

# **MANONMANIAM SUNDARANAR UNIVERSITY**

**B.Sc., DATA SCIENCE**

**SYLLABUS**

**2024 - 2025**

## **Introduction**

### **B.Sc. Data Science**

**Data Science is a vast field comprising many topics of Statistics, Mathematics, and IT. A Data Science course syllabus for beginners covers basic and advanced concepts of data analytics, machine learning, statistics, and programming languages like Python or R. It also teaches students how to interpret large datasets and identify patterns to create predictive models. Data Science has come a long**

way. Data Scientists were once referred to as 'business problem solvers' who knew how to make sense of incoherent data clusters. Fast-forward to the present, Data Scientists are the most important resources for any business looking to thrive in this mad rush. They are now the 'wizards of all problem solvers'.

The course is enabled to include several interdisciplinary areas like: programming languages, algorithms, operating systems, databases, machine learning, data mining, business intelligence, big data, probability and statistics, data optimization, statistical simulation and data analysis, management decision analysis, decision models and predictive analysis. Data Science has gained paramount importance in the computer science domain. The need for scientists who understand data in all its aspects will continue to grow strongly. Students graduating from the program will have significantly more depth and breadth in the broad area of Data Science and receive all the information they need to work with various kinds of data and statistical data. The program is designed so that students have in-depth knowledge of the many approaches, aptitudes, methodologies, and instruments needed to deal with corporate data. Students receive instruction in the abilities needed to find the needed solutions and assist in making significant judgments.

This is the primary reason the syllabus of Data Science courses includes concepts that touch base on cloud computing, big data, natural language processing, and data sentiment analysis. The future of Data Science is estimated to bring opportunities in various areas of banking, finance, insurance, entertainment, telecommunication, automobile, etc. A data scientist will help grow an organization by assisting them in making better decisions. Data science has become important due to recent technology disruptions. Most fundamental is Moore's Law which has driven an exponential growth in computing, storage, and communications per rupee over the past 50 years. This rate of growth shows no signs of abating. Consequently, today we have the Internet of Things: a plethora of sensors costing 10s of rupees or less, a global Internet with almost limitless bandwidth, and enormous storage in global clouds. The present era is full of technological advances in almost all spectrum of life and we are flooded with enormous amount of data. There is an increasing demand of capturing, analyzing, and synthesizing this large amount of data sets in a number of application domains to better understand various phenomena and to convert the information available in the data into actionable

**strategies such as new scientific discoveries, business applications, policy making, and healthcare etc.**

**Data science is the area where applications of various tools and techniques from the disciplines of applied statistics, mathematics and computer science are used to get greater insight and to make better and informed decisions for various purposes by analyzing a large amount of data. Consequently, the study of data science as a discipline has become essential to cater the growing need for professionals and researchers to deal with the future challenges.**

MMSU

**LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK GUIDELINES BASED REGULATIONS FOR UNDER GRADUATE PROGRAMME**

<b>Programme:</b>	<b>B.Sc., Data Science</b>
<b>Programme Code:</b>	
<b>Duration:</b>	<b>3 years [UG]</b>
<b>Eligibility</b>	<b>Candidates who have studied Mathematics in HSC are eligible for this programme</b>  <b>Refer Tamil Nadu Admission Guidelines G.O(D) No. 110 dt 22.05.2024</b>
<b>Programme Specific Outcomes:</b>	<b>PSO1: To enable students to apply basic microeconomic, macroeconomic and monetary concepts and theories in real life and decision making.</b> <b>PSO 2: To sensitize students to various economic issues related to Development, Growth, International Economics, Sustainable Development and Environment.</b> <b>PSO 3: To familiarize students to the concepts and theories related to Finance, Investments and Modern Marketing.</b> <b>PSO 4: Evaluate various social and economic problems in the society and develop answer to the problems as global citizens.</b> <b>PSO 5: Enhance skills of analytical and critical thinking to analyze effectiveness of economic policies.</b>

	<b>PO 1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>
<b>PSO 1</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>
<b>PSO 2</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>
<b>PSO3</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>
<b>PSO 4</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>
<b>PSO 5</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>

**3 – Strong, 2- Medium, 1- Low**

**Highlights of the Revamped Curriculum:**

- **Student-centric, meeting the demands of industry & society, incorporating industrial components, hands-on training, skill enhancement modules, industrial project, project with viva-voce, exposure to entrepreneurial skills, training for competitive examinations, sustaining the quality of the core components and incorporating application oriented content wherever required.**

- **The Core subjects include latest developments in the education and scientific front, advanced programming packages allied with the discipline topics, practical training, devising mathematical models and algorithms for providing solutions to industry / real life situations. The curriculum also facilitates peer learning with advanced mathematical topics in the final semester, catering to the needs of stakeholders with research aptitude.**
- **The General Studies and Mathematics based problem solving skills are included as mandatory components in the ‘Training for Competitive Examinations’ course at the final semester, a first of its kind.**
- **The curriculum is designed so as to strengthen the Industry-Academia interface and provide more job opportunities for the students.**
- **The Industrial Statistics course is newly introduced in the fourth semester, to expose the students to real life problems and train the students on designing a mathematical model to provide solutions to the industrial problems.**
- **The Internship during the second year vacation will help the students gain valuable work experience, that connects classroom knowledge to real world experience and to narrow down and focus on the career path.**
- **Project with viva-voce component in the fifth semester enables the student, application of conceptual knowledge to practical situations. The state of art technologies in conducting a Explain in a scientific and systematic way and arriving at a precise solution is ensured. Such innovative provisions of the industrial training, project and internships will give students an edge over the counterparts in the job market.**
- **State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature are incorporated as Elective courses, covering conventional topics to the latest - Artificial Intelligence.**

**Choice Based Credit System (CBCS), Learning Outcomes Based Curriculum  
Framework (LOCF) 2024-'25**

<b>I</b>				
<b>Component</b>	<b>Course code</b>	<b>List of courses</b>	<b>Credits</b>	<b>No. of Hrs</b>
<b>Part I</b>		<b>Language – Tamil</b>	<b>3</b>	<b>6</b>
<b>Part II</b>		<b>English</b>	<b>3</b>	<b>6</b>
<b>Part-III</b>		<b>Core Course CC- I Programing with C++</b>	<b>4</b>	<b>5</b>
<b>Part-III</b>		<b>Core Lab 1: C++ Programming Laboratory</b>	<b>4</b>	<b>5</b>

<b>Part-III</b>		<b>Elective Course : Statistics for Data Science/ Discrete Mathematics</b>	<b>3</b>	<b>4</b>
<b>Part- IV</b>		<b>Skill Enhancement Course Practical: Multimedia Laboratory</b>	<b>2</b>	<b>2</b>
<b>Part- IV</b>		<b>Foundation Course FC Digital Logic Design</b>	<b>2</b>	<b>2</b>
<b>TOTAL</b>			<b>21</b>	<b>30</b>
<b>Semester II</b>				
<b>Component</b>	<b>Course code</b>	<b>List of courses</b>	<b>Credits</b>	<b>No. of Hrs</b>
<b>Part I</b>		<b>Language - Tamil</b>	<b>3</b>	<b>6</b>
<b>Part II</b>		<b>English</b>	<b>3</b>	<b>6</b>
<b>Part III</b>		<b>Core Course CC III Programming with Python</b>	<b>4</b>	<b>5</b>
<b>Part III</b>		<b>Core Practical: Python Programming Laboratory</b>	<b>4</b>	<b>5</b>
<b>Part III</b>		<b>Elective Course II (General /Discipline Specific) Optimization Techniques / Artificial Neural Networks</b>	<b>3</b>	<b>4</b>
<b>Part IV</b>		<b>Skill Enhancement Course : Data Structures</b>	<b>2</b>	<b>2</b>
<b>Part IV</b>		<b>Skill Enhancement Course: Practical: PHP Scripting Lab</b>	<b>2</b>	<b>2</b>
<b>Part IV</b>		<b>Naan Muthalvan - Language Proficiency for Employability</b>	<b>2</b>	<b>2</b>
<b>TOTAL</b>			<b>23</b>	<b>30</b>

<b>Part</b>	<b>List of Courses</b>	<b>Credit</b>	<b>No. of Hours</b>
<b>Part-1</b>	<b>Language - Tamil</b>	<b>3</b>	<b>6</b>
<b>Part-2</b>	<b>English</b>	<b>3</b>	<b>6</b>
<b>Part-3</b>	<b>Core Course- Programming with Java</b>	<b>4</b>	<b>4</b>

**Semester III**

	<b>Core Lab Java Programming Laboratory</b>	<b>3</b>	<b>4</b>
	<b>Elective Operating Systems/Computational Intelligence</b>	<b>3</b>	<b>4</b>
<b>Part-4</b>	<b>SEC 4 Practical: Web Design Laboratory</b>	<b>2</b>	<b>2</b>
	<b>SEC 5 - Naan Mudhalvan</b>	<b>2</b>	<b>2</b>
	<b>E.V.S</b>	<b>2</b>	<b>2</b>
		<b>22</b>	<b>30</b>

**Semester-IV**

<b>Part</b>	<b>List of Courses</b>	<b>Credit</b>	<b>No. of Hours</b>
<b>Part-1</b>	<b>Language – Tamil</b>	<b>3</b>	<b>6</b>
<b>Part-2</b>	<b>English</b>	<b>3</b>	<b>6</b>
<b>Part 3</b>	<b>Core Course - Data Base Management Systems</b>	<b>4</b>	<b>4</b>
	<b>Core Lab 4 1- Data Base Management Systems Laboratory</b>	<b>3</b>	<b>4</b>
	<b>Elective- Human Computer Interaction/Computer Networks</b>	<b>3</b>	<b>4</b>
<b>Part-4</b>	<b>SEC 6 Practical: Office Automation Laboratory</b>	<b>2</b>	<b>2</b>
	<b>SEC 7 Naan Muthalvan</b>	<b>2</b>	<b>2</b>
	<b>Value Education</b>	<b>2</b>	<b>2</b>
		<b>22</b>	<b>30</b>



### Semester-V

Part	List of Courses	Credit	No. of Hours
Part 3	Core Course 5 1 Software Engineering	4	4
	Core Course 5 2 Machine Learning	4	4
	Core Course 5 3 Simulation & Modeling	4	4
	Core lab 5 .1 Machine Learning Laboratory	3	4
	Core lab 5 2 Android Applications Development Laboratory	2	4
	Mini Project	4	4
	Elective 5 1 Graph Theory and its Applications/ Data Mining/ E-Commerce	3	4
Part-4	Naan Muthalvan	2	2
	Internship / Industrial Visit/ Field Visit/ Knowledge Updation Activity	2	-
		28	30

### Semester-VI

Part	List of Courses	Credit	No. of Hours
Part-3	Core Course 6 1 Data Analytics using R	4	5
	Core Course 6 2 Deep Learning	4	5
	Core lab 6 1 Data Analytics using R Lab	4	4
	Project	4	6
	Elective 6.1 Augmented & Virtual Reality/Information Security	3	4
	Elective 6.2 Robotics & its Applications/ Cloud Computing	3	4
Part-4	Extension Activity	1	-
	Naan Muthalvan	2	2
		25	30

**Internship:** The students should submit certificate of attendance from the industry along with report for external evaluation.

**Industrial visit/Field visit/Knowledge Updation Activity:** A report should be submitted for external evaluation.

**Internship/ Industrial visit/Field visit/Research Knowledge Updation Activity:** Internal – 50 Marks, External – 50 Marks

**Project/ Mini Project: Individual or Group of Maximum Three members**  
**Project report should be submitted for external evaluation.**  
**Internal – 50 Marks, External – 50 Marks**

**Students who couldn't appear for Naan Muthalvan Course in a particular semester or who have failed in Naan Muthalvan Course should write the following papers (External – 100 marks)**

<b>Semester</b>	<b>Title of the Paper</b>
<b>II</b>	<b>Soft Skills for Employability</b>
<b>III</b>	<b>Digital Skills for Employability – Office Fundamentals</b>
<b>IV</b>	<b>Web Design with HTML</b>
<b>V</b>	<b>Internet &amp; E-Commerce</b>
<b>VI</b>	<b>C Programming</b>

**FIRST YEAR –SEMESTER- I****PROGRAMMING WITH C++**

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks			
							CIA	External	Total	
	4	1	0	I	4	5	25	75	100	
<b>Learning Objectives</b>										
<b>LO1</b>	<b>To inculcate knowledge on Object-oriented concepts and programming using C++.</b>									
<b>LO2</b>	<b>Demonstrate the use of various OOPs concepts with the help of programs</b>									
<b>Unit</b>	<b>Contents</b>							<b>No. of Hours</b>		
<b>I</b>	<b>OOP Paradigm – Concepts of OOP – Benefits of OOP - Object Oriented Languages – Applications of OOP – OOP Design: Using UML as a Design Tool Beginning with C++</b>							<b>15</b>		
<b>II</b>	<b>Tokens, Expressions and Control Structures - Functions in C++ : Function Prototyping – Call by Reference - Return by Reference – Inline Function – Default Arguments – Const Arguments – Recursion – Function Overloading – Classes and Objects</b>							<b>15</b>		
<b>III</b>	<b>Constructors and Destructors: Constructors – Parameterized Constructors – Multiple Constructors – Constructor with default Arguments – Copy Constructors – Dynamic Constructor – Destructors – Operator Overloading and Type Conversions: Operator Overloading – Overloading Unary Operators – Overloading Binary operators – Rules for Operator Overloading – Type Conversions</b>							<b>15</b>		
<b>IV</b>	<b>Inheritance: Introduction – Types of Inheritance – Virtual Base Classes – Abstract Classes – Pointers – Virtual Function - Polymorphism</b>							<b>15</b>		
<b>V</b>	<b>Templates: Class Templates – Function Templates – Overloading of template Function – Exception Handling</b>							<b>15</b>		
<b>TOTAL</b>							<b>75</b>			
<b>CO</b>	<b>Course Outcomes</b>									
<b>CO1</b>	<b>Outline the C++ programming fundamentals and the concepts of object-oriented programming like object and class, Encapsulation, inheritance and polymorphism.</b>									
<b>CO2</b>	<b>Classify the control structures, types of constructors, inheritance and different type conversion mechanisms.</b>									
<b>CO3</b>	<b>Analyze the importance of object oriented programming features like polymorphism, reusability, generic programming, data abstraction and the usage of exception handling.</b>									

<b>CO4</b>	<b>Determine the use of object oriented features such as classes, inheritance and templates to develop C++ programs for complex problems.</b>
<b>CO5</b>	<b>Create a program in C++ by implementing the concepts of object-oriented programming.</b>
<b>Textbooks</b>	
➤	<b>E. Balaguruswamy, (2013), “Object Oriented Programming using C++”, 6th Edition, Tata McGraw Hill.</b>
<b>Reference Books</b>	
<b>1</b>	<b>Bjarne Stroustrup, “The C++ Programming Language”, Fourth Edition, Pearson Education.</b>
<b>2</b>	<b>Hilbert Schildt, (2009), “C++ - The Complete Reference”, 4th Edition, Tata McGrawHill</b>
<b>Web Resources</b>	
<b>1.</b>	<b><a href="http://fahad.cprogramming.blogspot.com/p/c-simple-examples.html">http://fahad.cprogramming.blogspot.com/p/c-simple-examples.html</a></b>
<b>2.</b>	<b><a href="http://www.sitesbay.com/cpp/cpp-polymorphism">http://www.sitesbay.com/cpp/cpp-polymorphism</a></b>

<b>CO/PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO1</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>
<b>CO2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>
<b>CO3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>
<b>CO4</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>
<b>CO5</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>
<b>Weightage of course contributed to each PSO</b>	<b>15</b>	<b>14</b>	<b>11</b>	<b>15</b>	<b>15</b>	<b>10</b>

### Core Practical 1 : C++ Programming Laboratory

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
	0	0	5	I	4	5	50	50	100
<b>Learning Objectives</b>									
LO1	To inculcate knowledge on Object-oriented concepts and programming using C++.								
LO2	Demonstrate the use of various OOPs concepts with the help of programs								
<b>List of Exercises</b>									
<b>Exercises:</b> <ol style="list-style-type: none"> <li>1. Working with Classes and Objects</li> <li>2. Using Constructors and Destructors</li> <li>3. Using Function Overloading</li> <li>4. Using Operator Overloading</li> <li>5. Using Type Conversions</li> <li>6. Using Inheritance</li> <li>7. Using Polymorphism</li> <li>8. Using Console I/O</li> <li>9. Using Templates</li> <li>10. Using Exceptions</li> </ol> <p style="text-align: right;"><b>TOTAL      75</b></p>									
CO	<b>Course Outcomes</b>								
CO1	Understand the fundamentals of C++ programming structure								
CO2	Identify the basic features of OOPS such as classes, objects, polymorphism, inheritance								
CO3	Analyze the concept of inheritance with the understanding of early and late binding, usage of exception handling, constructors, destructors, generic programming and type conversions								
CO4	Determine the use of various data structures such as stacks, queues solve various computing problems in C++ by incorporating OOPS concepts								
CO5	Develop a program in C++ with the concepts of object oriented programming solve real-world problems.								

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	3	2
CO2	3	3	2	3	3	2
CO3	3	3	3	3	3	2
CO4	3	3	2	3	3	2
CO5	3	3	2	3	3	2
<b>Weightage of course contributed to each PSO</b>	<b>15</b>	<b>14</b>	<b>11</b>	<b>15</b>	<b>15</b>	<b>10</b>

<b>Title of the Course</b>	<b>Statistics for Data Science</b>					
<b>Elective Course 1A</b>						
	<b>Year</b>	<b>I</b>	<b>Credits</b>	<b>3</b>	<b>Course Code</b>	
	<b>Semester</b>	<b>I</b>				
<b>Instructional Hours per week</b>	<b>Lecture</b>	<b>Tutorial</b>	<b>Lab Practice</b>	<b>Total</b>		
	4		--	4		
<b>Objectives of the Course</b>	<b>To develop knowledge and understand fundamental concepts in probability and statistics</b>					
<b>Learning Outcome</b>	<p><b>Students will be able to</b></p> <p><b>CO1: Organize, manage and present data.</b></p> <p><b>CO2: Understand, describe, and calculate the measures of data and correlation.</b></p> <p><b>CO3: Recognize and understand various probability distribution functions, calculate and interpret expected results</b></p> <p><b>CO4: Apply the methods of estimating a parameter.</b></p> <p><b>CO5: Understand the concept of probability and apply for simple events</b></p>					
<b>Course Outline</b>	<p><b>UNIT-I:</b></p> <p><b>Introduction to Statistics: Types of data: primary, secondary - quantitative and qualitative data. Types of Measurements: nominal, ordinal, discrete and continuous data. Presentation of data by tables: construction of frequency distributions for discrete and continuous data, graphical representation of a frequency distribution by histogram and frequency polygon, cumulative frequency distributions</b></p>					

	<p><b>UNIT-II:</b></p> <p><b>Descriptive statistics: Describing Data Sets-Frequency Tables and Graphs- Histograms, Ogives, and Stem and Leaf Plots-Summarizing Data Sets-Sample Mean, Sample Median, and Sample Mode-Sample Variance and Sample Standard Deviation-Sample Percentiles -Chebyshev's Inequality-Normal Data Sets-Paired Data Sets</b></p> <p><b>Correlation: Karl Pearson coefficient of correlation, Spearman's rank correlation coefficient</b></p> <hr/> <p><b>UNIT-III:</b></p> <p><b>Random variables and expectation: The Bernoulli and Binomial Random Variables-Computing the Binomial Distribution Function-The Poisson Random Variable-Computing the Poisson Distribution Function - Normal Random Variables-Exponential Random Variables-The Poisson Process-The Gamma Distribution- The Chi-Square Distribution-The t-Distribution-The F Distribution</b></p> <hr/> <p><b>Unit IV</b></p> <p><b>Analysis of variance: -One-Way Analysis of Variance-Multiple Comparisons of Sample Means-One-Way Analysis of Variance with Unequal Sample Sizes-Two-Factor Analysis of Variance:</b></p> <p><b>4Goodness of fit tests and categorical data analysis: Goodness of Fit Tests When All Parameters Are Specified-Determining the Critical Region by Simulation-Goodness of Fit Tests When Some Parameters Are Unspecified- The Kolmogorov-Smirnov Goodness of Fit Test for Continuous Data</b></p> <hr/> <p><b>UNIT-V :</b></p> <p><b>Elements of Probability: classical, empirical and axiomatic approaches to probability, conditional probability and independent events, Laws of total probability, Baye's theorem and its applications- Axioms of Probability-Sample Spaces Having Equally Likely Outcomes</b></p>
<p><b>Skills acquired from this course</b></p>	<p><b>Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</b></p>

<b>Recommended Text</b>	<p>[1] Sheldon M. Ross, Introduction to Probability and Statistics for Engineers And Scientists, Elsevier Academic Press, UK, Fifth Edition, 2023</p> <p>[2]. Rohatgi V.K and Saleh E, An Introduction to Probability and Statistics, 3rd edition, John Wiley &amp; Sons Inc., New Jersey, 2015.</p> <p>[3]. Gupta S.C and Kapoor V.K, Fundamentals of Mathematical Statistics, 11th edition, Sultan Chand &amp; Sons, New Delhi, 2014.</p>
<b>Reference Books</b>	<b>Jim Frost, Introduction to Statistics: An Intuitive Guide for Analyzing Data and Unlocking Discoveries</b>
<b>Website and e-Learning Source</b>	<p><a href="https://onlinestatbook.com/2/">https://onlinestatbook.com/2/</a></p> <p><a href="https://www.simplilearn.com/tutorials/statistics-tutorial">https://www.simplilearn.com/tutorials/statistics-tutorial</a></p> <p><a href="https://towardsdatascience.com/fundamentals-of-statistics-for-data-scientists-and-data-analysts-69d93a05aae7">https://towardsdatascience.com/fundamentals-of-statistics-for-data-scientists-and-data-analysts-69d93a05aae7</a></p>

<b>CO/PSO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>
<b>CO1</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>CO2</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>
<b>CO3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>
<b>CO4</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>
<b>CO5</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>Weightage of course contributed to each PSO</b>	<b>13</b>	<b>15</b>	<b>13</b>	<b>15</b>	<b>15</b>	<b>12</b>



## DISCRETE MATHEMATICS

Subject Code	L	T	P	Seme ster	Credits	Inst. Hours	Marks		
							CIA	External	Total
	4	0	0	I	3	4	25	75	100
<b>Learning Objectives</b>									
L01	<b>To get the knowledge about the relations</b>								
L02	<b>To understand the functions and their classifications</b>								
L03	<b>To understand the propositions and normal forms</b>								
L04	<b>To understand the usage of matrix</b>								
L05	<b>To acquire knowledge about the graphs</b>								
<b>Prerequisites: Mathematics Fundamentals</b>									
Unit	Contents								No. of Hours
I	<b>Introduction to Relations - Binary relation - Classification of Relations - Composition of Relations - Inverse of Relation - Closure operation on Relations - Matrix representation of Relation - digraphs</b>								12
II	<b>Introduction to Functions - Addition and Multiplication of Functions - Classification of Functions - Composition of Function - Inverse Function</b>								12
III	<b>Introduction - Statement (Propositions) - Laws of Formal Logic - Basic Set of Logical operators/operations - Propositions and Truth Tables - Algebra Propositions - Tautologies and Contradictions - Logical Equivalence - Logical Implication - Normal Forms.</b>								12
IV	<b>Introduction - Definition of a Matrix - Types of Matrices - Operations on Matrices - Related Matrices - Transpose of a Matrix - Symmetric and Skew-symmetric Matrices - Complex Matrix - Conjugate of a Matrix - Determinant of a Matrix - Typical Square Matrices - Adjoint and Inverse of a Matrix - Singular and Non-singular Matrices - Adjoint of a Square Matrix - Properties of Adjoint of a Matrix - Properties of Inverse of a Matrix.</b>								12
V	<b>Introduction - Graph and Basic Terminologies - Types of Graphs - Sub Graph and Isomorphic Graph - Operations on Graphs - Representation of Graph</b>								12
<b>TOTAL</b>								<b>60</b>	
CO	<b>Course Outcomes</b>								

<b>CO1</b>	<b>To recall basic concepts for clear understanding of mathematical principles</b>
<b>CO2</b>	<b>To explain practical problems</b>
<b>CO3</b>	<b>To construct matrices using discrete mathematics</b>
<b>CO4</b>	<b>To analyze techniques to draw graph using mathematics</b>
<b>CO5</b>	<b>To design graphs using the representations</b>
<b>Textbooks</b>	
<b>Ø</b>	<b>DISCRETE MATHEMATICS, Swapan Kumar Chakraborty and Bikash Kanti Sarkar, OXFORD University Press</b>
<b>Reference books</b>	
<b>Ø</b>	<b>DISCRETE MATHEMATICS, Third Edition, Seymour Lipschutz and Marc Lars Lipson, Tata McGraw Hill Education Private Limited</b>
<b>Ø</b>	<b>Discrete Mathematical Structures with Applications to Computer Science by J.P. Tremblay, R. Manohar TMH edition</b>
<b>Web Reference</b>	
<b>Ø</b>	<b><a href="https://www.tutorialspoint.com/discrete_mathematics">https://www.tutorialspoint.com/discrete_mathematics</a></b>

**Mapping with Programme Outcomes:**

<b>CO/PSO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>
<b>CO 1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>CO2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>CO 3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>CO 4</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>
<b>CO 5</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>
<b>Weightage of course contributed to each PSO</b>	<b>15</b>	<b>15</b>	<b>14</b>	<b>15</b>	<b>14</b>	<b>14</b>

**S-Strong-3 M-Medium-2L-Low-1**

## MULTIMEDIA LABORATORY (USING REACT)

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks	
							CIA	External
	0	0	2	IV	2	2	50	50
<b>Learning Objectives</b>								
<b>LO1</b>	<b>Toget the knowledge to write the programs using React</b>							
<b>LO2</b>	<b>To understand the usage of functions</b>							
<b>LO3</b>	<b>To understand the usage of mapping</b>							
<b>LO4</b>	<b>To understand the application of various components</b>							
<b>LO5</b>	<b>To understand the usage of audio and video players</b>							
<b>Prerequisites: None</b>								
<b>Contents</b>								
<ol style="list-style-type: none"> <li><b>1. Create an image gallery component that displays a list of images.</b></li> <li><b>2. Create a video player component that can play, pause, and control the volume of a video.</b></li> <li><b>3. Create an audio player component with play, pause, and volume controls.</b></li> <li><b>4. Create a component that allows users to upload an image and preview it before submission.</b></li> <li><b>5. Create a component that visualizes audio frequencies using the Web Audio API.</b></li> <li><b>6. Create an image slider that automatically transitions between images.</b></li> <li><b>7. Create a Picture-in-Picture (PiP) video player that allows users to watch a video in a small overlay window while continuing to browse the page.</b></li> <li><b>8. Create a component that allows users to draw annotations on an image.</b></li> <li><b>9. Create an interactive map component using a mapping library like Leaflet.</b></li> </ol>								

**10. Create a 3D model viewer using Three.js and React.**

<b>CO</b>	<b>Course Outcomes</b>
<b>CO1</b>	<b>Applythebasicelements</b>
<b>CO2</b>	<b>Implementingthecomponents</b>
<b>CO3</b>	<b>Usingtheaudio and video players</b>
<b>CO4</b>	<b>PlayingwithAnimations</b>
<b>CO5</b>	<b>Displayingvarious applications with React</b>

<b>CO/PSO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>
<b>CO1</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>
<b>CO2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>
<b>CO3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>
<b>CO4</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>
<b>CO5</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>2</b>
<b>Weightage Of course contributed to each PSO</b>	<b>15</b>	<b>14</b>	<b>14</b>	<b>14</b>	<b>11</b>	<b>11</b>

## **Digital Logic Design**

**L T P C**

**2 0 0 2**

**Objective: To understand the concept of digital systems, to operate on various number systems and simplify Boolean functions and to distinguish logical and combinational circuits.**

**Unit – I: Number Systems**

**6 hours**

**Binary Number System – Binary to Decimal Conversion – Decimal to Binary Conversion – Octal**

**Numbers – Hexadecimal Numbers**

**Unit – II: Codes and Digital Logic**

**6 hours**

**The ASCII Code – The Excess-3 Code – The Gray Code. Digital Logic: Basic gates NOT, OR, AND – Universal Logic Gates NOR, NAND**

**Unit – III: Combinational Logic Circuits**

**6 hours**

**Boolean Laws and Theorems – Sum of Products Method – Truth Table to Karnaugh Map – Pairs,**

**Quads and Octets – Karnaugh Simplifications – Don't Care Conditions – Product of Sums**

**Unit – IV:**

**6 hours**

**Binary Arithmetic: Unsigned Binary Numbers – Sign-Magnitude Numbers – 2's Complement – Binary Addition – Binary Subtraction**

**Unit – V:**

**Flip-Flops 6 hours**

**RS Flip Flops – D Flip Flops – JK Flip – T Flip flop – JK Master Slave Flip Flops.**

**Text Book:**

**Digital Principles and Applications, by Albert Paul Malvino & Donald P. Leach, Seventh Edition, Tata**

**McGraw Hill Education Private Limited**

**Reference Book:**

**1. Fundamentals of Digital Circuits, A. Anand Kumar, Second Edition, PHI Learning Private Limited**

**2. Digital design, M. Morris Mano, Third Edition, Pearson Education**

**FIRST YEAR -SEMESTER- II**

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	<b>PROGRAMMING WITH PYTHON</b>	CCI	4	1	-	II	4	25	75	100
<b>Learning Objectives</b>										
LO1	<b>To make students understand the concepts of Python programming.</b>									
LO2	<b>To apply the OOPs concept in PYTHON programming.</b>									
LO3	<b>To impart knowledge on demand and supply concepts</b>									
LO4	<b>To make the students learn best practices in PYTHON programming</b>									
LO5	<b>To know the costs and profit maximization</b>									
UNIT	Contents									No. of Hours
I	<b>Basics of Python Programming: History of Python-Features of Python-Literal-Constants-Variables - Identifiers-Keywords-Built-in Data Types-Output Statements - Input Statements-Comments - Indentation- Operators-Expressions-Type conversions. Python Arrays: Defining and Processing Arrays - Array methods.</b>									15
II	<b>Control Statements: Selection/Conditional Branching statements: if, if-else, nested if and if-elif-else statements. Iterative Statements: while loop, for loop, else suite in loop and nested loops. Jump Statements: break, continue and pass statements.</b>									15
III	<b>Functions: Function Definition - Function Call - Variable Scope and its Lifetime-Return Statement. Function Arguments: Required Arguments, Keyword Arguments, Default Arguments and Variable Length Arguments- Recursion.</b>									15
IV	<b>Python Strings: String operations- Immutable Strings - Built-in String Methods and Functions - String Comparison. Modules: import statement- The Python module - dir() function - Modules and Namespace - Defining own modules. Lists: Creating a list -Access values in List-Updating values in Lists-Nested lists -Basic list operations-List Methods.</b>									15
V	<b>Tuples: Creating, Accessing, Updating and Deleting Elements in a tuple - Nested tuples- Difference between lists and tuples. Dictionaries: Creating, Accessing, Updating and Deleting Elements in a Dictionary - Dictionary Functions and Methods - Difference between Lists and Dictionaries.</b>									15
									<b>TOTAL HOURS</b>	<b>75</b>

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Learn the basics of python, Do simple programs on python, Learn how to use an array.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Develop program using selection statement, Work with Looping and jump statements, Do programs on Loops and jump statements.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Concept of function, function arguments, Implementing the concept strings in various application, Significance of Modules, Work with functions, Strings and modules.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Work with List, tuples and dictionary, Write program using list, tuples and dictionary.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Usage of File handlings in python, Concept of reading and writing files, Do programs using files.	PO1, PO2, PO3, PO4, PO5, PO6
<b>Textbooks</b>		
1	Reema Thareja, "Python Programming using problem solving approach", First Edition, 2017, Oxford University Press.	
2	Dr. R. Nageswara Rao, "Core Python Programming", First Edition, 2017, Dream tech Publishers.	
<b>Reference Books</b>		
1.	VamsiKurama, "Python Programming: A Modern Approach", Pearson Education.	
2.	Mark Lutz, "Learning Python", Orielly.	
3.	Adam Stewarts, "Python Programming", Online.	
4.	Fabio Nelli, "Python Data Analytics", APress.	
5.	Kenneth A. Lambert, "Fundamentals of Python – First Programs", CENGAGE Publication.	
<b>Web Resources</b>		
1.	<a href="https://www.programiz.com/python-programming">https://www.programiz.com/python-programming</a>	
2.	<a href="https://www.guru99.com/python-tutorials.html">https://www.guru99.com/python-tutorials.html</a>	
3.	<a href="https://www.w3schools.com/python/python_intro.asp">https://www.w3schools.com/python/python_intro.asp</a>	
4.	<a href="https://www.geeksforgeeks.org/python-programming-language/">https://www.geeksforgeeks.org/python-programming-language/</a>	
5.	<a href="https://en.wikipedia.org/wiki/Python_(programming_language)">https://en.wikipedia.org/wiki/Python_(programming_language)</a>	

#### Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3

<b>CO 2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>
<b>CO 3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>
<b>CO 4</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>
<b>CO 5</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>Weightage of course contributed to each PSO</b>	<b>15</b>	<b>14</b>	<b>15</b>	<b>15</b>	<b>13</b>	<b>14</b>

**S-Strong-3 M-Medium-2 L-Low-1**

MMSU



Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	<b>PYTHON PROGRAMMING LABORATORY</b>	CCII	-	-	5	II	4	50	50	100

### Course Objectives

1. Be able to design and program Python applications.
2. Be able to create loops and decision statements in Python.
3. Be able to work with functions and pass arguments in Python.
4. Be able to build and package Python modules for reusability.
5. Be able to read and write files in Python.

LAB EXERCISES	Required Hours
<ol style="list-style-type: none"> <li>1. Program using variables, constants, I/O statements in Python.</li> <li>2. Program using Operators in Python.</li> <li>3. Program using Conditional Statements.</li> <li>4. Program using Loops.</li> <li>5. Program using Jump Statements.</li> <li>6. Program using Functions.</li> <li>7. Program using Recursion.</li> <li>8. Program using Arrays.</li> <li>9. Program using Strings.</li> <li>10. Program using Modules.</li> <li>11. Program using Lists.</li> <li>12. Program using Tuples.</li> <li>13. Program using Dictionaries.</li> <li>14. Program for File Handling.</li> </ol>	75

### Course Outcomes

On completion of this course, students will

CO1	Demonstrate the understanding of syntax and semantics of
CO2	Identify the problem and solve using PYTHON programming techniques.
CO3	Identify suitable programming constructs for problem solving.
CO4	Analyze various concepts of PYTHON language to solve the problem in an efficient way.
CO5	Develop a PYTHON program for a given problem and test for its correctness.

**Mapping with Programme Outcomes:**

<b>CO/PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO 1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>CO 2</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>2</b>	<b>3</b>
<b>CO 3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>
<b>CO 4</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>
<b>CO 5</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>Weightage of course contributed to each PSO</b>	<b>15</b>	<b>15</b>	<b>13</b>	<b>15</b>	<b>13</b>	<b>14</b>

**S-Strong-3 M-Medium-2 L-Low-1**

MMSU

**OPTIMIZATION TECHNIQUES L - 4 C - 3**

**Course objectives:**

- 1. To apply various optimization techniques for decision making.**
- 2. To introduce the use of variables for formulating complex mathematical models in management, science and industrial applications**

**Course Outcome:**

**On successful completion of the course, the learners will be able to CO1. Formulate and solve Linear Programming Problems.**

**CO2. Analyze the usage of Sequencing Problems.**

**CO3. Evaluate Queuing Models.**

**CO4. Apply PERT and CPM techniques to find the optimal solution.**

**UNIT I**

**12 hours**

**INTRODUCTION-LINEAR PROGRAMMING PROBLEM**

**The Nature and Meaning of OR – Management – Applications of OR – Scope of OR.**

**Linear Programming Problem: Formulation of LP problems – Graphical solution of LP problems – General formulation of LPP – Slack and Surplus variables – Canonical & Standard form of LPP – Simplex Method I (only)**

**UNIT II**

**10hours**

**ASSIGNMENT PROBLEMS**

**Assignment Problem: Mathematical formulation–Hungarian method– Unbalanced Assignment problem**

**UNIT III**

**14 hours**

**TRANSPORTATION PROBLEMS**

**Transportation Model: Mathematical formulation – Matrix form–Methods for finding Initial Basic Feasible solution and Optimal solution – Degeneracy in Transportation Problems – Unbalanced Transportation Problem.**

**UNIT IV**

**12 hours**

**QUEUING MODELS**

**Queuing Models: Queuing System – Transient and Steady States–Kendal's Notation for representing Queuing Models – Various Models in Queuing System – Problems in Birth and Death Model(only)**

**UNIT V**

**12 hours**

**PERT AND CPM TECHNIQUES**

**PERT and CPM Techniques: Basic Steps – Network Diagram representation– Rules for drawing Network Diagram – Labeling Fulkerson's I–J Rule – Time Estimates and Critical Path in Network Analysis – Examples on optimum duration and minimum duration cost – PERT.**

**CO-PO –PSO Mapping**

<b>OPTIMIZATION TECHNIQUES</b>											
<b>CO</b>	<b>PO</b>					<b>PSO</b>					<b>COGNITIVE LEVEL</b>
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	
<b>CO1</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>M</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>M</b>	<b>S</b>	<b>S</b>	<b>K-2</b>
<b>CO2</b>	<b>S</b>	<b>S</b>	<b>M</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>K-1</b>
<b>CO3</b>	<b>S</b>	<b>S</b>	<b>M</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>K-3</b>
<b>CO4</b>	<b>S</b>	<b>S</b>	<b>M</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>K-5</b>
<b>CO5</b>	<b>S</b>	<b>S</b>	<b>M</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>K- 6</b>

**Strongly Correlated–S, Moderately Correlated–M, Weekly Correlated-L**

**TEXT BOOK**

**V.K. Kapoor “Problems and Solutions in Operations Research” Sultan Chand and Sons, New Delhi**

**S.D.Sharma, “Operations Research”, Tenth Edition, Pearson, 2017.**

**REFERENCE BOOKS**

1. **Hamdy A Taha, “Operations Research”, Ninth Edition, 2016.**

2.

**undaesan, K.S.Ganapathy Subramanian, K.Ganesan, “Resource Management Techniques”, Ninth Edition, R.Publications, 2015.**

**V.S**

## Artificial Neural Networks

L T P C

4 0 0 3

### OBJECTIVES:

- **Basic neuron models:** McCulloch-Pitts model and the generalized one, distance or similarity based neuron model, radial basis function model, etc.
- **Basic neural network models:** multilayer perceptron, distance or similarity based neural networks, associative memory and self-organizing feature map, radial basis function based multilayer perceptron, neural network decision trees, etc.
- **Basic learning algorithms:** the delta learning rule, the back propagation algorithm, self-organization learning
- **Applications:** pattern recognition, function approximation, information visualization, etc.

### UNIT I

**Introduction to Neural networks: Neural processing- Neural networks- an overview – the raise of neuro computing – introduction to artificial neural networks : introduction- artificial neural networks – historical development of neural networks – biological neural networks – comparison between the brain and the computer – artificial and biological neural networks – basic building blocks of artificial neural networks – artificial neural network terminologies. (12L)**

### UNIT II

**Fundamental models of artificial neural networks: McCulloch-Pits neuron Model- Learning rules. Perceptron networks: Introduction –single layer perceptron –brief introduction to multi layer perceptron networks. (12L)**

### UNIT III

**Feedback networks: Introduction- discrete Hopfield net-continuous Hopfield net- relation between BAM and Hopfield nets. Feed forward networks: introduction-back propagation networks. (12L)**

### UNIT IV

**Kohonen self - organizing feature maps - counter propagation network: introduction-Full counter propagation network-Forward only propagation network. (12L)**

### UNIT V

**Applications of Neural Networks: Applications of neural networks in Arts- Bioinformatics – Knowledge Extraction – Forecasting - Bankruptcy forecasting- Healthcare-Intrusion - Detection. (12L)**

### TEXT BOOK

**Introduction to Neural Networks using MATLAB 6.0., S N Sivanandam S Sumathi S N Deepa ,McGraw Hill, 2006.**

### REFERENCE BOOKS

**1.Artificial neural Networks B.Yegnanarayana, Prentice Hall India, 2005.**

**2.Neural Networks Alogorithms, Applications and programming Techniques, James A Freeman David M Skapura, Pearson Education.**

**3.Neural Networks for Pattern Recognition, Christopher M. Bishop, Indian Edition, OXFORD University Press.**

MMSU

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	<b>DATA STRUCTURES</b>	<b>SEC</b>	<b>2</b>	<b>-</b>	<b>-</b>	<b>II</b>	<b>2</b>	<b>25</b>	<b>75</b>	<b>100</b>
<b>Learning Objectives</b>										
<b>LO1</b>	<b>Understand the meaning asymptotic time complexity analysis and various data structures</b>									
<b>LO2</b>	<b>To enhancing the problem solving skills and thinking skills</b>									
<b>LO3</b>	<b>To write efficient algorithms and Programs</b>									
<b>LO4</b>	<b>To make the students learn best practices in programming</b>									
<b>LO5</b>	<b>To understand how to handle the files in Data Structure</b>									
<b>UNIT</b>	<b>Contents</b>								<b>No. Of. Hours</b>	
<b>I</b>	<b>Arrays and ordered Lists Abstract data types - asymptotic notations - complexity analysis- Linked lists: Singly linked list - doubly linked lists-</b>								<b>6</b>	
<b>II</b>	<b>Stacks - Queues - Circular Queues Trees - Binary Trees - Binary Tree Traversal - Binary Tree Representations - Binary Search Trees</b>								<b>6</b>	
<b>III</b>	<b>Graphs - Representation of Graphs - Graph implementation - graph Traversals - Minimum Cost Spanning Trees</b>								<b>6</b>	
<b>IV</b>	<b>Searching and Sorting Sorting - Insertion Sort, Quick Sort, Merge Sort Searching - Linear search, Binary search</b>								<b>6</b>	
<b>V</b>	<b>Backtracking - 8-Queen's problem - Graph Colouring- Branch And Bound:- Travelling Sales Person Problem</b>								<b>6</b>	
<b>TOTAL HOURS</b>								<b>30</b>		
<b>Course Outcomes</b>									<b>Programme Outcomes</b>	
<b>CO</b>	<b>On completion of this course, students will</b>									
<b>CO1</b>	<b>To understand the asymptotic notations and analysis of time and space complexity To understand the concepts of Linked List, Stack and Queue.</b>								<b>PO1, PO2, PO3, PO4, PO5, PO6</b>	
<b>CO2</b>	<b>To understand the Concepts of Trees and Graphs Perform traversal operations on Trees and Graphs. To enable the applications of Trees and Graphs.</b>								<b>PO1, PO2, PO3, PO4, PO5, PO6</b>	
<b>CO3</b>	<b>To apply searching and sorting techniques</b>								<b>PO1, PO2, PO3, PO4, PO5, PO6</b>	

<b>Textbooks</b>		
<b>1</b>	<b>Seymour Lipshutz(2011),Schaum"s Outlines - Data Structures with C, Tata McGraw Hill publications.</b>	
<b>2</b>	<b>Ellis Horowitz and SartajSahni (2010), Fundamentals of Computer Algorithms, Galgotia Publications Pvt., Ltd.</b>	
<b>3</b>	<b>Dr. K. Nagesware Rao, Dr. Shaik Akbar, ImmadiMurali Krishna, Problem Solving and Python Programming(2018)</b>	
<b>Reference Books</b>		
<b>1.</b>	<b>Gregory L.Heileman(1996), Data Structures, Algorithms and Object-Oriented Programming, McGraw Hill International Edition, Singapore.</b>	

MMSU



### PHP SCRIPTING LABORATORY

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
	0	0	2	II	2	2	50	50	100
<b>Learning Objectives</b>									
<b>LO1</b>	<b>To enable the students to understand, analyze and build dynamic web pages using PHP and jQuery with MySQL database</b>								
<b>Contents</b>									
	<b>Introduction to PHP: Embedding PHP in Web Pages</b>							<b>No. of Hours</b>	
	<b>1. Working with Forms.</b>							<b>5</b>	
	<b>2. String Manipulations</b>							<b>10</b>	
	<b>3. Functions</b>								
	<b>4. Sorting</b>								
	<b>5. Classes and Objects</b>							<b>10</b>	
	<b>6. Cookies and Sessions</b>								
	<b>7. Graphics</b>								
	<b>Working with MySQL Database: Select data from a single table – Select data from multiple tables- Performing DML operations</b>							<b>5</b>	
	<b>8. Working with multiple tables</b>								
<b>TOTAL</b>							<b>30</b>		
<b>CO</b>	<b>Course Outcomes</b>								
<b>CO1</b>	<b>Demonstrate simple programs using PHP</b>								
<b>CO2</b>	<b>Apply the interface setup, styles &amp; themes for the given application</b>								
<b>CO3</b>	<b>Analyze the problem and add necessary user interface components, multimedia components and web data source into the application</b>								
<b>CO4</b>	<b>Evaluate the results by implementing the correct techniques on the web form</b>								
<b>CO5</b>	<b>Construct web applications with the facilitated components in PHP</b>								
<b>Textbooks</b>									
➤	<b>Kevin Tatroe, Peter MacIntyre, Rasmus Lerdorf, “Programming PHP”, O’Reilly Publications, Third Edition</b>								
➤	<b>Joel Murach, Ray Harris (2010), “PHP and MySQL”, Shroff Publishers &amp; Distributors</b>								
➤	<b>Cesar Otero, Rob Losen (2012), “Professional jQuery”, John Wiley Sons &amp; Inc</b>								
<b>Reference Books</b>									

1.	W.Jason Gilmore(2010), “BeginningPHP&MySql”,Apress
2.	LarryUllman (2008), “PHP6 and MySQL5”, Pearson Education
3.	John Coggeshall(2006), “PHP5”,Pearson Education
4.	MichaleC.Glass(2004),“BeginningPHP,Apache, MySQLWebDevelopment”,Wiley DreamTechPress
5.	Robin Nixon (2013),“LearningPHP,MySQL, JavaScript &CSS”, O’Reilly, 2 <sup>nd</sup> Edition

**NOTE: Latest Edition of Textbooks May be Used**

**Web Resources**

1.	<a href="http://www.w3schools.com/jquery/">http://www.w3schools.com/jquery/</a>
2.	<a href="http://www.ccc.commnet.edu/faculty/sfreeman/cst%20250/jQueryNotes.pdf">http://www.ccc.commnet.edu/faculty/sfreeman/cst%20250/jQueryNotes.pdf</a>
3.	<a href="http://www.w3schools.com/php/">http://www.w3schools.com/php/</a>
4.	<a href="http://www.tutorialspoint.com/php/">http://www.tutorialspoint.com/php/</a>
5.	<a href="http://www.tutorialspoint.com/mysql/">http://www.tutorialspoint.com/mysql/</a>

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	3	2
CO2	3	3	2	2	2	3
CO3	3	2	3	2	2	3
CO4	3	2	2	2	2	3
CO5	3	2	2	3	2	2
<b>Weightage of course contributed to each PSO</b>	<b>15</b>	<b>11</b>	<b>11</b>	<b>12</b>	<b>11</b>	<b>13</b>

**SEMESTER III**

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	Ext	Total
CC7	Programming with Java	Core	4	-	-	-	4	5	25	75	100
<b>Learning Objectives</b>											
LO1	To provide fundamental knowledge of object-oriented programming										
LO2	To equip the student with programming knowledge in Core Java from the basics up.										
LO3	To enable the students to use AWT controls, Event Handling and Swing for GUI.										
LO4	To provide fundamental knowledge of object-oriented programming.										
LO5	To equip the student with programming knowledge in Core Java from the basics up.										
<b>UNIT</b>	<b>Contents</b>							<b>No. of Hours</b>			
I	Introduction: Review of Object Oriented concepts - History of Java - Java buzzwords - JVM architecture - Datatypes - Variables - Scope and life time of variables - arrays - operators - control statements - type conversion and casting - simple java program - constructors - methods - Static block - Static Data - Static Method String and StringBuffer Classes.							15			
II	<b>Inheritance:</b> Basic concepts - Types of inheritance - Member access rules - Usage of this and Super key word - Method Overloading - Method overriding - Abstract classes - Dynamic method dispatch - Usage of final keyword. <b>Packages:</b> Access Protection - Importing Packages. <b>Interfaces:</b> Implementation - Extending Interfaces. <b>Exception Handling:</b> try - catch - throw - throws - finally - Built-in exceptions - Creating own Exception classes.							15			

<b>III</b>	<b>Multithreaded Programming: Thread Class - Runnable interface -Synchronization-Using synchronizedmethods- Using synchronized statement- InterthreadCommunication - Deadlock.</b>  <b>I/O Streams: Concepts of streams - Stream classes- Byte and Character stream - Reading console Input and Writing Console output - File Handling.</b>	<b>15</b>
<b>IV</b>	<b>AppletsThe Applet class: Applet Basics - Applet Architecture -Applet Skeleton- Applet Display method -Requesting Repainting - HTML APPLET tag- Passing Parameters to Applet.</b>  <b>-Layout managers.</b>	<b>15</b>
<b>V</b>	<b>Event Handling: Events - Event sources - Event Listeners - Event Delegation Model (EDM) - Handling Mouse and Keyboard Events - Adapter classes - Inner classes</b>	<b>15</b>
	<b>Total</b>	<b>75</b>

**Course Outcomes**

<b>Course Outcomes</b>	<b>On completion of this course, students will;</b>	
<b>CO1</b>	<b>Understand the basic Object-oriented concepts.Implement the basic constructs of Core Java.</b>	<b>PO1, PO2, PO6</b>
<b>CO2</b>	<b>Implement inheritance, packages, interfaces and exception handling of Core Java.</b>	<b>PO2, PO3, PO8</b>
<b>CO3</b>	<b>Implement multi-threading and I/O Streams of Core Java</b>	<b>PO1, PO3, PO5</b>
<b>CO4</b>	<b>Implement AWT and Event handling.</b>	<b>PO2, PO6</b>

**Text Books:**

<b>1.</b>	<b>Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010</b>
<b>2.</b>	<b>Gary Cornell, Core Java 2 Volume I - Fundamentals, Addison Wesley, 1999</b>

**References :**

<b>1.</b>	<b>Head First Java, O’Rielly Publications,</b>
-----------	--

2.	<b>Y. Daniel Liang, <i>Introduction to Java Programming</i>, 7th Edition, Pearson Education India, 2010</b>
<b>Web Resources</b>	
1.	<b><a href="https://javabeginnerstutorial.com/core-java-tutorial">https://javabeginnerstutorial.com/core-java-tutorial</a></b>
2.	<b><a href="http://docs.oracle.com/javase/tutorial/">http://docs.oracle.com/javase/tutorial/</a></b>
3.	<b><a href="https://www.coursera.org/">https://www.coursera.org/</a></b>

**Mapping with Programme Outcomes:**

**S-Strong-3 M-Medium-2 L-Low-1**

<b>CO/ PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>
<b>CO2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>
<b>CO3</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>CO4</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>
<b>CO5</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>
<b>Weightage of course contributed to each PSO</b>	<b>14</b>	<b>14</b>	<b>13</b>	<b>14</b>	<b>14</b>	<b>11</b>

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		Total
									CIA	External	
	Java Programming Lab	Core	-	-	4	-	3	4	50	50	100
<b>Learning Objectives</b>											
LO1	To provide fundamental knowledge of object-oriented programming.										
LO2	To equip the student with programming knowledge in Core Java from the basics up.										
LO3	To enable the students to know about Event Handling .										
LO4	To enable the students to use String Concepts.										
LO5	To equip the student with programming knowledge in to creat GUI using AWT controls.										
<b>EXERCISE</b>	<b>Details</b>										
1	Write a Java program that prompts the user for an integer and then prints out all the prime numbers up to that Integer										
2	Write a Java program to multiply two given matrices.										
3	Write a Java program that displays the number of characters, lines and words in a text										
4	Generate random numbers between two given limits using Random class and print messages according to the range of the value generated.										
5	Write a program to do String Manipulation using CharacterArray and perform the following string operations: a. String length										

	<ul style="list-style-type: none"> <li>b. Finding a character at a particular position</li> <li>c. Concatenating two strings</li> </ul>	<b>60</b>
<b>6</b>	<p>Write a program to perform the following string operations using String class:</p> <ul style="list-style-type: none"> <li>a. String Concatenation</li> <li>b. Search a substring</li> <li>c. To extract substring from given string</li> </ul>	
<b>7</b>	<p>Write a program to perform string operations using String Buffer class:</p> <ul style="list-style-type: none"> <li>a. Length of a string</li> <li>b. Reverse a string</li> <li>c. Delete a substring from the given string</li> </ul>	
<b>8</b>	<p>Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.</p>	
<b>9</b>	<p>Write a threading program which uses the same method asynchronously to print the numbers 1to10 using Thread1 and to print 90 to100 using Thread2.</p>	
<b>10</b>	<p>Write a program to demonstrate the use of following exceptions.</p> <ul style="list-style-type: none"> <li>a. Arithmetic Exception</li> <li>b. Number Format Exception</li> <li>c. Array Index Out of Bound Exception</li> <li>d. Negative Array Size Exception</li> </ul>	
<b>11</b>	<p>Write a Java program that reads on file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes</p>	
<b>12</b>	<p>Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired. (Use adapter classes).</p>	

<b>Total</b>		<b>60</b>
<b>Course Outcomes</b>		<b>Programme Outcome</b>
<b>CO</b>	<b>On completion of this course, students</b>	

	<b>will</b>	
<b>1</b>	<b>Understand the basic Object-oriented concepts. Implement the basic constructs of Core Java.</b>	<b>PO1</b>
<b>2</b>	<b>Implement inheritance, packages, interfaces and exception handling of Core Java.</b>	<b>PO1, PO2</b>
<b>3</b>	<b>Implement multi-threading and I/O Streams of Core Java</b>	<b>PO4, PO6</b>
<b>4</b>	<b>Implement AWT and Event handling.</b>	<b>PO4, PO5, PO6</b>
<b>5</b>	<b>Use Swing to create GUI.</b>	<b>PO3, PO6</b>
<b>Text Book</b>		
<b>1</b>	<b>Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010.</b>	
<b>2.</b>	<b>Gary Cornell, Core Java 2 Volume I - Fundamentals, Addison Wesley, 1999.</b>	
<b>Reference Books</b>		
<b>1.</b>	<b>Head First Java, O’Rielly Publications,</b>	
<b>2.</b>	<b>Y. Daniel Liang, Introduction to Java Programming, 7th Edition, Pearson Education India, 2010.</b>	
<b>Web Resources</b>		
<b>1.</b>	<b><a href="https://www.w3schools.com/java/">https://www.w3schools.com/java/</a></b>	
<b>2.</b>	<b><a href="http://java.sun.com">http://java.sun.com</a></b>	
<b>3.</b>	<b><a href="http://www.afu.com/javafaq.html">http://www.afu.com/javafaq.html</a></b>	

**Mapping with Programme Outcomes:**

<b>CO/ PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>
<b>CO2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>
<b>CO3</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>CO4</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>
<b>CO5</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>
<b>Weightage of course contributed to each PSO</b>	<b>14</b>	<b>14</b>	<b>13</b>	<b>14</b>	<b>14</b>	<b>12</b>



**S-Strong M-Medium L-Low**

MMSU

## **OPERATING SYSTEMS      L - 4   C - 3**

### **UNIT I**

**12 Hours**

**Introduction: Computer System Organization - Computer System Architecture - Operating System Structure - Operating System Operations - Process Management. Operating-System Structures: Operating System Services - User and Operating-System Interface - System Calls - System Programs - Operating System Design and Implementation - System Boot.**

### **UNIT II**

**12 Hours**

**Processes: Process Concept- Process Scheduling -Operations on Processes- Interprocess Communication - Communication in Client - Server Systems. Process Synchronization: Background - The Critical Section Problem-Peterson's Solution - Mutex Locks - Semaphores - Classic Problems of Synchronization.**

### **UNIT III**

**12 Hours**

**CPU Scheduling: Scheduling Criteria- Scheduling Algorithms-Thread Scheduling- Real Time CPU Scheduling- Algorithm Evaluation. DeadLocks: System Model- Deadlock Characterization- Methods for Handling Deadlocks- Deadlock Prevention- Deadlock Avoidance-Deadlock Detection - Recovery from Deadlock.**

### **UNIT IV**

**12 Hours**

**Memory Management: Swapping - Contiguous Memory Allocation - Segmentation - Paging. Virtual Memory: Background - Demand Paging - Copy on Write- Page Replacement-Allocation of Frames - Thrashing.**

### **UNIT V**

**12 Hours**

**Mass-Storage Structure: Mass-Storage Structure-Disk Structure - Disk Scheduling - Disk Management -RAID Structure. File System Interface: File Concept-Access Methods-Directory and Disk Structure - File Sharing- Protection. File System Implementation : File System Structure - File System Implementation- Directory Implementation-Allocation Methods - Free Space Management - Recovery.**

### **TEXT BOOK:**

**Operating System Concepts - Abraham Silberscartz, Peter Baer Galvin, and Greg Gange. Addison Wesley Publishing Company - Ninth Edition.**

### **REFERENCE BOOKS:**

- 1. Operating System: Internal and Design Principles - Fifth Edition, William Stalling, PHI Learning Private Limited.**
- 2. Understanding Operating Systems: Ida M.Flynn, Ann McIverMcHoes**

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst.	Marks		
									CIA	External	Total
	<b>Computational Intelligence</b>	<b>Elective</b>	<b>4</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>3</b>	<b>4</b>	<b>25</b>	<b>75</b>	<b>100</b>
<b>Course Objective</b>											
<b>C1</b>	<b>To identify and understand the basics of AI and its search.</b>										
<b>C2</b>	<b>To study about the Fuzzy logic systems.</b>										
<b>C3</b>	<b>Understand and apply the concepts of Neural Network and its functions.</b>										
<b>C4</b>	<b>Understand the concepts of Artificial Neural Network</b>										
<b>C5</b>	<b>To study about the Genetic Algorithm.</b>										
<b>UNIT</b>	<b>Details</b>									<b>No. of Hours</b>	
<b>I</b>	<b>Artificial Intelligence: Problem formulation – AI Applications – Problems – State Space and Search – Production Systems – Breadth First and Depth First – Travelling Salesman Problem – Heuristic search techniques: Generate and Test – Types of Hill Climbing.</b>									<b>12</b>	
<b>II</b>	<b>Fuzzy Logic Systems: Notion of fuzziness – Operations on fuzzy sets – T-norms and other aggregation operators – Basics of Approximate Reasoning – Compositional Rule of Inference – Fuzzy Rule Based Systems – Schemes of Fuzzification – Inferencing – Defuzzification – Fuzzy Clustering – fuzzy rule-based classifier.</b>									<b>12</b>	
<b>III</b>	<b>Neural Networks: Learning rules and various activation functions, Single layer Perception Back Propagation networks, Architecture of Backpropagation (BP) Networks, Back propagation Learning -Neural Network, Introduction to Associative Memory, Adaptive Resonance theory and Self Organizing Map,</b>									<b>12</b>	
<b>IV</b>	<b>Artificial Neural Networks: Fundamental Concepts – Basic Models of Artificial Neural Networks – Important Terminologies of ANNs – McCulloch-Pitts Neuron – Linear Separability – Hebb Network.</b>									<b>12</b>	
<b>V</b>	<b>Genetic Algorithm: Introduction – Biological Background – Genetic Algorithm Vs Traditional Algorithm – Basic Terminologies in Genetic Algorithm – Simple GA – General Genetic Algorithm – Operators in Genetic Algorithm</b>									<b>12</b>	
<b>Total</b>							<b>60</b>				
<b>Course Outcomes</b>							<b>Programme Outcomes</b>				

<b>CO</b>	<b>On completion of this course, students will</b>	
<b>1</b>	<b>Describe the fundamentals of artificial intelligence concepts and searching techniques.</b>	<b>PO1</b>
<b>2</b>	<b>Develop the fuzzy logic sets and membership function and defuzzification techniques.</b>	<b>PO1, PO2</b>
<b>3</b>	<b>Understand the concepts of Neural Network and analyze and apply the learning techniques</b>	<b>PO4, PO6</b>
<b>4</b>	<b>Understand the artificial neural networks and its applications.</b>	<b>PO4, PO5, PO6</b>
<b>5</b>	<b>Understand the concept of Genetic Algorithm and Analyze the optimization problems using GAs.</b>	<b>PO3, PO8</b>
<b>Text Book</b>		
<b>1</b>	<b>S.N. Sivanandam and S.N. Deepa, “Principles of Soft Computing”, 2nd Edition, Wiley India Pvt. Ltd.</b>	
<b>2</b>	<b>Stuart Russell and Peter Norvig, “Artificial Intelligence - A Modern Approach”, 2nd Edition, Pearson Education in Asia.</b>	
<b>3</b>	<b>S. Rajasekaran, G. A. Vijayalakshmi, “Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis &amp; Applications”, PHI.</b>	
<b>Reference Books</b>		
<b>1.</b>	<b>F. Martin, Mc neill, and Ellen Thro, “Fuzzy Logic: A Practical approach”, AP Professional, 2000. Chin Teng Lin, C. S. George Lee,” Neuro-Fuzzy Systems”, PHI</b>	
<b>2.</b>	<b>Chin Teng Lin, C. S. George Lee,” Neuro-Fuzzy Systems”, PHI.</b>	
<b>Web Resources</b>		
<b>1.</b>	<b><a href="https://www.javatpoint.com/artificial-intelligence-tutorial">https://www.javatpoint.com/artificial-intelligence-tutorial</a></b>	
<b>2.</b>	<b><a href="https://www.w3schools.com/ai/">https://www.w3schools.com/ai/</a></b>	

**Mapping with Programme Outcomes:**

	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>
<b>CO 1</b>	<b>S</b>							
<b>CO 2</b>	<b>M</b>	<b>S</b>						
<b>CO 3</b>				<b>S</b>		<b>S</b>		
<b>CO 4</b>				<b>S</b>	<b>S</b>	<b>M</b>		
<b>CO 5</b>			<b>S</b>					<b>S</b>

**S-Strong M-Medium L-Low**

<b>CourseCode</b>	<b>Web Design Laboratory</b>		<b>Credits 2</b>
<b>Lecture Hours:(L) Per week</b>	<b>TutorialHours: (T)perweek</b>	<b>Lab Practice Hours: (P)per week 2</b>	<b>Total:(L+T+P) Per week 2</b>
<b>CourseCategory:</b>	<b>Year &amp; Semester:II &amp; III</b>	<b>AdmissionYear:</b>	
	<b>Contents</b>		
<ol style="list-style-type: none"> <li>1. Introduction to HTML. Create a basic web page</li> <li>2. Create a static webpage using table tags of HTML</li> <li>3. Create a static web page which defines all text formatting tags of HTML in tabular format</li> <li>4. Create webpage using list tags of HTML</li> <li>5. Create webpage to include image using HTML tag</li> <li>6. Create webpage with frames</li> <li>7. Create employee registration webpage using HTML form objects</li> <li>8. Create webpages with Hyperlinks</li> </ol>			

**DATABASE MANAGEMENT SYSTEMS**

**UNIT I: Introduction to Databases and Database System Concepts 12 hours**

**Introduction – Characteristics of the Database Approach – Actors on the Scene and Workers behind the Scene – Advantages of Using the Database Management System Approach – Database Applications – Data Models, Schemas, and Instances – Three-Schema Architecture of a Database Management System – Data Independence – Database Languages and Interfaces – Database System Environment – Architectures for Database Management Systems Database Management Systems – Classification of Database Management Systems.**

**UNIT II: Entity Relationship Model and Relational Model 12 hours**

**Entity Types, Entity Sets, Attributes, and Keys – Relationship Types – Steps to Model an Entity Relationship Diagram – Relational Model Concepts – Relational Model Constraints and Relational Database Schemas – Update Operations, Transactions, and Dealing with Constraint**

**Violations – Mapping Entity Relationship Model to Relational Data Model.**

**UNIT III: Relational Algebra and Structured Query Language 12 hours**

**Unary Relational Operations: SELECT and PROJECT – Relational Algebra Operations from Set Theory – Binary Relational Operations: Cartesian Product – Equi Join – Left Outer Join – Right Outer Join – Full Outer Join – Data Definition Language – Data Manipulation Language – Transaction Control Language – Aggregate Functions – Joins – Nested Queries – Views – Stored Procedures – Cursors – Functions – Triggers.**

**UNIT IV: Database Normalization 12 hours**

**Functional Dependencies – First Normal Form – Second Normal Form – Third Normal Form – Boyce-Codd Normal Form – Multivalued Dependency and Fourth Normal Form – Join Dependencies and Fifth Normal Form.**

**UNIT V: Transaction Processing and Concurrency Control 12 hours**

**Introduction to Transaction Processing – Transaction and System Concepts – Properties of Transactions – Characterizing Schedules Based on Recoverability – Characterizing Schedules Based on Serializability – Transaction Support in SQL – Concurrency Control Techniques – Two-Phase Locking Techniques for Concurrency Control – Concurrency Control Based on Timestamp Ordering.**

**Text Books:**

1. Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems, Seventh Edition, Pearson Education, 2016.
2. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, Seventh Edition, McGraw Hill Education, 2020.

**Reference:**

[http://www.uoitc.edu.iq/images/documents/informaticsinstitute/Competitive\\_exam/Database\\_Systems.pdf](http://www.uoitc.edu.iq/images/documents/informaticsinstitute/Competitive_exam/Database_Systems.pdf)

**An Introduction Relational Database Theory, Hugh Darwen, EBook**

<http://www.zums.ac.ir/files/research/site/ebooks/it-programming/an-introductionto-relational-database-theory.pdf>

MMSU

**Write programs for the following:**

- 1. Data Definition Language – Create – Alter – Drop – Enforcing Primary Key and Foreign Key Constraints**
- 2. Data Manipulation Language – Insert – Delete – Update – Transaction Control Language – Commit – Rollback – Save Points.**
- 3. Cartesian Product – Equi Join – Left Outer Join – Right Outer Join – Full Outer Join.**
- 4. Set Operations – Creating Views – Creating Sequence – Indexing – Aggregate Functions – Analytic Functions – Nested Queries. (separate programs)**
- 4. Creating Stored Procedures, Functions and Triggers (separate programs)**



<b>CourseCode</b>		<b>Human – Computer Interaction</b>		<b>Credits 3</b>	
<b>LectureHours:(L) Per week 4</b>		<b>TutorialHours: (T)perweek</b>	<b>LabPractice Hours: (P)perweek</b>		<b>Total:(L+T+P) perweek 4</b>
<b>CourseCategory:</b>		<b>Year&amp;Semester:</b>		<b>AdmissionYear:</b>	
<b>Pre-requisite</b>					
<b>LearningObjectives:(forteachers:whatttheyhavetodointheclass/lab/field)</b> <ul style="list-style-type: none"> <li>• To learn the foundations of Human Computer Interaction.</li> <li>• To become familiar with the design technologies for individuals and persons with disabilities.</li> <li>• To be aware of mobile HCI.</li> <li>• To learn the guidelines for user interface</li> </ul>					
<b>Course Outcomes:</b> <b>CO1:Design effective dialog for HCI</b> <b>CO2: Design effective HCI for individuals and persons with disabilities</b> <b>CO3:designing multimedia/ ecommerce/ e-learning Web sites</b> <b>CO4: Assess the importance of user feedback.</b>					
<b>Units</b>	<b>Contents</b>				<b>RequiredHours</b>
<b>I</b>	<b>FOUNDATIONS OF HCI :The Human: I/O channels – Memory - Reasoning and problem solving; The Computer: Devices – Memory – processing and networks;- Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms</b>				<b>1 2</b>
<b>II</b>	<b>DESIGN &amp; SOFTWARE PROCESS: Interactive Design:: Basics – process – scenarios - Navigation: screen design Iteration and prototyping- HCI in software process: - Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design</b>				<b>1 2</b>
<b>III</b>	<b>MODELS AND THEORIES: HCI Models : Cognitive models:- Socio-Organizational issues and stakeholder requirements - Communication and collaboration models-Hypertext, Multimedia</b>				<b>1 2</b>

	and WWW.	
IV	Mobile HCI: Mobile Ecosystem: Platforms, Application frameworks -Types of Mobile Applications: Widgets, Applications, Games Mobile Information Architecture, Mobile 2.0 - Mobile Design: Elements of Mobile Design, Tools.	1 2
V	WEB INTERFACE DESIGN:	1 2
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	
<b>Learning Resources:</b> <ul style="list-style-type: none"> <li>• <b>Recommended Texts</b> <ol style="list-style-type: none"> <li>1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human - Computer Interaction", III Edition, Pearson Education, 2004 (UNIT I, II &amp; III)</li> <li>2. . Brian Fling, –"Mobile Design and Development", I Edition, O'Reilly Media Inc., 2009 (UNIT – IV)</li> <li>3. . Bill Scott and Theresa Neil, –Designing Web Interfaces, First Edition, O'Reilly, 2009. (UNIT-V)</li> </ol> </li> <li>• <b>Reference Books</b> <ol style="list-style-type: none"> <li>1. Shneiderman, "Designing the User Interface: Strategies for Effective Human-Computer Interaction", V Edition, Pearson Education</li> </ol> </li> </ul>		

<b>CourseCode:</b>	<b>Computer Networks</b>		<b>Credits: 3</b>
<b>LectureHours:(L) perweek: 4</b>	<b>TutorialHours: (T)perweek</b>	<b>LabPractice Hours: (P)perweek</b>	<b>Total:(L+T+P) perweek: 4</b>
<b>CourseCategory:</b>	<b>Year&amp;Semester:</b>	<b>AdmissionYear:</b>	
<b>LearningObjectives:</b>			
<ul style="list-style-type: none"> <li>• To understand the concept of Data communication and Computer network</li> <li>• To get a knowledge on routing algorithms.</li> <li>• To impart knowledge about networking and inter networking devices</li> <li>• To gain the knowledge on Security over Network communication</li> </ul>			
<b>CourseOutcomes:(forstudents:Toknowwhattheyaregoingtolearn)</b>			
<b>CO1:To Understand the basics of Network architecture, OSI &amp; TCP/IP reference models</b>			
<b>CO2:To gain knowledge on Telephone systems and Satellite communications</b>			
<b>CO3:To impart the concept of Elementary data link protocols</b>			
<b>CO4: To analyze the characteristics of Routing and Congestion control algorithms</b>			
<b>CO5: To understand network security &amp; defines protocols such as FTP, HTTP, Telnet, DNS</b>			
<b>Units</b>	<b>Contents</b>		<b>RequiredHours</b>
<b>I</b>	<b>Introduction - DATA COMMUNICATIONS - NETWORKS - PROTOCOLS AND STANDARDS - Network Models - THE OSI MODEL - TCP/IP PROTOCOL SUITE</b>		<b>1</b> <b>2</b>
<b>II</b>	<b>Bandwidth Utilization: Multiplexing and Spreading - MULTIPLEXING - SPREAD SPECTRUM</b> <b>Transmission Media - GUIDED MEDIA - UNGUIDED MEDIA: WIRELESS</b> <b>Svitching - CIRCUIT-SWITCHED NETWORKS - DATAGRAM NETWORKS - VIRTUAL-CIRCUIT NETWORKS</b>		<b>1</b> <b>2</b>
<b>III</b>	<b>Data Link Layer: Error Detection and Correction - Types of Errors -BLOCK CODING - CYCLIC CODES - CHECKSUM</b>		<b>1</b> <b>2</b>
<b>IV</b>	<b>Network Layer: Internet Protocol - IPv4 - IPv6 - Delivery, Forwarding, and Routing</b> <b>Transport Layer - PROCESS-TO-PROCESS DELIVERY - USER DATAGRAM PROTOCOL (UDP) - TCP - SCTP - Congestion Control and Quality</b>		<b>1</b> <b>2</b>

	<b>of Service</b>	
<b>V</b>	<b>Application Layer: DO/main Name System - DOMAIN NAME SPACE - Remote Logging, Electronic Mail, and File Transfer - HTTP - SIMPLE NETWORK MANAGEMENT PROTOCOL (SNMP)</b>	<b>1 2</b>
<b>Extended Professional Component (is a part of Internal component only,</b>	<b>Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC-CSIR/GATE/TNPSC/other to be solved (To be discussed during the Tutorial hour)  Not to be included in the External Examination question paper</b>	
<b>Skills acquired</b>	<b>Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferable Skill</b>	
<b>Learning Resources:</b> <ul style="list-style-type: none"> <li>• <b>Recommended Texts</b></li> <li>• <b>B. A. Forouzan, “Data Communications and Networking”, Tata McGraw Hill, 4th Edition, 2017.</b></li> <li>• <b>Reference Books</b></li> <li>1. <b>A. S. Tanenbaum, “Computer Networks”, 4th Edition, Prentice-Hall of India, 2008.</b></li> <li>2. <b>F. Halsall, “Data Communications, Computer Networks and Open Systems”, Pearson Education, 2008.</b></li> <li>3. <b>D. Bertsekas and R. Gallager, “Data Networks”, 2nd Edition, PHI, 2008.</b></li> <li>4. <b>Lamarca, “Communication Networks”, Tata McGraw- Hill, 2002</b></li> </ul>		

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	<b>Office Automation Laboratory</b>	<b>SEC</b>		<b>Y</b>	<b>2</b>	<b>I</b>	<b>2</b>	<b>2</b>	<b>50</b>	<b>50</b>	<b>100</b>
<b>Course Objective</b>											
<b>C1</b>	<b>Understand the basics of computer systems and its components.</b>										
<b>C2</b>	<b>Understand and apply the basic concepts of a word processing package.</b>										
<b>C3</b>	<b>Understand and apply the basic concepts of electronic spreadsheet software.</b>										
<b>C4</b>	<b>Understand and apply the basic concepts of database management system.</b>										
<b>C5</b>	<b>Understand and create a presentation using PowerPoint tool.</b>										
<b>Exercises</b>											
<p><b>MS – Word</b></p> <ol style="list-style-type: none"> <li>1. Prepare a word document for spell checking and Thesaurus.</li> <li>2. Apply Cut, Copy and Paste operations in a document.</li> <li>3. Find a word and Replace with another in a document.</li> <li>4. Insert Header with College Name, Footer with Page No., and Footnote in a document.</li> <li>5. Insert mathematical symbols using Microsoft equation 3.0.</li> <li>6. Preparing Newspaper format (Apply Alignment, Font, Property, Line spacing, Picture Format).</li> <li>7. Prepare a Bio-Data and insert the contents of qualification within the table.</li> <li>8. Mail Merge</li> </ol> <p><b>MS – Excel</b></p> <ol style="list-style-type: none"> <li>1. Apply formulas and functions</li> <li>2. Prepare a chart for population growth.</li> <li>3. Apply ascending and descending order</li> </ol> <p><b>MS – PowerPoint</b></p> <ol style="list-style-type: none"> <li>1. Create a power point presentation with 3 slides.</li> <li>2. Create a design template with 3 slides.</li> <li>3. Create a presentation with animation.</li> <li>4. Create a power point presentation with 4 slides. Set slide transition time of 3 seconds and Display your presentation.</li> <li>5. Create a presentation with auto content wizard.</li> </ol> <p><b>MS – Access</b></p> <ol style="list-style-type: none"> <li>1. Create an employee database.</li> <li>2. Create a student database. Set primary key.</li> <li>3. Prepare salary list.</li> <li>4. Create a report.</li> </ol>											
<b>Web Resources</b>											
<b>1.</b>	<a href="https://www.udemy.com/course/office-automation-certificate-course/">https://www.udemy.com/course/office-automation-certificate-course/</a>										

2.

<https://www.javatpoint.com/automation-tools>

**Mapping with Programme Outcomes:**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	M	S	M			M		L
CO 2	S	M	S			M		
CO 3		S	S		M		L	
CO 4			S	L	M		M	
CO 5				M		S	M	S

**S-Strong M-Medium L-Low**

## SEMESTER V

<b>Course Code:</b>	<b>Software Engineering</b>		<b>Credits: 4</b>
<b>Lecture Hours:(L) Per week: 4</b>	<b>TutorialHours: (T)perweek</b>	<b>LabPractice Hours: (P)perweek</b>	<b>Total:(L+T +P) perweek: 5</b>
<b>CourseCategory:CC9</b>	<b>Year &amp; Semester: III Year V Semester</b>	<b>AdmissionYear:</b>	
<b>Pre-requisite</b>	<b>Basic Knowledge on Software Applications</b>		
<b>LearningObjectives:(forteachers:whatttheyhavetodointheclass/lab/field)</b>			
<ul style="list-style-type: none"> <li>• <b>To understand the software engineering concepts and to create a system model in real life applications</b></li> </ul>			
<b>CourseOutcomes:(forstudents:Toknowwhatttheyaregoingtolearn)</b>			
<b>CO1:Gain basic knowledge of analysis and design of systems</b>			
<b>CO2: Ability to apply software engineering principles and techniques</b>			
<b>CO3:Model a reliable and cost-effective software system</b>			
<b>CO4: Ability to design an effective model of the system</b>			
<b>CO5: Perform Testing at various levels and produce an efficient system.</b>			
<b>Units</b>	<b>Contents</b>		<b>RequiredH ours</b>
<b>I</b>	<b>Introduction: The software engineering discipline, programs vs. software products, emergence of software engineering, Notable changes in software development practices, computer systems engineering.</b>  <b>Software Life Cycle Models: Classical waterfall model, iterative waterfall model, prototyping model, evolutionary model, spiral model, comparison of different life cycle models.</b>		<b>12</b>
<b>II</b>	<b>Requirements Analysis and Specification: Requirements gathering and analysis, Software requirements specification (SRS)</b>  <b>Software Design: Functional independence - cohesion and coupling, software design approaches, object-</b>		<b>1 2</b>

	oriented vs function-oriented design	
III	<p><b>Function-Oriented Software Design: Overview of SA/SD methodology, structured analysis, data flow diagrams (DFD's), structured design, detailed design.</b></p> <p><b>User-Interface design: Good interface; basic concepts; types of user interfaces; component based GUI development, a user interface methodology.</b></p>	1 2
IV	<p><b>Coding and Testing: Coding; code review; testing; testing in the large vs testing in the small; unit testing; black-box testing; white-box testing; debugging; program analysis tools; integration testing; system testing; some general issues associated with testing.</b></p>	1 2
V	<p><b>Software Maintenance: Characteristic of software maintenance; software reverse engineering; software maintenance process models; estimation of maintenance cost;</b></p> <p><b>Computer Aided Software Engineering: CASE and its scope; CASE environment; CASE support in software life cycle; other characteristics of CASE tools; towards second generation CASE tool; architecture of a CASE environment.</b></p>	1 2
<ul style="list-style-type: none"> <li>• <b>Recommended Texts</b> <ol style="list-style-type: none"> <li>1. <b>Rajib Mall, Fundamentals of Software Engineering, Fifth Edition, Prentice-Hall of India, 2018</b></li> </ol> </li> <li>• <b>Reference Books</b> <ol style="list-style-type: none"> <li>1. <b>Richard Fairley, Software Engineering Concepts, Tata McGraw-Hill publishing company Ltd, Edition 1997.</b></li> <li>2. <b>Roger S. Pressman, Software Engineering, Seventh Edition, McGraw-Hill.</b></li> </ol> <p style="margin-left: 40px;"><b>James A. Senn, Analysis &amp; Design of Information Systems, Second Edition, McGraw-Hill International Editions.</b></p> </li> </ul> <p><b>Webresources: Web resources from NDL Library, E-content from open-source libraries</b></p>		



**Objectives:**

- **To introduce the basic concepts and techniques of Machine Learning.**
- **To have an understanding of the Supervised and Unsupervised learning techniques**
- **To study the various probability based learning techniques**
- **To understand graphical models of machine learning algorithms**

**Unit I :**

**Introduction and Foundations Introduction to AI, Introduction to Machine Learning, Python –Data Visualization Matplotlib with Hands on-Pandas and Data frame(12L)**

**Unit II:**

**Linear Regression Supervised Learning -Classification problem -Linear Regression and Logistic Regression -Gradient Descent Optimization -Concepts, Training Data – Test Data -Algorithm and Implementation(12L)**

**Unit III:**

**SVM and k-NN Support Vector Machines -Concepts, Training Data –Test Data–Data Normalization Algorithm and Implementation-K-Nearest Neighbours -Concepts, Algorithm and Implementation(12L)**

**Unit IV:**

**Decision Trees and Naïve Bayes Algorithm Decision Trees –Concepts, Algorithm and Implementation-Naïve –Bayes Algorithms –Concepts, Algorithm and Implementation**

**Unit V:**

**Clustering: K-means Clustering –Concepts, Algorithm and Implementation-Machine Learning and Data Science –Ethical and moral issues and Challenges**

**Reference Books:**

- 1. Building Machine Learning Systems with Python, Willi Richert, Luis Pedro Coelho, PACKT Publishing, 2013**
- 2. Artificial Intelligence –A Modern Approach, Third Edition, Stuart J Russel, Peter Norvig**
- 3. Getting Started with TensorFlow, Gianclro Zaccane, PACKT Publishing, 2016.**
- 4 .Machine Learning –An Algorithmic Perspective, .Stephen Marsland, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.**
- 5. Machine Learning, Tom M Mitchell, First Edition, McGraw Hill Education, 2013.**

<b>Course Code</b>		<b>Simulation and Modeling</b>		<b>Credits 4</b>
<b>Lecture Hours:(L) perweek 4</b>		<b>TutorialHours: (T)perweek</b>	<b>LabPractice Hours: (P)perweek</b>	<b>Total:(L+T+P) perweek</b>
<b>CourseCategory:</b>		<b>Year&amp;Semester:</b>		<b>AdmissionYear:</b>
<b>CourseOutcomes:(forstudents:Toknowwhattheyaregoingtolearn)</b> <b>CO1:Introduction To Modeling &amp; Simulation, Input Data Analysis and Modeling.</b> <b>CO2: Random Variate and Number Generation. Analysis of Simulations and methods.</b> <b>CO3:Comparing Systems via Simulation</b> <b>CO4: Entity Body Modeling, Visualization, Animation.</b> <b>CO5: Algorithms and Sensor Modeling.</b>				
<b>Units</b>	<b>Contents</b>			<b>RequiredHours</b>
I	<b>Introduction To Modeling &amp; Simulation –</b> <b>What is Modeling and Simulation? – Complexity</b> <b>Types – Model Types – Simulation Types – M&amp;S</b> <b>Terms and Definitions Input Data Analysis –</b> <b>Simulation Input Modeling – Input Data Collection</b> <b>- Data Collection Problems - - Input Modeling</b> <b>Strategy - Histograms -Probability Distributions -</b> <b>Selecting a Probability Distribution.</b>			1 2
II	<b>Random Variate Generation – Random</b> <b>Numbers – Random Number Generators – General</b> <b>principles – Inverse Transform Method –</b> <b>Acceptance Rejection Method –Composition</b> <b>Method –Relocate and Rescale Method - Specific</b> <b>distributions-Output Data Analysis – Introduction -</b> <b>Types of Simulation With Respect to Output</b> <b>Analysis - Stochastic Process and Sample Path -</b> <b>Sampling and Systematic Errors - Mean, Standard</b> <b>Deviation and Confidence Interval - Analysis of</b> <b>Finite-Horizon Simulations - Single Run -</b> <b>Independent Replications - Sequential Estimation –</b> <b>Analysis of Steady-State Simulations - Removal of</b> <b>Initialization Bias (Warm-up Interval) - Replication-</b>			1 2

	<b>Deletion Approach - Batch-Means Method .</b>	
<b>III</b>	<b>Comparing Systems via Simulation – Introduction – Comparison Problems - Comparing Two Systems - Screening Problems - Selecting the Best - Comparison with a Standard - Comparison with a Fixed Performance Discrete Event Simulations – Introduction - Next-Event Time Advance - Arithmetic and Logical Relationships - Discrete-Event Modeling Approaches – Event-Scheduling Approach – Process Interaction Approach</b>	<b>1 2</b>
<b>IV</b>	<b>Entity Modeling – Entity Body Modeling – Entity Body Visualization – Entity Body Animation – Entity Interaction Modeling – Building Modeling Distributed Simulation – High Level Architecture (HLA) – Federation Development and Execution Process (FEDEP) – SISO RPR FOM Behavior Modeling – General AI Algorithms - Decision Trees - Neural Networks - Finite State Machines - Logic Programming - Production Systems – Path Planning - Off-Line Path Planning - Incremental Path Planning - Real-Time Path Planning – Script Programming -Script Parsing - Script Execution.</b>	<b>1 2</b>
<b>V</b>	<b>Optimization Algorithms – Genetic Algorithms – Simulated Annealing Examples: Sensor Systems Modeling – Human Eye Modeling – Optical Sensor Modeling – Radar Modeling.</b>	<b>1 2</b>
<b>Skills acquired from the Course</b>	<b>Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</b>	

**LearningResources:**

- **RecommendedTexts**

1. **Jerry Banks, “Handbook of Simulation: Principles, Methodology, Advances, Applications, and Practice”, John Wiley & Sons, Inc., 1998.**

2. **George S. Fishman, “Discrete-Event Simulation: Modeling, Programming and Analysis”, Springer-Verlag New York, Inc., 2001.**

- **ReferenceBooks**

1. **Andrew F. Seila, Vlatko Ceric, Pandu Tadikamalla, “Applied Simulation Modeling”, Thomson Learning Inc., 2003.**

MMSU

Subject Code	Subject Name	Category	L	T	P	S	Instruction Hours	Credits	Marks		
									CIA	External	Total
	<b>MACHINE LEARNING LABORATORY</b>		-	-	4	-		3	50	50	100
<b>Learning Objectives: To apply the concepts of Machine Learning to solve real-world problems and to implement basic algorithms in clustering &amp; classification applied to text &amp; numeric data</b>											
<b>LAB EXERCISES</b>											
<b>1. Solving Regression &amp; Classification using Decision Trees            2. Bayesian Inference in Gene Expression Analysis            3. Pattern Recognition Application using Bayesian Inference            4. Bagging, Boosting applications using Regression Trees            5. Data &amp; Text Classification using Neural Networks            6. Using Weka tool for SVM classification for chosen domain application            7. Data &amp; Text Clustering using K-means algorithm</b>											
<b>Course Outcomes</b>											
<b>CO</b>	<b>On completion of this course, students will</b>										
<b>CO1</b>	<b>Effectively use the various machine learning tools</b>										
<b>CO2</b>	<b>Understand and implement the procedures for machine learning algorithms</b>										
<b>CO3</b>	<b>Design Python programs for various machine learning algorithms</b>										
<b>CO4</b>	<b>Apply appropriate datasets to the Machine Learning algorithms</b>										
<b>CO5</b>	<b>Analyze the graphical outcomes of learning algorithms with specific datasets</b>										

<b>CourseCode</b>	<b>Mini Project</b>		<b>Credits:4</b>
<b>LectureHours:(L) perweek</b>	<b>TutorialHours: (T)perweek</b>	<b>LabPractice Hours: 4</b>	<b>Total:(L+T+P) perweek:4</b>
<b>CourseCategory:</b>	<b>Year&amp;Semester:</b>	<b>AdmissionYear:</b>	
<b>Units</b>	<b>Contents</b>		<b>RequiredHours</b>
	<p><b>Students(Individual or maximum three in a group) will take a specific problem for the Mini Project and solve it using any one of latest tool and submit a report. Further each student will participate in regular project review with project guide / Faculty.</b></p>		
<b>Extended Professional Component (isapartof Internal component only,</b>	<p><b>Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminationsUPSC/TRB/NET/UGC-CSIR/GATE/TNPSC/otherstobesolved(TobediscussedduringtheTutorialhour)</b></p> <p><b>Notto be included inthe ExternalExaminationquestion paper</b></p>		
<b>Skillsacquired</b>	<p><b>Knowledge,ProblemSolving,Analyticalability,ProfessionalCompetency,ProfessionalCommunication andTransferrable Skill</b></p>		

## ANDROID APPLICATIONS DEVELOPMENT PRACTICAL

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
	0	0	4	IV	2	4	50	50	100
<b>Learning Objectives</b>									
<b>LO1</b>	<b>Toget the knowledge to write the programs using Android Programming</b>								
<b>LO2</b>	<b>To understand mobile applications</b>								
<b>LO3</b>	<b>To understand the basic concepts of android studio</b>								
<b>LO4</b>	<b>To understand the application development methods</b>								
<b>LO5</b>	<b>To understand the deployment methods</b>								
<b>Contents</b>									
<ol style="list-style-type: none"> <li>1. <b>Layout with Flexbox</b></li> <li>2. <b>Breaking down a UI into Components</b></li> <li>3. <b>Dealing with the Keyboard</b></li> <li>4. <b>Listing Data with the FlatList</b></li> <li>5. <b>Persistent Storage</b></li> <li>6. <b>Dealing with Remote Images on Slow Networks</b></li> <li>7. <b>Playing with Animations</b></li> <li>8. <b>Complex Navigation Structure</b></li> <li>9. <b>Build a Swiper Component</b></li> <li>10. <b>Making a Declarative API for an Imperative API</b></li> </ol>									
<b>CO</b>	<b>Course Outcomes</b>								
<b>CO1</b>	<b>Apply the basic elements</b>								
<b>CO2</b>	<b>Implementing the components</b>								
<b>CO3</b>	<b>Using the Persistent storage</b>								
<b>CO4</b>	<b>Playing with Animations</b>								
<b>CO5</b>	<b>Displaying Remote Images and Building App with API</b>								

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
<b>CO1</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>
<b>CO2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>
<b>CO3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>
<b>CO4</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>
<b>CO5</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>2</b>
<b>Weightage Of course contributed to each PSO</b>	<b>15</b>	<b>14</b>	<b>14</b>	<b>14</b>	<b>11</b>	<b>11</b>

<b>CourseCode: EC2</b>	<b>Graph Theory and its applications</b>		<b>Credits: 3</b>
<b>LectureHours:(L) perweek: 4</b>	<b>TutorialHours: (T)perweek</b>	<b>LabPractice Hours: (P)perweek</b>	<b>Total:(L+T+P) perweek: 5</b>
<b>CourseCategory: EC2</b>	<b>Year&amp;Semester: I Year &amp; I Semester</b>	<b>AdmissionYear:</b>	
<b>Pre-requisite</b>	<b>Basic knowledge in data and representations</b>		
<b>Linksto otherCourses</b>			
<b>LearningObjectives:(forteachers:whattheyhavetodointheclass/lab/field)</b> <ol style="list-style-type: none"> <li>1. Definition of Graph, sub graph their representations, degree and algebraic operations.</li> <li>2. Connected graphs, weighted graphs and shortest paths</li> <li>3. Trees: Characterizations, spanning tree, minimum spanning trees</li> <li>4. Eulerian and Hamiltonian graphs: Characterization, Necessary and sufficient conditions</li> <li>5. Special classes of graphs: Bipartite graphs, line graphs, chordal graphs.</li> </ol>			
<b>CourseOutcomes:(forstudents:Toknowwhattheyaregoingtolearn)</b> <p><b>CO1: To Introduce the fundamental concepts in graph theory Graphs, subgraphs, walks,Eulergraphs, Hamiltonian Paths Tree Properties, Hamiltonian paths and circuits</b></p> <p><b>CO2: Understanding the concepts of Circuits, Cut set and its Properties, Network Flows, Isomorphism and Combinatorial and Planar Graphs.</b></p> <p><b>CO3: Applying the concept of Colouring with Chromatic Number, Directed Graphs, Matching , Covering Pattern and Euler Graphs</b></p> <p><b>CO4: Analysing the Various Concepts of Representation of Graphs, Euler Paths Circuit, Kruskals and Prims Algorithms, Connected Components.</b></p> <p><b>CO5: Implementation of an application using All Types of Graphs and evaluate the Applications with travelling sales person Problem, K colour Problem with n vertices in a Graph and Shortest Path finding Problem using Directed and Undirected Graphs.</b></p>			
<b>Units</b>	<b>Contents</b>		<b>RequiredHours</b>
<b>I</b>	<b>INTRODUCTION: Graph-mathematical definition-</b>		<b>1</b>



	Introduction – sub graphs –Walks, paths, Circuits connectedness- Components- Euler Graphs-Hamiltonian paths and circuits-Trees- properties of Trees- Distance and centers in Tree- Rooted and Binary Trees	2
II	CONNECTIVITY AND PLANARITY: Introduction to circuits - cut set- properties of cut set- All cut sets –connectivity and separability – Network Flows - 1- Isomorphism - 2-Isomorphism- Combinatorial and Geometric graphs- Planar Graphs – Different representation of planar graph.	1 2
III	COLORING AND DIRECTED GRAPH: Basics of Colouring & Chromatic number – Chromatic partitioning – Graph Colouring – four colour Problem Chromatic polynomial - Matching – Covering - Directed graphs - Types of Directed Graphs – Diagraphs and binary relations – Directed paths- Euler Graph.	1 2
IV	MATRIX REPRESENTATION IN GRAPH: Matrix representation of graphs, Sub graphs & Quotient Graphs, Transitive Closure digraph, Euler's Path & Circuit (only definitions and examples), spanning Trees of Connected Relations, Prim's Algorithm to construct Spanning Trees, Weighted Graphs, Minimal, Spanning Trees by Prim's Algorithm & Kruskal's Algorithm.	1 2
V	APPLICATIONS OF GRAPH: Traveling Sales Person Problem with Directed and Un directed Graph, - Graph with n vertices and k colours- Shortest path from one to many Cities with directed graph- Shortest Paths with Un directed Graphs-Connected Components.	1 2

**Learning Resources:**

1 Narsingh Deo , “ Graph Theory with Application to Engineering and Computer Science”

Prentice Hall of India 2010(Reprint )

2 Rosen H “Discrete Mathematics and Its Application “ Mc Graw Hill , 2007

**Reference Books:**

1 Discrete Maths for Computer Scientists & Mathematicians by Mott, Kandel, Baker

2 Clark J and Holton DA “ First look at Graph Theory” Allied Publishers 1995

3 Discrete Maths for Computer Scientists & Mathematicians by Mott, Kandel, Baker

**Webresources:** Web resources from NDL Library, E-content from open source libraries

<https://d3gt.com/>

<https://www.coursera.org/courses?query=graph%20theory>

<b>CourseCode</b>	<b>Data Mining</b>		<b>Credits 3</b>
<b>LectureHours:(L) perweek 4</b>	<b>TutorialHours: (T)perweek</b>	<b>LabPractice Hours: (P)perweek</b>	<b>Total:(L+T+P) perweek</b>
<b>CourseCategory:</b>	<b>Year&amp;Semester:</b>	<b>AdmissionYear:</b>	
<b>Pre-requisite</b>			
<b>LearningObjectives:(forteachers:whatttheyhavetodointheclass/lab/field)</b> <ul style="list-style-type: none"> <li>• <b>To provide the knowledge on DataMining and Warehousing concepts and techniques.</b></li> <li>• <b>To study the basic concepts of cluster analysis</b></li> <li>• <b>To study a set of typical clustering methodologies, algorithms, and applications</b></li> </ul>			
<b>CourseOutcomes:</b> <b>CO1:To understand the basic concepts and the functionality of the various data mining and data warehousing component</b> <b>CO2: To know the concepts of Data mining system architectures</b> <b>CO3:To analyse the principles of association rules</b> <b>CO4: To get analytical idea on Classification and prediction methods.</b> <b>CO5: To Gain knowledge on Cluster analysis and its methods.</b>			
<b>Recap:(notforexamination)Motivation/previouslecture/relevantportionsrequired forthe course)[Thisisdoneduring2Tutorialhours)</b>			
<b>Units</b>	<b>Contents</b>	<b>RequiredHours</b>	
I	<b>Introduction: Data mining – Functionalities – Classification – Introduction to Data Warehousing – Data Preprocessing: Preprocessing the Data – Data cleaning – Data Integration and Transformation – Data Reduction</b>	17	
II	<b>Data Mining, Primitives, Languages and System Architecture: Data Mining – Primitives – Data Mining Query Language, Architecture of Data mining Systems. Concept Description, Characterization and Comparison: Concept</b>	17	

	<b>Description, Data Generalization and Summarization, Analytical Characterization, Mining Class Comparison – Statistical Measures</b>	
<b>III</b>	<b>Mining Association Rules: Basic Concepts – Single Dimensional Boolean Association Rules From Transaction Databases, Multilevel Association Rules from transaction databases – Multi dimension Association Rules from Relational Database and Data Warehouses</b>	<b>1 7</b>
<b>IV</b>	<b>Classification and Prediction: Introduction – Issues – Decision Tree Induction – Bayesian Classification – Classification of Back Propagation. Classification based on Concepts from Association Rule Mining – Other Methods. Prediction – Introduction – Classifier Accuracy.</b>	<b>1 7</b>
<b>V</b>	<b>Cluster Analysis: Introduction – Types of Data in Cluster Analysis, Partitioning Methods – Hierarchical Methods-Density Based Methods – GRID Based Method – Model based Clustering Method</b>	<b>1 7</b>
<b>Skills acquired from the Course</b>	<b>Knowledge, Problem Solving, Analytical Ability, Professional Competency, Professional Communication and Transferrable Skill</b>	
<b>Learning Resources:</b> <ul style="list-style-type: none"> <li>• <b>Recommended Texts</b> <ol style="list-style-type: none"> <li>1. Han and M. Kamber, “Data Mining Concepts and Techniques”, 2001, Harcourt India Pvt. Ltd, New Delhi.</li> </ol> </li> <li>• <b>Reference Books</b> <ol style="list-style-type: none"> <li>1. K.P. Soman, Shyam Diwakar, V. Ajay “Insight into Data Mining Theory and Practice “, Prentice Hall of India Pvt. Ltd, New Delhi</li> <li>2. Parteek Bhatia, ‘Data Mining and Data Warehousing: Principles and Practical Techniques’, Cambridge University Press, 2019</li> </ol> </li> </ul>		

<b>CourseCode</b>	<b>E-Commerce</b>		<b>Credits 3</b>
<b>Lecture Hours:(L) Per week 4</b>	<b>TutorialHours: (T)perweek</b>	<b>LabPractice Hours: (P)perweek</b>	<b>Total:(L+T+P) perweek</b>
<b>CourseCategory:</b>	<b>Year&amp;Semester:</b>	<b>AdmissionYear:</b>	
<b>Pre-requisite</b>			
<b>LearningObjectives:(forteachers:whatttheyhavetodointheclass/lab/field)</b> <ul style="list-style-type: none"> <li>To provide knowledge on Ecommerce technology, Business Models and M-Commerce.</li> <li>To explore the major issues associated with e-commerce-security, privacy, authentication, encryption and e-Payment</li> </ul>			
<b>Course Outcomes</b> <b>CO1:Understanding the basic electronic business management</b> <b>CO2: Analyze the technologies and marketing trends in Ecommerce</b> <b>CO3:Knowledge gain in E security, Legal and Ethical issues</b> <b>CO4: A clear evaluation of the e payment systems</b> <b>CO5: Improve the expertise in mobile commerce and apply knowledge in development of E- Business portals</b>			
<b>Recap:(notforexamination)Motivation/previouslecture/relevantportionsrequired forthe course)[Thisisdoneduring2Tutorialhours)</b>			
<b>Units</b>	<b>Contents</b>	<b>RequiredHours</b>	
<b>I</b>	<b>E-commerce and Indian Business Context: E-Commerce –Emergence of the Internet – Emergence of the WWW – Advantages of E-Commerce – Transition to E-Commerce in India – The Internet and India – E-transition - Challenges for Indian Corporate.</b>  <b>Business Models for E-commerce: Business Model – E-business Models Based on the Relationship of Transaction Parties -E-business Models Based on the Relationship of Transaction Types.</b>	<b>1 2</b>	
<b>II</b>	<b>Enabling Technologies of the World Wide Web: World Wide Web – Internet Client-Server Applications–Networks and Internets–Software Agents–Internet Standards and Specifications – ISP.</b>	<b>1 2</b>	

	<b>e-Marketing: Traditional Marketing-Identifying Web Presence Goals- Online Marketing -E-advertising-E-branding.</b>	
<b>III</b>	<b>E-Security: Information system Security-Security on the Internet -E-business Risk Management Issues - Information Security Environment in India. Legal and Ethical Issues :Cybers talking - Privacy is at Risk in the Internet Age- Phishing - Application Fraud -Skimming-Copyright-Internet Gambling-ThreatstoChildren.</b>	<b>1 2</b>
<b>IV</b>	<b>e-Payment Systems: Main Concerns in Internet Banking - Digital Payment Requirements -Digital Token-based e-payment Systems - Classification of New Payment Systems - Propertiesof Electronic Cash - Cheque Payment Systems on the Internet - Risk and e-Payment Systems - Designing e-payment Systems - Digital Signature - Online Financial Services in India - OnlineStockTrading.</b>	<b>1 2</b>
<b>V</b>	<b>Information systems for Mobile Commerce: Mobile Commerce-Wireless Applications -Cellular Network - Wireless Spectrum - Technologies for Mobile Commerce -Wireless Technologies -Different Generations in Wireless Communication - Security Issues Pertaining to CellularTechnology.</b>	<b>1 2</b>
<b>Skills acquired from the Course</b>	<b>Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</b>	
<b>Learning Resources:</b>		
<ul style="list-style-type: none"> <li>• <b>Recommended Texts</b> <ol style="list-style-type: none"> <li>1. P.T. Joseph, S.J., "E-Commerce-An Indian Perspective", PHI 2012, 4<sup>th</sup> Edition</li> </ol> </li> <li>• <b>Reference Books</b> <ol style="list-style-type: none"> <li>1. David Whiteley, "E-Commerce Strategy, Technologies and Applications", Tata McGraw Hill, 2001.</li> <li>2. Ravi Kalakota, Andrew B Whinston, "Frontiers of Electronic Commerce</li> </ol> </li> </ul>		

MMSU

**”, Pearson 2006, 12<sup>th</sup> Impression.**

Semester VI

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst.	Marks		
									CIA	External	Total
	<b>Data Analytics using R</b>	<b>Core</b>	<b>4</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>4</b>	<b>5</b>	<b>25</b>	<b>75</b>	<b>100</b>
<b>Course Objective</b>											
<b>C1</b>	<b>To understand the problem solving approaches</b>										
<b>C2</b>	<b>To learn the basic programming constructs in R Programming</b>										
<b>C3</b>	<b>To learn the basic programming constructs in R Programming</b>										
<b>C4</b>	<b>To use R Programming data structures - lists, tuples, and dictionaries.</b>										
<b>C5</b>	<b>To do input/output with files in R Programming.</b>										
<b>UNIT</b>	<b>Contents</b>						<b>No. of Hours</b>				
<b>I</b>	<b>INTRODUCTION – R Studio, R data types and objects, reading and writing data, sub setting R Objects, Essentials of the R Language, Installing R, Running R, Packages in R, Calculations, Complex numbers in R, Rounding, Arithmetic, Modulo and integer quotients, Variable names and assignment, Operators, Integers, Factors, Logical operations</b>						<b>15</b>				
<b>II</b>	<b>CONTROL STRUCTURES AND VECTORS - Control structures, functions, scoping rules, dates and times, Introduction to Functions, preview of Some Important R Data Structures, Vectors, Character Strings, Matrices, Lists, Data Frames, Classes Vectors: Generating sequences, Vectors and subscripts, Extracting elements of a vector</b>						<b>15</b>				

	using subscripts, Working with logical subscripts, Scalars, Vectors, Arrays, and Matrices, Adding and Deleting Vector Elements, Obtaining the Length of a Vector, Matrices and Arrays as Vectors Vector Arithmetic and Logical Operations, Vector Indexing, Common Vector Operations	
III	LISTS- Lists: Creating Lists, General List Operations, List Indexing Adding and Deleting List Elements, Getting the Size of a List, Extended Example: Text Concordance Accessing List Components and Values Applying Functions to Lists, Data Frames, Creating Data Frames, Accessing Data Frames, Other Matrix-Like Operations	15
IV	FACTORS AND TABLES - Factors and Levels, Common Functions Used with Factors, Working with Tables, Matrix/Array-Like Operations on Tables , Extracting a Sub table, Finding the Largest Cells in a Table, Math Functions, Calculating a Probability, Cumulative Sums and Products, Minima and Maxima, Calculus, Functions for Statistical Distributions R PROGRAMMING .	15
V	OBJECT-ORIENTED PROGRAMMING S Classes, S Generic Functions, Writing S Classes, Using Inheritance, S Classes, Writing S Classes, Implementing a Generic Function on an S Class, visualization, Simulation, code profiling, Statistical Analysis with R, data manipulation	15
	<b>Total</b>	<b>75</b>
	<b>Course Outcomes</b>	<b>Programme Outcomes</b>
<b>CO</b>	<b>On completion of this course, students will</b>	



1	Work with big data tools and its analysis techniques.	PO1
2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO3
3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO2, PO6
4	Perform analytics on data streams.	PO4, PO5, PO6
5	Learn NoSQL databases and management.	PO5, PO6
<b>Text Book</b>		
1	Roger D. Peng," R Programming for Data Science ", 2012	
2	Norman Matloff, "The Art of R Programming- A Tour of Statistical Software Design", 2011	
<b>Reference Books</b>		
1.	Garrett Golemund, Hadley Wickham,"Hands-On Programming with R: Write Your Own Functions and Simulations" , 1st Edition, 2014	
2.	Venables ,W.N.,andRipley,"S programming", Springer, 2000.	
<b>Web Resources</b>		
1.	<a href="https://www.simplilearn.com">https://www.simplilearn.com</a>	

#### Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	3	3
CO2	3	3	2	3	2	2
CO3	3	2	3	3	3	2
CO4	3	2	3	2	3	3
CO5	2	3	3	3	3	3
<b>Weightage of course contributed to each PSO</b>	14	13	14	14	14	13

S-Strong-3 M-Medium-2 L-Low-1

**Unit I: Basics of artificial neural networks (ANN): Artificial neurons, Computational models of neurons, Structure of neural networks, Functional units of ANN for pattern recognition tasks -Feed forward neural networks: Pattern classification using perceptron, Multilayer Feed forward neural networks (MLFFNNs), Backpropagation learning, Empirical risk minimization, Regularization, Autoencoders**

**Unit II: Deep neural networks (DNNs): Difficulty of training DNNs, Greedy layer wise training, Optimization for training DNNs, Newer optimization methods for neural networks (AdaGrad, RMSProp, Adam), Second order methods for training, Regularization methods (dropout, drop connect, batch normalization)**

**Unit III: Convolution neural networks (CNNs): Introduction to CNNs – convolution, pooling, Deep CNNs, Different deep CNN architectures – LeNet, AlexNet, VGG, PlacesNet, training a CNNs: weights initialization, batch normalization, hyperparameter optimization, Understanding and visualizing CNNs.**

**Unit IV: Recurrent neural networks (RNNs): Sequence modeling using RNNs, Backpropagation through time, Long Short Term Memory (LSTM), Bidirectional LSTMs,**

**Bidirectional RNNs, Gated RNN Architecture - Generative models: Restricted Boltzmann Machines (RBMs), Stacking RBMs, Belief nets.**

**Unit V: Learning sigmoid belief nets, Deep belief nets Under complete - Auto encoder, Regularized Auto encoder, stochastic Encoders and Decoders, Contractive Encoders.**

**Applications: Applications in vision, speech and natural language processing**

**Recommended Texts:**

1. S. Haykin, **Neural Networks and Learning Machines** , Prentice Hall of India, 2016
2. Ian Goodfellow, Yoshua Bengio and Aaron Courville, “ **Deep Learning**”, MIT Press, 2017

**Reference Books:**

1. Satish Kumar, **Neural Networks - A Classroom**
2. B. Yegnanarayana, **Artificial Neural Networks**, Prentice- Hall of India, 1999
3. Giancarlo Zaccane, Md. RezaulKarim, Ahmed Menshawy "Deep Learning with TensorFlow: Explore neural networks with Python", Packt Publisher, 2017.
4. Antonio Gulli, Sujit Pal "Deep Learning with Keras", Packt Publishers, 2017.
5. Francois Chollet "Deep Learning with Python", Manning Publications, 2017.

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst.	Marks
--------------	--------------	----------	---	---	---	---	---------	-------	-------

MMSU

[https://www.youtube.com/watch?v=aPfkYu\\_qiF4&list=PLEAYkSg4uSQ1r2XrJ\\_GBzzS6I-f8yfRU](https://www.youtube.com/watch?v=aPfkYu_qiF4&list=PLEAYkSg4uSQ1r2XrJ_GBzzS6I-f8yfRU)

	<b>Data Analytics using R Laboratory</b>	<b>Core</b>	-	-	4	-	4	4	50	<b>CIA</b>	<b>External</b>	<b>Total</b>
	<b>Course Objective</b>											
<b>C1</b>	<b>To understand problem solving approaches</b>											
<b>C2</b>	<b>To learn the basic programming constructs in R Programming</b>											
<b>C3</b>	<b>To practice various computing strategies for R Programming -based solutions to real world problems</b>											
<b>C4</b>	<b>To use R Programming data structures - lists, tuples, and dictionaries.</b>											
<b>C5</b>	<b>To do input/output with files in R Programming.</b>											
<b>Sl. No</b>	<b>Contents</b>											
<b>1.</b>	<b>convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.</b>										<b>60</b>	
<b>2.</b>	<b>find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.</b>											
<b>3.</b>	<b>Write a program to find list of even numbers from 1 to n using R-Loops.</b>											
<b>4.</b>	<b>Create a function to print squares of numbers in sequence.</b>											
<b>5.</b>	<b>join columns and rows in a data frame using cbind() and rbind()</b>											
<b>6.</b>	<b>Implement different String Manipulation functions</b>											
<b>7.</b>	<b>Implement different data structures (Vectors, Lists, Data Frames)</b>											
<b>8</b>	<b>Write a program to read a csv file and analyze the data in the file</b>											
<b>9</b>	<b>Create pie chart and bar chart for a data set</b>											
<b>10</b>	<b>Create a data set and do statistical analysis on the data</b>											
<b>11</b>	<b>Program to find factorial of the given number using recursive function</b>											
<b>12</b>	<b>count the number of even and odd numbers from array of N numbers.</b>											
	<b>Total</b>										<b>60</b>	

<b>Course Outcomes</b>		<b>Programme Outcome</b>
<b>CO</b>	<b>On completion of this course, students will</b>	
<b>1</b>	<b>Acquire programming skills in core R Programming</b>	<b>PO1,PO4,PO5</b>
<b>2</b>	<b>Acquire Object-oriented programming skills in R Programming.</b>	<b>PO1, PO4,PO6</b>
<b>3</b>	<b>Develop the skill of designing graphical-user interfaces (GUI) in R Programming</b>	<b>PO1,PO3,PO6</b>
<b>4</b>	<b>Acquire R Programming skills to move into specific branches</b>	<b>PO3,PO4</b>
<b>5</b>		<b>PO1,PO5,PO6</b>
<b>Text Book</b>		
<b>1</b>	<b>Roger D. Peng, "R Programming for Data Science", 2012</b>	
<b>2</b>	<b>Norman Matloff, "The Art of R Programming- A Tour of Statistical Software Design", 2011</b>	
<b>Reference Books</b>		
<b>1</b>	<b>Garrett Golemund, Hadley Wickham, "Hands-On Programming with R: Write Your Own Functions and Simulations", 1st Edition, 2014</b>	
<b>2.</b>	<b>Venables ,W.N., and Ripley, "S programming", Springer, 2000.</b>	
<b>Web Resources</b>		
<b>1.</b>	<b><a href="https://www.simplilearn.com">https://www.simplilearn.com</a></b>	

<b>CourseCode</b>	<b>Project</b>		<b>Credits:4</b>
<b>LectureHours:(L) Per week</b>	<b>TutorialHours: (T)perweek</b>	<b>LabPractice Hours: 6</b>	<b>Total:(L+T+P) perweek:4</b>
<b>CourseCategory:</b>	<b>Year&amp;Semester:</b>	<b>AdmissionYear:</b>	
<b>Units</b>	<b>Contents</b>		<b>RequiredHours</b>
	<p><b>Students(Individual or maximum three in a group) will take a specific problem for the Project and solve it using any one of latest tool and submit a report. Further each student will participate in regular project review with group project guide / Faculty.</b></p>		
<b>ExtendedP rofessional Component (isapartof Internalco mponent only,</b>	<p><b>Questionsrelatedtotheabovetopics,fromvariousco mpetitiveexaminationsUPSC/TRB/NET/UGC- CSIR/GATE/TNPSC/otherstobesolved(Tobediscus sedduringtheTutorialhour)</b></p> <p><b>Notto be included inthe ExternalExaminationquestion paper</b></p>		
<b>Skillsacqui red</b>	<b>Knowledge,ProblemSolving,Analyticalability,Prof essionalCompetency,ProfessionalCommunication andTransferrable Skill</b>		

## **AUGMENTED & VIRTUAL REALITY L - 4 C - 3**

### **UNIT I 12 Hrs**

**Augmented Reality: Taxonomy, Technology and features of augmented reality, Difference between AR and VR, Types Of AR, Challenges with AR, Advantages of AR, Ingredients of an Augmented Reality experience, Visualization techniques for augmented reality, Applying Augmented Reality to a problem.**

### **UNIT II 12 Hrs**

**Virtual Reality Environment: Introduction, The Three I's of VR, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, Benefits of virtual reality, Historical development of VR. 3D Computer Graphics: Introduction, The Virtual world space, Bpositioning the virtual observer, the perspective projection, human vision, stereo perspective projection, 3D clipping, Colour theory, Realism-Stereographic image.**

### **UNIT III 12 Hrs**

**VR Hardware: Introduction, Computers, Tracking, Input Devices, Output Devices, Glasses, Displays and Audio. VR Software: Introduction, VR Software Features, Web-Based VR, Division's dVISE and Blueberry 3D.**

### **UNIT IV 12 Hrs**

**Human Factors: Introduction, Vision, Vision and Display Technology, Hearing, Tactile, Cyber sickness, VR and Society.**

### **UNIT V 12 Hrs**

**Applications of AR and VR: Applications of AR in education, science, business, manufacturing and medicine. Application of VR in Film and TV Production, Military VR applications, VR Technology in Robotics and Games.**

### **Text Book**

**1 John Vince Introduction to Virtual Reality Springer 2004**

**2 Alan B. Craig Understanding Augmented Reality, Concepts and Applications Morgan Kaufmann 2013**

### **Reference Books**

**1. Alan Craig, William Sherman and Jeffrey Will Developing Virtual Reality Applications, Foundations of Effective Design Morgan Kaufmann 2009**

**2. Grigore C. Burdea, Philippe Coiffet Virtual Reality Technology Wiley 2016**

**3. Anand R Augmented and Virtual Reality Khanna Publishing House 2010**

<b>CourseCode</b>	<b>Information Security</b>		<b>Credits 3</b>
<b>LectureHours:(L) perweek 4</b>	<b>TutorialHours: (T)perweek</b>	<b>LabPractice Hours: (P)perweek</b>	<b>Total:(L+T+P) perweek 4</b>
<b>CourseCategory:</b>	<b>Year&amp;Semester:</b>	<b>AdmissionYear:</b>	
<b>LearningObjectives:(forteachers:whattheyhavetodointheclass/lab/field)</b> <ul style="list-style-type: none"> <li>• To know the objectives of information security</li> <li>• Understand the importance and application of each of confidentiality, integrity, authentication and availability</li> <li>• Understand various cryptographic algorithms</li> <li>• Understand the basic categories of threats to computers and networks</li> </ul>			
<b>CourseOutcomes:(forstudents:Toknowwhattheyaregoingtolearn)</b> <b>CO1: Understand network security threats, security services, and countermeasures</b> <b>CO2: Understand vulnerability analysis of network security</b> <b>CO3:Acquire background on hash functions; authentication; firewalls; intrusion detection techniques.</b> <b>CO4: Gain hands-on experience with programming and simulation techniques for security protocols.</b> <b>CO5: Apply methods for authentication, access control, intrusion detection and prevention.</b>			
<b>Units</b>	<b>Contents</b>	<b>RequiredHours</b>	
I	Introduction to Information Security :, Computer Security Concepts (CIA), Attacks, Vulnerabilities and protections, Security Goals, Security Services, Threats, Attacks, Assets, malware	1 2	
II	The Security Problem in Computing: Computer Criminals, Methods of Défense.  Cryptography: Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption	1 2	
III	Symmetric and Asymmetric Cryptographic	1 2	



	Techniques : DES, AES, RSA algorithms .Authentication and Digital Signatures : Use of Cryptography for authentication, Secure Hash function, Key management – Kerberos.	
IV	Program Security : Non-malicious Program errors – Buffer overflow, Incomplete mediation, Time-of-check to Time-of- use  Viruses, Trapdoors, Salami attack, Man-in-the-middle attacks  File protection Mechanisms, User Authentication Designing Trusted O.S:: trusted O.S design	1 2
V	Security in Networks : Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security.  Web Security: Web security considerations, Secure Socket Layer and Transport Layer Security, Secure electronic transaction.	1 2
Skillsacquired from the Course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	
<b>Learning Resources:</b> <ul style="list-style-type: none"> <li>• <b>Recommended Texts</b> <ol style="list-style-type: none"> <li>1. Security in Computing, Fourth Edition, by Charles P. Pfleeger, Pearson Education</li> <li>2. Cryptography And Network Security Principles And Practice, Fourth or Fifth Edition, William Stallings, Pearson</li> </ol> </li> <li>• <b>Reference Books</b> <ol style="list-style-type: none"> <li>1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.</li> <li>2. Cryptography and Network Security : Forouzan Mukhopadhyay, Mc Graw Hill, 2"d Edition</li> <li>3. Information Security, Principles and Practice: Mark Stamp, Wiley India.</li> <li>4. Principles of Computer Sceurity: WM.Arthur Conklin, Greg White, TMH</li> </ol> </li> </ul>		

- **Webresources**

MMSU

<b>CourseCode</b>	<b>Robotics and Its Applications</b>		<b>Credits 3</b>
<b>LectureHours:(L) perweek 4</b>	<b>TutorialHours: (T)perweek</b>	<b>LabPractice Hours: (P)perweek</b>	<b>Total:(L+T+P) perweek 4</b>
<b>CourseCategory:</b>	<b>Year&amp;Semester:</b>	<b>AdmissionYear:</b>	
<b>LearningObjectives:</b> <ul style="list-style-type: none"> <li>• To make the students familiar with the various drive systems of robots, sensors and their applications in robots</li> <li>• To introduce the parts of robots, basic working concepts and types of robots</li> </ul>			
<b>CourseOutcomes:(forstudents:Toknowwhattheyaregoingtolearn)</b> <b>CO1:Describe the different physical forms of robot architectures</b> <b>CO2: Kinematically model simple manipulator and mobile robots</b> <b>CO3:Mathematically describe a kinematic robot system.</b> <b>CO4: Analyze manipulation and navigation problems using knowledge of coordinate frames, kinematics, optimization, control, and uncertainty.</b> <b>CO5: Program robotics algorithms related to kinematics, control, optimization, and uncertainty.</b>			
<b>Units</b>	<b>Contents</b>	<b>RequiredHours</b>	
I	Introduction :Introduction, brief history, components of robotics, classification, workspace, work-envelop, motion of robotic arm, end-effectors and its types, service robot and its application, Artificial Intelligence in Robotics.	1 2	
II	Actuators and sensors :Types of actuators, stepper-DC-servo-and brushless motors- model of a DC servo motor-types of transmissions-purpose of sensor-internal and external sensor-common sensors-encoders tachometers-strain gauge based force torque sensor-proximity and distance measuring sensors  Kinematics of robots :Representation of joints and	1 2	

	frames, frames transformation, homogeneous matrix, D-H matrix, Forward and inverse kinematics: two link planar (RR) and spherical robot (RRP). Mobile robot Kinematics: Differential wheel mobile robot	
III	Localization: Self-localizations and mapping - Challenges in localizations - IR based localizations - vision based localizations - Ultrasonic based localizations - GPS localization systems.	1 2
IV	Path Planning :Introduction, path planning-overview-road map path planning-cell decomposition path planningpotential field path planning-obstacle avoidance-case studies  Vision system: Robotic vision systems-image representation-object recognition-and categorization-depth measurement- image data compression-visual inspection-software considerations	1 2
V	Application : Ariel robots-collision avoidance robots for agriculture-mining-exploration-underwater-civilian- and military applications-nuclear applications-space applications-Industrial robots-artificial intelligence in robots-application of robots in material handling-continuous arc welding-spot welding-spray painting-assembly operation-cleaning-etc.	1 2
Extended Professional Component (is a part of Internal component only,	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC-CSIR/GATE/TNPSC/other to be solved (To be discussed during the Tutorial hour)  Not to be included in the External Examination question paper	
Skills acquired	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

**LearningResources:**

- **RecommendedTexts**

1. **RichardD.Klafter. Thomas Achmielewski and MickaelNegin, Robotic Engineering and Integrated Approach, Prentice Hall India-Newdelhi-2001**
2. **SaeedB.Nikku, Introduction to robotics, analysis, control and applications, Wiley-India, 2 nd edition 2011**

- **ReferenceBooks**

1. **Industrial robotic technology-programming and application by M.P.Groover et.al, McGrawhill2008**
2. **Robotics technology and flexible automation by S.R.Deb, THH-2009**

- **Webresources**

MMSU

<b>CourseCode:</b>	<b>Cloud Computing</b>		<b>Credits: 3</b>
<b>LectureHours:(L) Perweek 4</b>	<b>Tutorial Hours: (T)perweek</b>	<b>LabPractice Hours: (P)perweek</b>	<b>Total:(L+T+P) perweek: 4</b>
<b>CourseCategory:SEC-5</b>	<b>Year&amp;Semester:</b>	<b>AdmissionYear:</b>	
<b>Pre-requisite</b>	<b>Basic knowledge on virtual storage or cloud concept</b>		
<b>LearningObjectives:(forteachers:whatttheyhavetodointheclass/lab/field)</b>			
<ul style="list-style-type: none"> <li>• <b>To impart fundamental concepts of Cloud Computing.</b></li> <li>• <b>To impart a working knowledge of the various cloud service types and their uses and pitfalls.</b></li> <li>• <b>To enable the students to know the common features and differences in the service offerings of the three major Cloud Computing service providers, namely Amazon, Microsoft and Google.</b></li> <li>• <b>To provide know-how of the various aspects of application design, benchmarking and security on the Cloud.</b></li> </ul>			
<b>Course Outcomes</b>			
<b>CO1:To understand the concepts and technologies involved in Cloud Computing.</b>			
<b>CO2: To understand the concepts of various cloud services and their implementation in the Amazon, Microsoft and Google cloud computing platforms.</b>			
<b>CO3:To understand the aspects of application design for the Cloud.</b>			
<b>CO4: To understand the concepts involved in benchmarking and security on the Cloud.</b>			
<b>CO5: To understand the way in which the cloud is used in various domains.</b>			
<b>Recap:(notforexamination)Motivation/previouslecture/relevantportionsrequired forthe course)[Thisisdoneduring2Tutorialhours)</b>			
<b>Units</b>	<b>Contents</b>		<b>RequiredHours</b>
<b>I</b>	<b>Introduction to Cloud Computing:- Characteristics of Cloud Computing – Cloud Models</b>		<b>1 2</b>
	<b>Cloud Concepts and Technologies: Virtualization – Load balancing – Scalability and Elasticity – Deployment – Replication – Monitoring – Virtualization</b>		
<b>II</b>	<b>Cloud Application Design: Introduction – Design</b>		<b>1 2</b>
	<b>Consideration for Cloud Applications – Scalability –</b>		

	<b>Reliability and Availability – Security – Maintenance and Upgradation – Performance – Reference Architectures for Cloud Applications</b>	
III	<b>Design Methodologies: Service Oriented Architecture (SOA), Cloud Component Model, IaaS, PaaS and SaaS Services for Cloud Applications, Model View Controller (MVC), RESTful Web Services – Data Storage Approaches: Relational Approach (SQL), Non-Relational Approach (NoSQL).</b>	1 2
IV	<b>Cloud Application Benchmarking and Tuning: Introduction to Benchmarking – Steps in Benchmarking – Workload Characteristics – Application Performance Metrics – Design Consideration for Benchmarking Methodology – Benchmarking Tools and Types of Tests – Deployment Prototyping.</b>	1 2
V	<b>Cloud Security: Introduction – CSA Cloud Security Architecture – Authentication (SSO) – Authorization – Identity and Access Management – Data Security : Securing data at rest, securing data in motion – Key Management – Auditing.</b>	1 2
<ul style="list-style-type: none"> <li>• <b>Recommended Texts</b></li> <li>• <b>Arshdeep Bahga, Vijay Madiseti, <i>Cloud Computing – A Hands On Approach</i>, Universities Press (India) Pvt. Ltd., 2018.</b></li> <li>• <b>Reference Books</b></li> <li>1. <b>Anthony T Velte, Toby J Velte, Robert Elsenpeter, <i>Cloud Computing: A Practical Approach</i>, Tata McGraw-Hill, 2013.</b></li> <li>2. <b>Barrie Sosinsky, <i>Cloud Computing Bible</i>, Wiley India Pvt. Ltd., 2013.</b></li> <li>3. <b>David Crookes, <i>Cloud Computing in Easy Steps</i>, Tata McGraw Hill, 2012.</b></li> <li>4. <b>Dr. Kumar Saurabh, <i>Cloud Computing</i>, Wiley India, Second Edition 2012.</b></li> </ul>		

**Students who couldn't appear for Naan Muthalvan Course in a particular semester or who have failed in Naan Muthalvan Course should write the following papers (External – 100 marks)**

<b>Semester</b>	<b>Title of the Paper</b>
<b>II</b>	<b>Soft Skills for Employability</b>
<b>III</b>	<b>Digital Skills for Employability – Office Fundamentals</b>
<b>IV</b>	<b>Web Design with HTML</b>
<b>V</b>	<b>Internet &amp; E-Commerce</b>
<b>VI</b>	<b>C Programming</b>



## SOFT SKILLS FOR EMPLOYABILITY

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
	-	-	-	II	2	-	0	100	100
<b>Learning Objectives</b>									
LO1	The course aims to acquaint the students with some very relevant and necessary soft skills and also to help them to develop their personality as well as to be self-motivated.								
LO2	To get the knowledge about the meditation techniques and mental conditioning								
LO3	To get the knowledge about the social skills and etiquette								
LO4	To get the knowledge about the communication and negotiation skills								
LO5	To get the knowledge about the preparation of resumes, appearing for interviews and handling both after campus issues that people normally face while setting foot on the professional sphere								
<b>Prerequisites: None</b>									
Unit	Contents								
I	<b>Minding the Mind: This Unit will focus on meditation techniques and mental conditioning</b> 1.1 Understanding YOU, which denotes 'Your Own Universe', wherein a person will be encouraged to self-introspect and critically analyse oneself. 1.2 Self-Analysis 1.3 Ice Breaker 1.4 Warming Up								
II	<b>The Charming Skills: This Unit will focus on training the students to develop and enhance their social skills, etiquette and basic personal grooming.</b> 2.1 Introduction 2.2 Social Skill 2.3 Etiquette (This will be broad-based delving on various etiquettes necessary for varied areas such as general conversation, table party, official meets and social media)								
III	<b>The Communication Mechanism: This Unit will focus on developing skills in both verbal and non-verbal communications (body language, framing emails, and social media communications). Moreover, input on importance of graphology will be taught.</b> 3.1 Introduction to Communication 3.2 Types of Communication 3.3 Public Speaking								

	<b>3.4 Group Conversation</b> <b>3.5 Letter writing and email</b>
<b>IV</b>	<b>The Negotiator: This unit will focus on inculcating good negotiations and conflict management skills.</b> <b>3.6 Introduction to Negotiation</b> <b>3.6.1 The Negotiation Clock Face</b> <b>3.6.2 Assertiveness Matters</b> <b>3.6.3 Traits of Negotiations</b> <b>3.6.4 Factors that Make a Difference</b> <b>3.6.5 Tactics and Values</b>
<b>V</b>	<b>Campus to Corporate: This Unit will focus on training about preparation of resumes, appearing for interviews and handling both after campus issues that people normally face while setting foot on the professional sphere.</b> <b>4.1 The Doorstep</b> <b>4.2 Resume Preparation/Portfolio Management</b> <b>4.3 Interviews: The Different Types and How to face the same</b>

<b>CO</b>	<b>Course Outcomes</b>
<b>CO1</b>	<b>The students will be able to appreciate the significance of soft skills.</b>
<b>CO2</b>	<b>The students will be able to get the personality augmentation with reference to their personal life.</b>
<b>CO3</b>	<b>The students will be able to get the personality augmentation with reference to their professional life.</b>
<b>CO4</b>	<b>The students will get the professional efficiency.</b>
<b>CO5</b>	<b>The course module will enhance the employability quotient of the students</b>
<b>Textbooks</b>	
<b>1.</b>	<b>Bezborah, P., Soft Skills and Personality Development. Banalata, Dibrugarh.</b>
<b>2.</b>	<b>Hartely C. B., The Gentlemen's Book of Etiquette and Manual of Politeness. Julia Miller.</b>
<b>3.</b>	<b>Rai, U., English Language Communication Skills, Himalaya Publishing House</b>
<b>Reference Books</b>	
<b>1.</b>	<b>Amen, K. K. and Ruiz, M. S., Hand Writing Analysis – The Complete Basic Book. New Page Books, New Jersey.</b>
<b>2.</b>	<b>Gates, S., The Negotiation Book. T J International Limited, Cornwall.</b>
<b>3.</b>	<b>Wainright. G. R., Understand Body Language. Hodder Education, London.</b>

## **Digital Skills for Employability – Office Fundamentals**

### **Unit I:**

**Word Processing: Open, Save and close word document; Editing text – tools, formatting, bullets; Spell Checker**

**Document formatting – Paragraph alignment, indentation, headers and footers, numbering; printing–Preview**

### **Unit II:**

**Spreadsheets : Excel–opening, entering text and data, formatting, navigating; Formulas–entering, handling and copying; Charts–creating, formatting and printing**

### **Unit III:**

**Power point: Introduction to Power point - Features – Understanding slide typesetting & viewing slides – creating slide shows. Applying special object – including objects & pictures – Slide transition–Animation effects, audio inclusion, timers.**

### **Unit IV:**

**Database Concepts: The concept of data base management system; Data field, records, and files- Sorting and indexing data; Searching records. Designing queries, and reports; Linking of datafiles; Understanding Programming environment in DBMS; Developing menu driven applications in query language (MS–Access).**

### **Unit V:**

**Microsoft Access – Creating Tables — Creating database - Creating a Table – Working on Tables – Saving the Table – Defining primary Key – Closing the Table – Closing the Database window**

### **Text Book:**

1. Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, “Microsoft 2003”, Tata McGrawHill.
2. VIKAS GUPTA, “Comdex Computer Course Kit (XP Edition)”, Dreametech press, New Delhi.

### **References:**

1. Stephen L. Nelson, “The Complete Reference office 2000” Tata McGraw – Hill Publishing Company limited, New Delhi.
2. N.Krishnan, “Window and MS Office 2000 with Database Concepts” Scitech publications (India) Pvt Ltd., Chennai

<https://www.udemy.com/course/office-automation-certificate-course/>

<https://www.javatpoint.com/automation-tools>

## **Web Design with HTML**

**Unit I: Introduction to HTML: Designing a Home page – History of HTML – HTML generations – HTML tags**

**Unit II: HTML Documents-Anchor tag –Hyper links –Sample HTML documents - Designing a web page**

**Unit III: Head and Body section: Header Section –Title-Prologue-Links-Colorful web page –Comments lines Designing the body: Heading printing**

**Unit IV: Aligning the headings-Horizontal rule- paragraph-Tab settings-Image and pictures-Embedding PNG format Images.**

**Unit V: Ordered and unordered lists: List-Unordered lists- headings in a list – ordered lists- Nested lists.**

### **Text Book:**

**World Wide Web Design with HTML, C. Xavier, TMH, 2001**

### **Reference Book:**

- 1. Internet & World Wide Web, H.M.Deital, P.J.Deital & A.B.Goldberg, Pearson Education**
- 2. Fundamentals of information technology, Mathew's lenon and Alxis leon, Vijay Nicole private limited, Chennai.**

# **Internet & E-Commerce**

## **Unit I**

**The Internet: Introduction – From Computers to the Internet - Advantages of the Internet – Major Internet Services – Hardware and Software for the Internet - – TCP/IP - The Protocols of the Internet.**

**World Wide Web: Architecture of the World Wide Web –Types of websites – Uniform Resource Locator – Domain Name System – Web Pages and Web Links – Visiting Web Pages — Searching the Web – Google & Chrome Search Engines.**

## **Unit II**

**Types of Internet Accounts – Selecting Internet Service Providers –Electronic Mail: Advantages of E-mails – E-mail addresses – Mail transfer protocols – Working of E-mail system.**

**Hosting Websites: Structure of Websites – Web Development tools – Hosting Websites –Getting a Domain /name – Visitor Analysis and Statistics –**

## **Unit III**

**Electronic Commerce: E-Business and E-Commerce – Types of business in the internet – M-Commerce - Marketing Strategies on the Web – Making Payments in Virtual Stores – Shopping in Virtual Stores — Major issues of E-commerce and M-Commerce**

## **Unit IV**

**Blogs and Social Networking: Blogs – Uses of Blogs – Blogs System Components – Steps for Blogging – Building a Blog site – Social Networking – Etiquette in networking sites.**

## **Unit V**

**Internet Security: Internet Threats – Identity theft and Cybersquatting – Hacking – Spamming and Spoofing – Phishing and Pharming – Denial of Service – spyware – Viruses and worms- Security solutions – Firewalls and Intrusion Prevention Systems –Internet Security Precautions-**

## **Text Book:**

**The Internet A User's Guide Second Edition by K.L. James – PHI Learning Private Limited Reference Books:**

- 1. Internet, World Wide Web, How to program, 4th Edition, Paul Deital, Harvey M Deitel, Pearson**
- 2. Learning Internet & Email, 4th Revised Edition, Ramesh Bangia, Khanna Book Publishing Co Pvt Ltd.**
- 3. Internet & Ecommerce, C. Nellai Kannan, NELS Publications.**

## **Programming in C**

**Objective:** To obtain knowledge about the structure of the programming language C and to develop the program writing and logical thinking skill.

**Unit – I: INTRODUCTION C Declarations:- Character Set – C tokens – Keywords and Identifiers – Identifiers – Constants – Variables – Data types – Declaration of Variables –Assigning Values to Variables**

**Operators and Expressions:- Introduction – Arithmetic Operators – Relational Operators – Logical Operators – Assignment Operators – Increment and Decrement Operators – Conditional Operator – Bitwise Operators – Special Operators**

**Input and Output Operations:- getchar( ) – putchar( ) – scanf( ) – printf( ).**

**Unit – II: CONTROL STRUCTURES Decision Making and Branching:- Decision Making with IF Statement – Simple IF statement – The IF...Else Statement – Nesting of IF...Else Statements – The ELSE IF ladder – The Switch Statement – The ?: Operator – The GOTO statement.**

**Unit – III: Decision Making and Looping:- The WHILE Statement – The DO Statement – The FOR statement.**

**ARRAYS One-dimensional arrays – Declaration of One-dimensional arrays – Initialization of One dimensional arrays - Two-dimensional arrays – Initialization of Two-dimensional arrays**

**Unit – IV: Character Arrays and Strings:- Declaring and Initializing String Variables – Reading Strings from Terminal – Writing Strings to Screen – String Handling Functions.**

**Unit V: FUNCTIONS User-Defined functions:- Need for User-defined functions – Definition of functions – Return Values and their Types – Function Calls – Function Declaration**

**The Scope, Visibility and lifetime of a variables.**

**Structures and Unions**

**Text Book :**

**Programming in ANSI C – 6 th Edition by E Balagurusamy – Tata McGraw Hill Publishing Company Limited.**

**Reference Books:**

**1. Computer System and Programming in C by Manish Varhney, Naha Singh – CBS Publishers and Distributors Pvt Ltd.**

**2. Introduction to Computer Science, IITL Education Solutions Limited, Second Edition, Pearson Education**

**3. Computer Basics and C Programming by V. Rajaraman – PHI Learning Private Limited 4. Programming with C, Third Edition, Byron S Gottfried, Tata McGraw Hill Education Private Limited.**