider, Fritz (2004), "JavaScript: The Complete Reference", TMH, 2nd edition.
2. T. A. Powell (2002), "Complete Reference HTML", Third Edition, TMH,

### **Web Sources:**

1. [www.geeksforsseeks.com](http://www.geeksforsseeks.com)
2. [www.nptel.ac.in](http://www.nptel.ac.in)

L	T	P	O	C
0	0	4	1	2

**COURSE OBJECTIVES:**

This course gives practical training in Linux programming to perform the various commands in shell script. It gives hands on training in File operations in C Programming.

1. Write a shell script to perform the file operations using Linux commands.
2. Write a shell script to perform the operations of basic Linux utilities.
3. Write a shell script to perform nCr calculation using recursion.
4. Write the shell script to find the grade of student's marks.
5. Write a Shell script to display the numbers between 1 and 9999 in words.
6. Write a Shell script for Palindrome Checking.
7. Write a shell script to find the biggest of three numbers using command line arguments.
8. Write a shell script to find the number of characters, words and lines for a given file without using the "wc" command.
9. Write a C program for implementation of system calls: a) open b) read & close c) create & write d) fork & exec
10. Write a C program for the following commands: a) cp b) mv c) delete
11. Write a C program to convert starting lowercase letter of each word into uppercase in a file.
12. Write a C program to print the contents of the file in reverse order.

**Total: 30 Hours**

**COURSE OUTCOMES:**

At the End of this course, the students will be able to:

- CO-1: Create basic application using Linux
- CO-2: Evaluate various Linux commands
- CO-3: Apply Operating system concepts using Linux.
- CO-4: Apply String manipulation using Linux.
- CO-5: Understand basic Linux commands

**Text Books:**

1. Richard Petersen (2008), “Linux: The Complete Reference”, Sixth Edition, Tata McGraw- Hill Publishing Company Limited, New Delhi.
2. Neil Matthew, Richard stones, Alan Cox (2009) “Beginning Linux Programming”, Wrox Publication.

**Reference Books:**

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**Web Sources:**

1. [www.youtube.com/watch?v=wBp0Rb-ZJak](http://www.youtube.com/watch?v=wBp0Rb-ZJak)
2. [www.javatpoint.com/linux](http://www.javatpoint.com/linux)



L	T	P	O	C
0	0	4	1	2

**COURSE OBJECTIVES:**

This course gives practical training in HTML, VB script, Java script and Perl scripts to perform the various Web page designs using scripts.

1. Create a table to show your class time table using HTML.
2. Use frames such that the page is divided into 3 frames 20% on left to show contents of pages, 60% in center to show body of page, remaining on right to show remarks.
3. Create a webpage with HTML describing your department use paragraph and list tags.
4. Write a VBScript code that accepts the length, breadth and height and displays the area of a rectangle.
5. Create a form that has an email field and write VBScript code for validation of the email address.
6. Write a java script program to test the first character of a string is uppercase or not.
7. Write a java script for loop that will iterate from 0 to 15 for each iteration, it will check if the current number is odd or even, and display a message to the screen.
8. Write a java script program which computes the average marks of the 10 student's then average is used to determine the corresponding grade.
9. Write a Perl script to substitute a word, with another word in a string.
10. Write a Perl script to validate IP address and email address.
11. Write a Perl script to print the file in reverse order using command line arguments.
12. Write a Perl program to display various Server Information like Server Name, Server Software, Server protocol, CGI Revision etc

**Total: 30 Hours**

**COURSE OUTCOMES:**

At the End of this course, the Student will be able to:

- CO-1:** Create basic application using shell scripts
- CO-2:** Evaluate various shell commands
- CO-3:** Apply Operating system concepts using shell.
- CO-4:** Apply String manipulation using shell.
- CO-5:** Understand basic shell commands

**Text Books:**

1. Ivan Bayross (2006), “Web Enable Commercial Application Development Using HTML, DHTML, Java script, PERL and CGI”, BPB Publications
2. Kathleen Kalata (2001), “Internet Programming with VBScript and JavaScript”, Thomson learning
3. J.Jaworski (1999), “Mastering Java script”, BPB Publications

**Reference Books:**

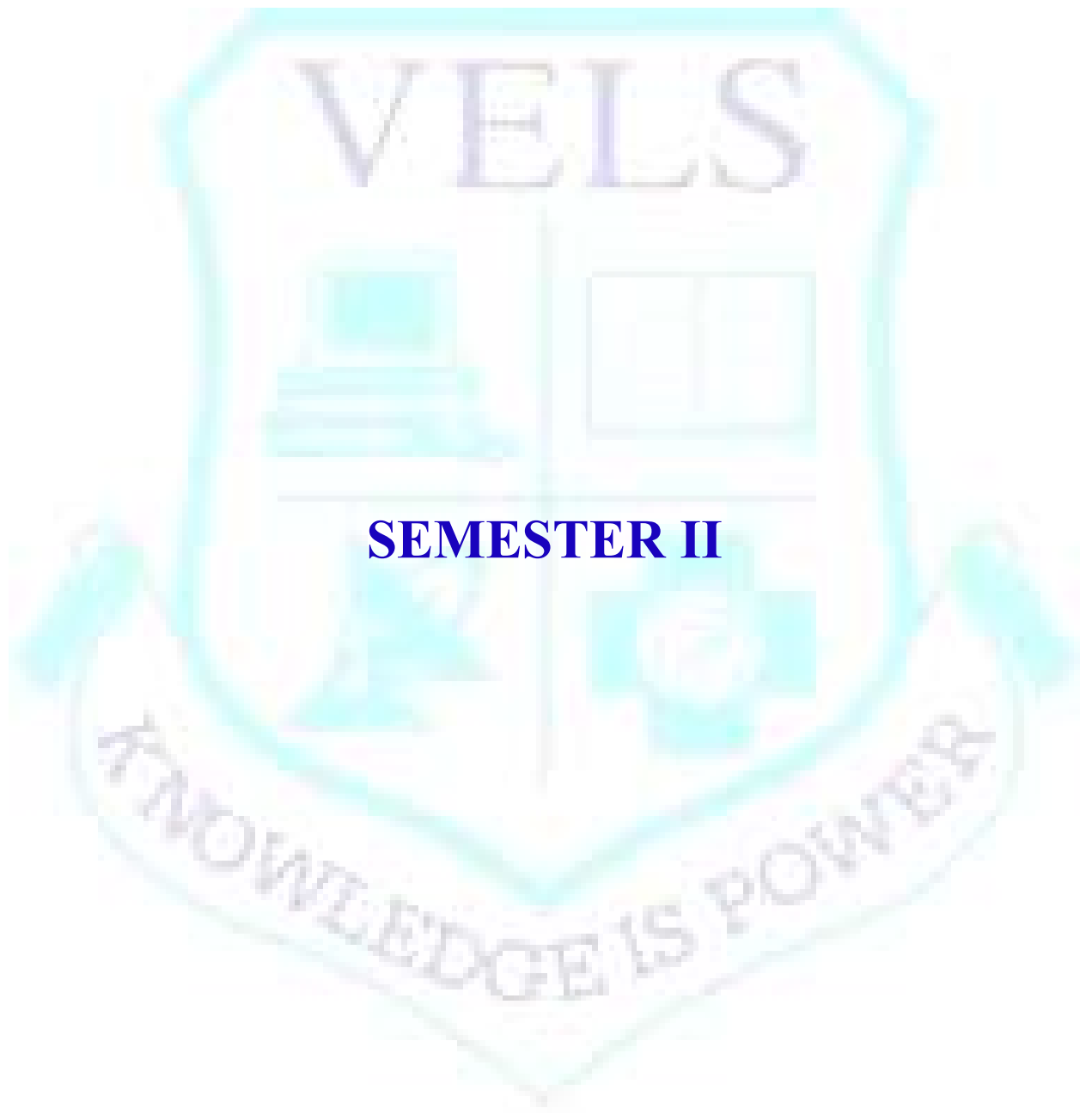
1. Powell, Thomas; Schneider, Fritz (2004), “JavaScript: The Complete Reference”, TMH, 2nd edition.
2. T. A. Powell (2002), “Complete Reference HTML”, Third Edition, TMH,

**Web Sources:**

1. [www.geeksforseeks.com](http://www.geeksforseeks.com)
2. [www.nptel.ac.in](http://www.nptel.ac.in)







**SEMESTER II**

**24CMCS21      ADVANCED DATABASE MANAGEMENT  
SYSTEMS**

L	T	P	O	C
4	0	0	2	4

**COURSE OBJECTIVES:**

This course aims to give students in depth information about system implementation techniques, data storage, representing data elements, database system architecture, the system catalogue, query optimization, centralized DB concepts, Normalization, distributed databases and client server architecture, advanced database concepts.

**UNIT-1      COMPARISON BETWEEN DIFFERENT DATABASES      12**

Significance of Databases, Database System Applications, Advantages and Disadvantages of different Database Management systems, Comparison between DBMS, RDBMS, Distributed and Centralized DB.

**UNIT-II      RDBMS      12**

Relational Query Languages, The SQL Query Language, Querying Multiple Relations, Creating Relations in SQL, Destroying and Altering Relations, Adding and Deleting Tuples, Integrity Constraints (ICs), Primary and Candidate Keys in SQL, Foreign Keys, Referential Integrity in SQL, Enforcing Referential Integrity.

**UNIT- III CATEGORIES OF SQL COMMANDS      12**

Data Definition, Data Manipulation Statements: SELECT - The Basic Form Subqueries, Functions, GROUP BY Feature, Updating the Database, Data Definition Facilities, Views, Embedded SQL \*, Declaring Variables and Exceptions, Embedding SQL Statements, Transaction Processing, Consistency and Isolation, Atomicity and Durability, Dynamic SQL.

**UNIT-IV      NORMALIZATION      12**

Functional Dependency, Anomalies in a Database, The normalization process: Conversion to first normal form, Conversion to second normal form, Conversion to third normal form, The boyce-code normal form(BCNF), Fourth Normal form and fifth normal form, normalization and database design, De-Normalization

## UNIT-V QUERY OPTIMIZATION

12

Algorithm for Executing Query Operations: External sorting, Select operation, Join operation, PROJECT and set operation, Aggregate operations, Outer join, Heuristics in Query Optimization, Semantic Query Optimization, Converting Query Tree to Query Evaluation Plan, multi-query optimization and application, Efficient and extensible algorithms for multi-query optimization, execution strategies for SQL sub queries, Query Processing for SQL Updates.

**Total : 60 Hours**

### COURSE OUTCOMES:

At the End of this course, the Student will be able to:

**CO-1:** Evaluate hierarchy of DBMS.

**CO-2:** Analyze different types of SQL statement.

**CO-3:** Apply normalization in the database & understand the internal data structure.

**CO-4:** Understand the transaction system & could extract data efficiently.

**CO-5:** Understand the notion of transaction and its ACID properties

### Text Books:

1. Date C. J (2003 ), “An Introduction to Database Systems”, Addison Wesley Longman, 8th Edition
2. Catell, R.G.G., Barry, D.K., Berler, M (2000), “The Object Data Standard: ODMG 3.0”, Morgan Kaufmann,
3. Silberschatz A., Korth H., and Sudarshan S (2010), “Database System Concepts”, McGraw- Hill, 6th Edition

### Reference Books:

1. Charles F. Goldfarb, Paul Prescod (2004 ), “The XML Handbook, Prentice Hall”, 5th Edition,.
2. Thomas M. Connolly, Carolyn Begg (2012), “Database Systems: Practical approach to Design, Implementation and Management”, Pearson Education Limited, 6th edition,

### Web Sources:

1. [www.oracle-tutorial.com](http://www.oracle-tutorial.com)
2. [www.studytonight.com](http://www.studytonight.com)

L	T	P	O	C
3	1	0	2	4

**COURSE OBJECTIVES:**

The Course provides the models, methods, and algorithms of statistical Natural Language Processing (NLP) for common NLP tasks, such as speech recognition, machinetranslation, spam filtering, text classification and spell checking.

**UNIT I OVERVIEW AND LANGUAGE MODELLING 12**

Overview - Origins and challenges of NLP-Language and Grammar-Processing Indian Languages - NLP Applications-Information Retrieval - Language Modeling: Various Grammar - based Language Models - Statistical Language Model.

**UNIT II WORD LEVEL AND SYNTACTIC ANALYSIS 12**

Word Level Analysis - Regular Expressions - Finite-State Automata - Morphological Parsing - Spelling Error Detection and correction - Words and Word classes - Part-of Speech Tagging. Syntactic Analysis – Context - free Grammar - Constituency - Parsing - Probabilistic Parsing.

**UNIT III SEMANTIC ANALYSIS AND DISCOURSE PROCESSING 12**

Semantic Analysis - Meaning Representation - Lexical Semantics – Ambiguity - Word Sense Disambiguation - Discourse Processing – Cohesion - Reference Resolution – Discourse Coherence and Structure.

**UNIT IV NATURAL LANGUAGE GENERATION AND MACHINE TRANSLATION 12**

Natural Language Generation - Architecture of NLG Systems - Generation Tasks and Representations - Application of NLG. Machine Translation - Problems in Machine Translation - Characteristics of Indian Languages - Machine Translation Approaches - Translation involving Indian Languages.

**UNIT V INFORMATION RETRIEVAL AND LEXICAL RESOURCES 12**

Information Retrieval - Design features of Information Retrieval Systems – Classical - Nonclassical - Alternative Models of Information Retrieval – valuation Lexical Resources: World Net - Frame Net - Stemmers - POS Tagger - Research Corpora.

**Total: 60 Hours**

### **COURSE OUTCOMES:**

At the End of this course, the Student will be able to:

- CO-1:** Analyze experimental results and write reports for each course project to develop scientific writing skills.
- CO-2:** Apply core computer science concepts and algorithms, such as dynamic programming.
- CO-3:** Apply the methods to new NLP problems and will be able to apply the methods to problems outside NLP.
- CO-4:** Understand the linguistic phenomena and to explore the linguistic features relevant to each NLP task.
- CO-5:** Understand natural language processing and to learn how to apply basic algorithms in this field.

### **Text Books:**

1. Tanveer Siddiqui, U.S. Tiwary (2008), “Natural Language Processing and Information Retrieval”, Oxford University Press

### **Reference Books:**

1. Daniel Jurafsky and James H Martin (2008 ) “Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition”, 2nd Edition, Prentice Hall,
2. James Allen ( 1995), “Natural Language Understanding”, 2nd edition, Benjamin / Cummings publishing company.

### **Web Sources:**

1. [www.towardsdatascience.com/a-practitioners-guide-to-natural-language-](http://www.towardsdatascience.com/a-practitioners-guide-to-natural-language-)
2. [www.javatpoint.com/nlp](http://www.javatpoint.com/nlp)

L	T	P	O	C
0	0	4	1	2

**COURSE OBJECTIVES:**

The student learns to work in DDL, DML, TCL and DCL, Joins. The student will be able to create cursors, manage users.

**LIST OF PROGRAMS:**

1. Learning basic DDL, DML, DCL and TCL commands
2. Working with dual table.
3. Use of Joins and Subqueries.
4. Views, sequences and indexes.
5. Managing users, privileges and roles.
6. PL/SQL-Data types, control structures.
7. Creating procedures with PL/SQL.
8. Error handling in PL/SQL.
9. Cursor Management in PL/SQL.
10. Writing Programs on Packages & triggers.
11. Embedding PL/SQL in high level language.
12. Implementation of Triggers & Assertions for Bank Database.

**Total: 30 Hours**

**COURSE OUTCOMES:**

At the end of this course, the student will be able to:

**CO-1:** Create an application to check user defined exception using PL/SQL.

**CO-2:** Evaluate the functionalities of trigger and cursor.

**CO-3:** Analyze different types of built-in function in PL/SQL.

**CO-4:** Apply DDL, DML and DCL statement using SQL.

**CO-5:** Apply various types of joins in tables.

**Text Books:**

1. A. Silberschatz, H. F. Korth, S.Sudharsan (2011), “ Database System Concepts” ,Sixth Edition,Tata McGraw Hill
2. Ivan Bayross ( 2015), “ SQL,PL/SQL, The programming language of Oracle”, Second Revised Edition, BPBPublication.

**Reference Books:**

1. R.Elmasri, S.B.Navathe ( 2008.), “ Fundamentals of Database systems, Fifth Edition, Pearson Education,
2. C. J. Date ( 2005), “ Introduction to Database Systems”, Fifth Edition, Pearson Education,.

**Web Sources:**

1. [www.guru99.com/dbms-tutorial.html](http://www.guru99.com/dbms-tutorial.html)
2. [www.oracletutorial.com](http://www.oracletutorial.com)



L	T	P	O	C
4	0	0	2	4

**COURSE OBJECTIVES:**

To familiarize the students to the principles of scientific methodology in business enquiry, to develop analytical skills of business research, and to develop the skills for scientific communications.

**UNIT-I INTRODUCTION 12**

Meaning, objectives and motivations in research, Characteristics and limitations of research – Components of research work - Criteria of good research, Research process – Types of Research, Fundamental, Pure or Theoretical Research –Applied Research –Descriptive Research – Evaluation Research –Experimental Research – Survey Research – Qualitative Research – Quantitative Research – Historical Research.

**UNIT-II RESEARCH DESIGN & LITERATURE REVIEW 12**

Research Design – definition – essentials and types of research design – errors and types of errors in research design. Research problem: Selecting and analyzing the research problem – problem statement formulation – formulation of hypothesis. Literature review: purpose, sources, and importance - literature review procedure. Objectives: Learning Objectives; Definitions; Formulation of the research objectives.

**UNIT-III MEASUREMENT, SCALING AND SAMPLING 12**

Variables in Research – Measurement and scaling – Different scales – Construction of instrument – Validity and Reliability of instrument. Data Collection methods – primary and secondary data – Construction of questionnaire and instrument – validation of instruments. Sample size determination - Sample design and sampling techniques.

**UNIT-IV DATA ANALYSIS AND TOOLS 12**

Processing of Data: Editing of Data – Coding of Data – Classification of Data – Statistical Series. Qualitative vs Quantitative data analyses – Univariate, Bivariate and Multivariate statistical techniques Measures of Central Tendency, Dispersion, correlation and Regression, Chi-square test: Applications, Steps, characteristics, limitations, Analysis of Variance and Covariance, Factor analysis – Discriminant analysis – cluster analysis – multiple regression



and correlation – multidimensional scaling – Conjoint Analysis - Application of statistical software for data analysis.

## **UNIT V RESEARCH REPORT WRITING**

**12**

Research report – Different types – Contents of report – executive summary – chapterization – contents of chapter – report writing – the role of audience – readability – comprehension – tone – final proof – report format – title of the report – Ethical issues in research: Code of Ethics in Research – Ethics and Research -Process – Importance of Ethics in Research.

**Total: 60 Hours**

### **COURSE OUTCOMES:**

On Completion of this course, the students can able to

**CO-1:** Demonstrate knowledge of research processes (reading, evaluating, and developing);

**CO-2:** Perform literature reviews using print and online databases;

**CO-3:** Employ American Psychological Association (APA) formats for citations of print and electronic materials;

**CO-4:** Identify, explain, compare, and prepare the key elements of a research proposal/report;

**CO-5:** Define and develop a possible HIED research interest area using specific research Designs.

### **Text Book:**

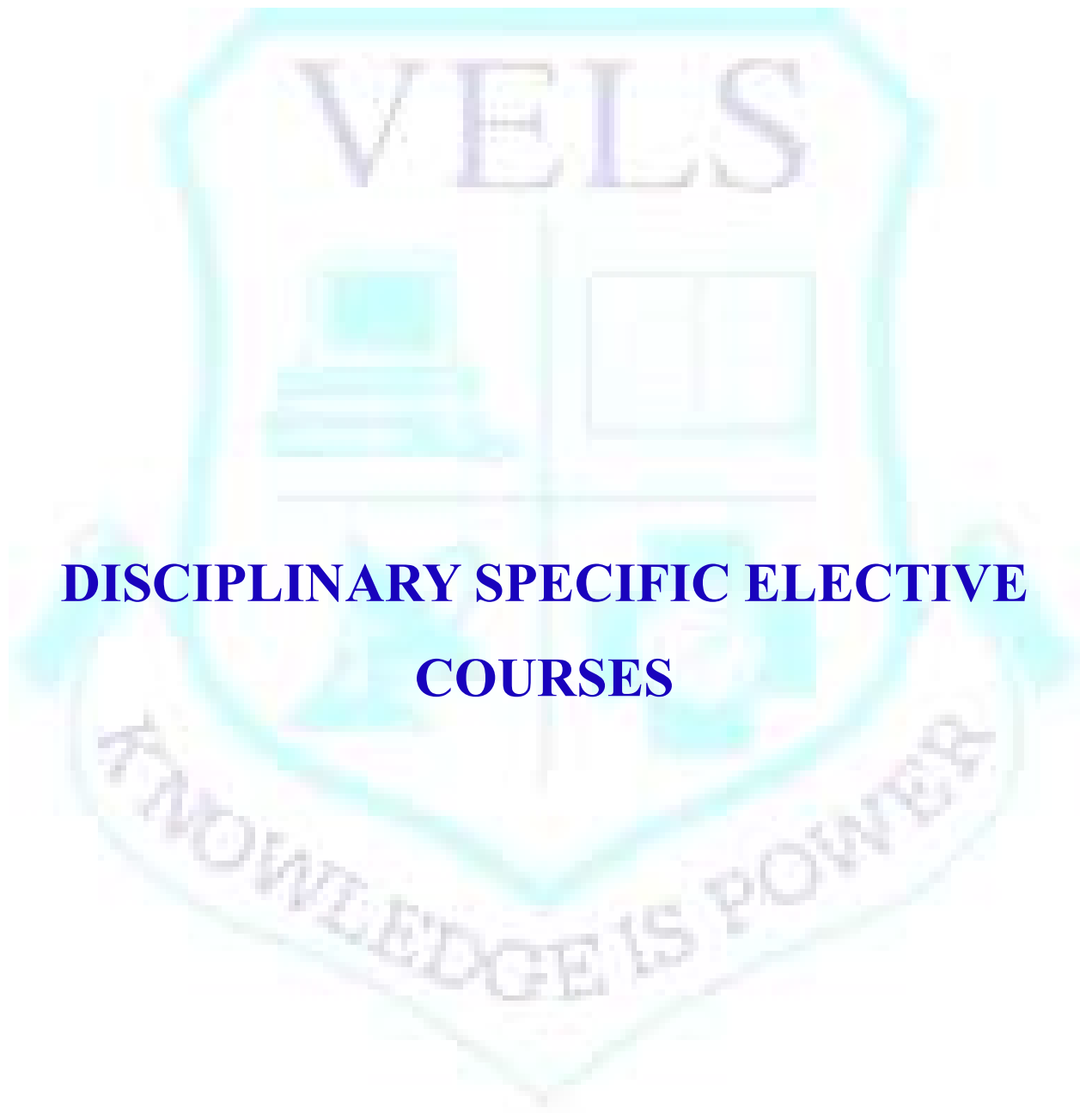
1. Kothari, C.R. (2004), Research methodology: Methods and techniques. New Age International.
2. Cooper, D.R., Schindler, P.S. and Sun, J. (2006), Business research methods (Vol. 9). New York: McGraw-Hill Irwin.
3. Creswell, J.W. and Creswell, J.D. (2017) Research design: Qualitative, quantitative, and mixed methods approaches. Sage publications.

### **Reference Books:**

1. Business Research Methods- Donald Cooper & Pamela Schindler, TMGH, 9th editions.
2. Business Research Methods- Alan Bryman & Emma Bell, Oxford University Press.

### **Websources:**

1. <https://www.geeksforgeeks.org/introduction-to-research-methodology/>



**DISCIPLINARY SPECIFIC ELECTIVE  
COURSES**

L	T	P	O	C
4	0	0	2	4

**COURSE OBJECTIVES:**

This course introduces the basic concepts of mobile computing, communication systems, mobile and wireless devices, GSM – Architecture – Routing Strategies –TCP.

**UNIT-I INTRODUCTION 12**

Mobile and Wireless Devices – Simplified Reference Model – Need for Mobile Computing – Wireless Transmissions –Multiplexing – Spread Spectrum and Cellular Systems- Medium Access Control –Comparisons.

**UNIT-II TELECOMMUNICATION SYSTEMS 12**

GSM – Architecture – Sessions –Protocols – Hand Over and Security – UMTS and IMT – 2000– Satellite Systems - Types of Satellite System - Routing- Localization

**UNIT-III WIRELESS LAN 12**

IEEE S02.11: System Architecture-Protocol Architecture, Physical Layer, 802.11b and 802.11a– Hiper LAN: WATM, BRAN, HYPERLAN2 – Bluetooth: User Scenarios, Architecture, Radio Layer, Baseband Layer, Link Manager Protocol, L2CAP, Security, SDP– Security and Link Management.

**UNIT-IV MOBILE NETWORK LAYER 12**

Mobile IP – Goals – Packet Delivery – Strategies – Registration – Tunneling and Reverse Tunneling – Adhoc Networks – Routing Strategies.

**UNIT-V MOBILE TRANSPORT LAYER 12**

Congestion Control – Implication of TCP Improvement – Mobility – Indirect – Snooping – Mobile – Transaction oriented TCP - TCP over wireless – Performance - Case study analysis: Smart Phone Enhanced Shopping, Advances on Sensors for Health Systems.

**Total: 60 Hours**

## **COURSE OUTCOMES:**

At the End of this course, the students will be able to:

**CO-1:** Evaluate about various wireless LAN techniques.

**CO-2:** Analyze radio signal propagation issues and their impact on communication system performance.

**CO-3:** Understand about various wireless systems and standards and their basic operation cases.

**CO-4:** Understand the techniques of radio spectrum allocation in multi-user systems and their impact on networks capacity.

**CO-5:** Understand how the various signal processing and coding techniques of GSM and its Architecture.

## **Text Books:**

1. J. Schiller (2013), "Mobile Communications", Pearson Education, Delhi, 2nd edition.
2. Hansmann, Merk, Nicklous, Stober (2004), Principles of Mobile Computing, 2nd Edition, Springer India.

## **Reference Books:**

1. Pahalavan, Krishnamurthy (2003), Principle of wireless Networks: A unified Approach, Pearson Education, Delhi.
2. Martyn Mallick (2004) Mobile and Wireless Design Essentials, Wiley Dreamtech India Pvt. Ltd., New Delhi.
3. W. Stallings (2004), Wireless Communications and Networks, 2nd Edition, Pearson Education, Delhi.

## **Web Sources:**

1. [www.nptel.ac.in](http://www.nptel.ac.in)
2. [www.nescoacademy.com](http://www.nescoacademy.com)

L	T	P	O	C
4	0	0	2	4

**COURSE OBJECTIVES:**

To explore, design, and implement basic concepts of big data & analytics methodologies for analyzing structured and unstructured data with emphasis on the relationship between the Data Scientist and its application to the business needs.

**UNIT-I: INTRODUCTION TO BIG DATA 12**

Introduction to Big Data Platform – Challenges of Conventional Systems - Nature of Data- Evolution of Analytic Scalability - Intelligent data analysis- Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools.

**UNIT-II: MINING DATA STREAMS 12**

Introduction to Streams Concepts – Stream Data Model and Architecture - Stream Computing -Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream –Real Time Analytics Platform (RTAP) Applications.

**UNIT-III: ADVANCED ANALYTICS 12**

Analyzing, Visualization and Exploring the Data, Statistics for Model Building and Evaluation, Advanced Analytics - K-means clustering, Association rules-Speedup, Linear Regression, Logistic Regression, Naïve Bayes, Decision Trees, Time Series Analysis, Text Analysis.

**UNIT-IV: HADOOP 12**

History of Hadoop- The Hadoop Distributed File System – Components of Hadoop - Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming.

**UNIT-V: FRAMEWORKS 12**

Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

**Total: 60 Hours**

### **COURSE OUTCOMES:**

At the End of this course, the students will be able to:

**CO-1:** Evaluate Big Data real time analytics platform applications.

**CO-2:** Analyze big data platform and learn intelligent data analysis and compare old and modern data analytic tool.

**CO-3:** Apply advanced analytics techniques to gain knowledge of latest techniques.

**CO-4:** Understand the data streams concepts and stream computing.

**CO-5:** Understand the fundamental concepts of big data platforms and know about the basic concepts of nature and evolution of big data.

### **Text Books:**

1. Prajapati (2014), Big Data Analytics with R and Hadoop.

### **Reference Books:**

1. Stephan Kudyba (2014), Big Data, Mining, and Analytics: Components of Strategic Decision Making, Auerbach Publications.
2. Michael Minelli, Michele Chambers, Ambiga Dhiraj (2013), Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, Wiley Publications.

### **Web Sources:**

1. [www.intellipaat.com/blog/big-data-tutorial-for-beginners/](http://www.intellipaat.com/blog/big-data-tutorial-for-beginners/)
2. [www.simplilearn.com/tutorials/data-analytics-tutorial](http://www.simplilearn.com/tutorials/data-analytics-tutorial)

L	T	P	O	C
4	0	0	2	4

**COURSE OBJECTIVES:**

To introduce concepts in automata theory and theory of computation. To identify different formal language classes and their relationships. To design grammars and recognizers for different formal languages.

**UNIT – I INTRODUCTION****12**

Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem.

**UNIT – II REGULAR EXPRESSION (RE)****12**

Regular expression (RE) Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages. Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

**UNIT – III CONTEXT FREE GRAMMAR (CFG) AND CONTEXT FREE LANGUAGES (CFL)****12**

Definition, Examples, Derivation, Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure properties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs.

**UNIT – IV PUSH DOWN AUTOMATA (PDA)****12**

Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG.

## **UNIT – V TURING MACHINES (TM)**

**12**

Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory.

**Total: 60 Hours**

### **COURSE OUTCOMES:**

**CO1:** Ability to relate practical problems to languages, automata, and computability

**CO 2:** Ability to demonstrate an increased level of mathematical sophistication

**CO 3:** Ability to apply mathematical and formal techniques for solving problems

**CO 4:** Ability to demonstrate an increased level of Automata and push down Automata

**CO 5:** Ability to understand and demonstrate turning machines

### **Text books:**

1. Hopcroft and Ullman (2006 ) “Introduction to Automata Theory, Languages and Computation”, Pearson Education, 3rd edition,

### **Reference Books:**

1. Martin J. C (2010 ), “Introduction to Languages and Theory of Computations”, TMH, 4th edition,
2. Peter Linz (2011) "An Introduction to Formal Language and Automata", Narosa Pub. House,
3. Papadimitriou, C. and Lewis, C. L. (1997), “Elements of the Theory of Computation”, PHI.

### **Web Sources:**

1. <https://ocw.mit.edu/courses/18-404j-theory-of-computation-fall-2020/pages/syllabus/>



**24DMCS14**

**CLOUD COMPUTING**

<b>L</b>	<b>T</b>	<b>P</b>	<b>O</b>	<b>C</b>
4	0	0	2	4

**COURSE OBJECTIVES:**

This course introduces the fundamental concepts of cloud computing, its services and Tools. Analyze the comparative advantages and disadvantages of cloud computing.

**UNIT-I CLOUD COMPUTING**

**12**

History of Cloud Computing – Cloud Architecture – Cloud Storage – Why Cloud Computing Matters – Advantages of Cloud Computing – Disadvantages of Cloud Computing – Companies in the Cloud Today – Cloud Services

**UNIT- II WEB-BASED APPLICATION**

**12**

Pros and Cons of Cloud Service Development – Types of Cloud Service Development– Software as a Service – Platform as a Service – Web Services – On-Demand Computing – Discovering Cloud Services Development Services and Tools–AmazonEc2– GoogleApp Engine – IBM Clouds.

**UNIT-III CENTRALIZING E MAIL COMMUNICATIONS**

**12**

Collaborating on Schedules – Collaborating on To-Do Lists – Collaborating Contact Lists - Cloud Computing for the Community Collaborating on Group Projects and Events for the Corporation

**UNIT-IV COLLABORATION ON CALENDARS SCHEDULES AND TASK**

**MANAGEMENT**

**12**

Exploring Online Scheduling Applications – Exploring Online Planning and Task Management – Collaborating on Event Management – Collaborating on Contact Management – Collaborating on Project Management – Collaborating on Word Processing - Collaborating on Databases– Storing and Sharing Files.

**UNIT V COLLABORATING VIA WEB-BASED COMMUNICATION TOOLS**

**12**

Evaluating Web Mail Services – Evaluating Web Conference Tools – Collaborating via Social Networks and Groupware – Collaborating via Blogs and Wikis.

**Total: 60 Hours**

### **COURSE OUTCOMES:**

At the end of this course, the Student will be able to:

**CO-1:** Create applications by utilizing cloud platforms.

**CO-2:** Evaluate cloud computing driven commercial systems such as Google Apps and Microsoft Azure.

**CO-3:** Analyze own organization's needs for capacity building and training in cloud related IT areas.

**CO-4:** Apply appropriate technologies and approaches for the related issues to cloud computing.

**CO-5:** Understanding the key dimensions of the challenges of cloud computing.

### **Text Books:**

1. Michael Miller (2008), "Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online", Que Publishing.
2. Haley Beard (2008) "Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs", Emereo Pty Limited.

### **Reference Books:**

1. Velete, Antony. T (2007), Cloud computing a practical approach, TMH, 4<sup>th</sup> Edition.
2. Jennings, Roger (2009), Cloud computing with Windows Azure platform, PHI.

### **Web Sources:**

1. [www.coursera.com](http://www.coursera.com)
2. [www.javatpoint.com](http://www.javatpoint.com)

**24DMCS21 THEORETICAL FOUNDATIONS OF  
COMPUTER SCIENCE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>O</b>	<b>C</b>
4	0	0	2	4

**COURSE OBJECTIVES:**

To understand the relationship with mathematics to computer sciences. The basic mathematics concepts behind the development of all algorithms.

**UNIT I INTRODUCTION TO DISCRETE MATHEMATICS AND SET THEORY 12**

Discrete Mathematics: Introduction, Set Notations, Cardinality of Sets; Some Standard Sets; Venn Diagrams; Operations on Sets; Principle of inclusion and exclusion; Disjoint Sets; Partition; Ordered Set; Cartesian Product of Sets; Algebra of Sets, Bit vector representation of sets

**UNIT II ALGEBRAIC STRUCTURES AND LOGICS 14**

Binary Operations: semi-group, group; Subgroup: Cosets; Ring; Field; Boolean algebra; Binary Arithmetic, Cyclic groups, generating sets, permutation groups, Cayley's theorem, Permutations: cycle structure and sign of a permutation, normal subgroups, quotient groups, homomorphism, Proposition, Logical Operators, Tautology, Contradiction, Logical Equivalence, Tautological Implication, Converse, Inverse, and Contrapositive, Normal Forms, Arguments validity check, Predicates, Methods of Proof.

**UNIT- III GRAPH THEORY 10**

Different Types of Graphs, Subgraphs, Operations on Graphs, Walk, Path, and Circuit; Connected Graph, Disconnected Graph, and Components; Euler and Hamiltonian Graphs; Eulerian graphs: characterization, directed graphs, tournaments; Planar Graph; characterization of bipartite graphs; Coloring of Graphs

**UNIT IV PROBABILITY 12**

Basic concepts, conditional probability and independence, Bayes' formula, random variables and expectation, linearity of expectation; Discrete random variables: Bernoulli, binomial, negative binomial, geometric, poisson; Probabilistic method: Lower bound on the maximum number of Hamiltonian paths in a tournament, Chernoff bound, maximum likelihood estimate, continuous random variables: probability density function, uniform and normal random variables.

## **UNIT- V: APPLICATIONS**

**12**

Entropy and error correcting codes: Entropy, noiseless coding theorem, rate of a code, noisy coding theorem for binary symmetric channel, simple examples: error correction by repetition, error detection using parity bits; Hamming codes: encoding and parity check matrices, distance, rate, linear codes, Singleton bound; Markov chains: Definition, irreducibility, aperiodicity, stationary distribution, Fundamental theorem of Markov chains (without proof), Example: Random walks on regular, undirected graphs.

**Total: 60 Hours**

### **COURSE OUTCOMES:**

**At the End of the course, the students will be able to:**

- CO1:**Apply the concepts of set theory, relations and functions in the context of various fields of computer science e.g. Database, Automata, Compiler etc.
- CO2:**Evaluate Boolean functions and Analyze algebraic structure using the properties of Boolean algebra.
- CO3:**Convert formal statements to logical arguments and correlate these arguments to Boolean logic, truth tables, rules of propositional and predicate calculus.
- CO4:**Apply the fundamental principle of counting, combinatorics and recurrence relations to find the complex pattern and sequences in Given datasets.
- CO5:**Apply graph theory concepts for designing solutions of various computing problems e.g. shortest path, graph colouring, job Sequencing etc.

### **Text Books:**

1. A First Course in Probability, by Sheldon Ross; Pearson Publications; 2019
2. Randomized algorithms by Motwani, Raghavan; Cambridge University Press; 1995
3. Rosen, K. H., Discrete Mathematics and Its Applications with Combinatorics and Graph Theory, Tata McGraw-Hill, 2008.

### **Reference Books:**

1. Ullman J. D. Foundations of Computer Science: C Edition, W. H. Freeman; 1994
2. Sipser, M., Introduction to the Theory of Computation, Second Edition, Thomson Course Technology, 2007.

L	T	P	O	C
4	0	0	2	4

**COURSE OBJECTIVES:**

To become familiar with digital image fundamentals. To get exposed to simple image enhancement techniques in Spatial and Frequency domain. To learn concepts of degradation function and restoration techniques. To study the image segmentation and representation techniques. To become familiar with image compression and recognition methods

**UNIT I DIGITAL IMAGE FUNDAMENTALS****12**

Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - Color image fundamentals - RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT.

**UNIT II IMAGE ENHANCEMENT****12**

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.

**UNIT III IMAGE RESTORATION****12**

Image Restoration - degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering

**UNIT IV IMAGE SEGMENTATION****12**

Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.

## **UNIT V IMAGE COMPRESSION AND RECOGNITION**

**12**

Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

**Total: 60 Hours**

### **COURSE OUTCOMES:**

**At the End of the course, the students will be able to:**

- CO1:** Know and understand the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms.
- CO2:** Operate on images using the techniques of smoothing, sharpening and enhancement.
- CO3:** Perform the restoration concepts and filtering techniques.
- CO4:** Demonstrate the segmentation, features extraction, compression and recognition methods for color models.
- CO5:** Compress images and use tools for image recognition.

### **Text Books:**

1. Rafael C. Gonzalez, Richard E. Woods (2018), Digital Image Processing; Pearson, Fourth Edition.
2. Anil K. Jain (2015). Fundamentals of Digital Image Processing; Pearson.

### **Reference Books:**

1. Kenneth R. Castleman (2006), Digital Image Processing ‘, Pearson,
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins (2011), Digital Image Processing using MATLAB ; Pearson Education, Inc.
3. D E. Dudgeon and RM. Mersereau (1990), Multidimensional Digital Signal Processing; Prentice Hall.
4. William K. Pratt (2002), Digital Image Processing ; John Wiley.
5. Milan Sonka et al (1999), Image processing, analysis and machine vision; Brookes/Cole, Vikas Publishing House; 2nd edition.

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**COURSE OBJECTIVES:**

The course will address key AI technologies in an attempt to help in understanding their role in cyber security and the implications of these new technologies to the world of politics. AI deficiently will complement and strengthen the cyber security practices and will improve their applications in enhancing our security.

**UNIT-I INTRODUCTION TO ARTIFICIAL INTELLIGENCE 12**

Introduction–Definition – Future of Artificial Intelligence – Characteristics of Intelligent Agents– Typical Intelligent Agents – Problem Solving Approach to Typical AI problems- Algorithms and Optimization Problems -Searching with Partial Observations – Constraint Satisfaction Problems – Constraint Propagation–Backtracking Search–Game Playing– Optimal Decisions in Games– Alpha– Beta Pruning – Stochastic Games

**UNIT-II SOFTWARE AGENTS AND APPLICATIONS 12**

Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems- AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing – Machine Translation–Speech Recognition–Robot– Hardware–Perception– Planning–Moving

**UNIT-III CYBER SECURITY VULNERABILITIES ANDSAFEGUARDS 12**

Cyber Security Vulnerabilities-Overview- vulnerabilities in software-System administration- Complex Network Architectures- Open Access to Organizational Data- Weak Authentication- Unprotected Broadband communications-Poor Cyber Security Awareness- Cyber Security Safeguards- Access control- Cryptography- Deception-Denial of Service Filters-Ethical Hacking- Firewalls-Intrusion Detection Systems- Threat Management.

**UNIT-IV SECURING WEB APPLICATION, SERVICES AND SERVERS 12**

Basic security for HTTP Applications and Services- Basic Security for SOAP Services- Identity Management and Web Services- Authorization Patterns- Security Considerations- Challenges - Malware infection, Intrusion detection and Prevention Techniques, Anti-Malware software- Botnet detection-Spam filter applications- Hacking incident forecasting-cyber security ratings

**UNIT-V CYBER FORENSICS AND CASE STUDIES 12**

Introduction to Cyber Forensics- Conducting disk-based analysis- Investigating Information-hiding-Scrutinizing E-mail- Tracing Internet access- Tracing memory in real-time-Case study: Cyber Security Regulations- Roles of International Law- Cyber Security Standards-The INDIAN Cyberspace- National Cyber Security Policy2013.

**Total: 60 Hours**

**COURSE OUTCOMES:**

**At the End of this course, the Student will be able to:**

- CO-1:** Create self-learning and research skills to tackle a topic of interest on his/her own or as part of a team.
- CO-2:** Interpret the modern view of AI as the study of agents that receive percept from the environment and perform actions.
- CO-3:** Analyze the dimensions along which agents and environments vary, along with key functions that must be implemented in a general agent.
- CO-4:** Understand the concepts of Artificial intelligence
- CO-5:** Understand major challenges and the complexity of AI problems

**Text Books**

1. Stuart Russell and Peter Norvig (2010), “Artificial Intelligence: A Modern Approach”, 3rd Edition,.
2. James Graham, Richar Howard,Ryan Olson (2011), “Cyber Security Essentials”, CRC Press, Tailor and Francis Group,.
3. Nina Godbole, Sunit Belapur (2011), “Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Wiley India Publications, April,.



**Reference Books:**

1. Patterson (2012), “Introduction to Artificial Intelligence & Expert Systems”, PHIPoole, Computational Intelligence, OUP,
2. Saroj Kaushik (2014), “Logic & Prolog Programming”, New Age International Expert Systems, Giarranto, VIKAS,

**Web Resources:**

1. [www.edureka.com](http://www.edureka.com)
2. [www.towardsdatascience.com](http://www.towardsdatascience.com)



**24DMCS24**

**EMBEDDED SYSTEM**

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**COURSE OBJECTIVES:**

To learn parallel and distributed algorithm's development techniques for shared memory and message passing models. To study the main classes of parallel algorithms. To study the complexity and correctness models for parallel algorithms

**UNIT I INTRODUCTION TO EMBEDDED SYSTEMS 12**

Definition of Embedded System - Embedded Systems Vs General Computing Systems - History of Embedded Systems - Classification, Major Application Areas - Purpose of Embedded Systems - Characteristics and Quality Attributes of Embedded Systems

**UNIT II TYPICAL EMBEDDED SYSTEM 12**

Core of the Embedded System - General Purpose and Domain Specific Processors - ASICs, PLDs, Commercial Off- The Shelf Components (COTS) - Memory - ROM, RAM- Memory according to the type of Interface - Memory Shadowing - Memory selection for Embedded Systems - Sensors and Actuators - Communication Interface: Onboard and External Communication Interfaces

**UNIT III EMBEDDED FIRMWARE 12**

Reset Circuit - Brown-out Protection Circuit - Oscillator Unit - Real Time Clock - Watchdog Timer - Embedded Firmware Design Approaches and Development Languages

**UNIT IV RTOS BASED EMBEDDED SYSTEM DESIGN 12**

Operating System Basics - Types of Operating Systems – Tasks - Process and Threads - Multiprocessing and Multitasking - Task Scheduling

**UNIT V TASK COMMUNICATION 12**

Shared Memory - Message Passing - Remote Procedure Call and Sockets - Task Synchronization: Task Communication/Synchronization Issues - Task Synchronization Techniques - and Device Drivers - Case-Study: How to Choose an RTOS.

**Total: 60 Hours**

## **COURSE OUTCOMES:**

**At the End of this course, the Student will be able to:**

**CO-1:** Apply concept of Embedded system and General Computing systems.

**CO-2:** Understand the History and Classification of Embedded systems.

**CO-3:** Understand the Major Application Areas, Purpose of Embedded Systems.

**CO-4:** Understand about the Core of the Embedded System.

**CO-5:** Understand of General Purpose and Domain Specific Processors.

## **Text Books:**

1. Shibu K.V, "Introduction to Embedded Systems", McGraw Hill 2009
2. Raj Kamal, "Embedded Systems", TMH, 2nd edition 2008.
3. Frank Vahid, Tony Givargis, "Embedded System Design", John Wiley 2002.

## **Reference Books:**

1. Lyla, "Embedded Systems", Pearson 2013.
2. David E. Simon, "An Embedded Software Primer", Pearson Education, 1st Edition 2002.

## **Web Sources:**

1. [www.tutorialandexample.com/embedded-systems-tutorial/](http://www.tutorialandexample.com/embedded-systems-tutorial/)
2. [www.studyelectronics.in/embedded-programming-tutorial](http://www.studyelectronics.in/embedded-programming-tutorial)