B.Sc., ARTIFICIAL INTELLIGENCE & DATA SCIENCE

SYLLABUS

FROM THE ACADEMIC YEAR
2024 - 2025

1. Introduction

B.Sc. Artificial Intelligence &Data Science

Artificial Intelligence or AI is a branch of computer science that deals with building smart machines that are capable of performing complex tasks that normally require human interference and intelligence. It combines <u>Data Science</u> with real-life data to leverage machines and computers to imitate the decision-making and problem-solving capabilities that the human mind has. Many human mental activities such as writing computer programs, doing mathematics, engaging in common sense reasoning, understanding language, and even driving an automobile are said to demand "intelligence". AI systems are developed, undergo experimentation, and are improved.

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 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, artificial 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 Artificial Intelligence &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.

Artificial Intelligence & Data Science is the area where applications of various tools and techniques from the disciplines of Artificial Intelligence & Data Science, 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 Artificial Intelligence & Data Science as a discipline has become essential to cater the growing need for professionals and researchers to deal with the future challenges.

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

Programme:	**B.Sc., Artificial Intelligence & Data Science**
Eligibilty	**Candidates who have studied Mathematics in HSC are eligible for this programme** **Refer Tamil Nadu Admission Guidelines G.O(D) No. 110 dt 22.05.2024**
Duration:	**3 years [UG]**
Programme Outcomes:	**PO1: Disciplinary knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study **PO2: Communication Skills:** Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups. **PO3: Critical thinking:** Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development. **PO4: Problem solving:** Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations. **PO5: Analytical reasoning:** Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data

		from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.
Programme Specific Outcomes:		PSO1: To enable students to apply basic microeconomic, macroeconomic and monetary concepts and theories in real life and decision making. PSO 2: To sensitize students to various economic issues related to Development, Growth, International Economics, Sustainable Development and Environment. PSO 3: To familiarize students to the concepts and theories related to Finance, Investments and Modern Marketing. PSO 4: Evaluate various social and economic problems in the society and develop answer to the problems as global citizens. PSO 5: Enhance skills of analytical and critical thinking to analyze effectiveness of economic policies.

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PSO 1	Y	Y	Y	Y	Y	Y	Y	Y
PSO 2	Y	Y	Y	Y	Y	Y	Y	Y
PSO3	Y	Y	Y	Y	Y	Y	Y	Y
PSO 4	Y	Y	Y	Y	Y	Y	Y	Y
PSO 5	Y	Y	Y	Y	Y	Y	Y	Y

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 Internship during the 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 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)

Methodsof Evaluation - Theory		
InternalEvaluation	ContinuousInternalAssessmentTest	**25 Marks**
	Assignments	
ExternalEvaluation	EndSemesterExamination	**75 Marks**
	Total	**100 Marks**
MethodsofAssessment		
Recall(K1)	Simpledefinitions,MCQ,Recallsteps,Conceptdefinitions	
Understand /Comprehend(K2)	MCQ,True/False,Shortessays,Conceptexplanations,Shortsummaryor Overview	
Application (K3)	Suggestidea/conceptwithexamples,Suggestformulae, Solveproblems, Observe,Explain	
Analyze(K4)	Problem-solvingquestions,Finishaprocedureinmanysteps,Differentiate betweenvariousideas,Mapknowledge	
Evaluate(K5)	Longer essay/Evaluationessay,Critiqueorjustifywithprosandcons	
Create(K6)	Checkknowledgeinspecificoroffbeatsituations,Discussion,Debatingor Presentations	

Practicals&Projects : Internal - 50   External - 50

Credit Distribution for all UG courses with LAB Hours

B.Sc. ARTIFICIAL INTELLIGENCE & DATA SCIENCE

Semester I				
Component	**Course code**	**List of courses**	**Credits**	**No. of Hrs**
Part I		Language – Tamil	3	6
Part II		English	3	6
Part-III		Core: Programming with C++	4	5
Part-III		Core Practical: C++ Programming Laboratory	4	5
Part-III		Elective Course I (Generic/Discipline Specific) EC1 Statistics for Data Science/ Applied Mathematics	3	4
Part- IV		Skill Enhancement Course SEC-Practical PHP Scripting Laboratory	2	2
Part- IV		Foundation Course FC Artificial Intelligence	2	2
TOTAL			**21**	**30**
Semester II				
Component	**Course code**	**List of courses**	**Credits**	**No. of Hrs**
Part I		Language – Tamil	3	6
Part II		English	3	4
Part III		Core: Programming with Python	4	5
Part III		Core Practical: Python Programming Laboratory	4	5
Part III		Elective Course II (General /Discipline Specific) Optimization Techniques / Digital Logic Fundamentals	3	4
Part IV		Skill Enhancement Course SEC 2 Data Structures	2	2
Part IV		Skill Enhancement Practical: Multimedia Laboratory	2	2
Part IV		Naan Muthalvan – Language Proficiency for Employability	2	2
TOTAL			**23**	**30**

III Semester

Part	List of Courses	Credit	No. of Hours
Part-1	Language – Tamil	3	6
Part-2	English	3	6
Part-3	Core- Programming with Java	4	4
	CorePractical Java Programming Laboratory	3	4
	Elective: Artificial Neural Networks / Computer Architecture	3	4
Part-4	SEC 4 Practical: Office Automation Laboratory	2	2
	SEC 5 - Naan Mudhalvan	2	2
	E.V.S	2	2
		22	30

Semester-IV

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

Third Year
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 Data Science & Big Data	4	4
	Core Practical 5.1 - Machine Learning Laboratory	3	4
	Core Practical 5 2 Android Applications Development Laboratory	2	4
	Mini Project	4	4
	Elective 5 1 Cognitive Computing/ Operating Systems	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 R Programming	4	5
	Core Course 6 2 Data Communication & Networking	4	5
	Core Practical 6 1 R Programming Laboratory	4	4
	Project	4	6
	Elective 6.1 Pattern Recognition/ Robotics & its Applications	3	4
	Elective 6.2 Computer Graphics/ / Simulation & Modeling/ Graph Theory & its Applications	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)

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 Self-Study papers (External – 100 marks)

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

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

Learning Objectives	
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

Unit	Contents	No. of Hours
I	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++	15
II	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	15
III	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	15
IV	Inheritance: Introduction – Types of Inheritance – Virtual Base Classes – Abstract Classes – Pointers - Virtual Function - Polymorphism	15
V	Templates: Class Templates – Function Templates – Overloading of template Function – Exception Handling	15

TOTAL	75

CO	Course Outcomes
CO1	Outline the C++ programming fundamentals and the concepts of object-oriented programming like object and class, Encapsulation, inheritance and polymorphism.
CO2	Classify the control structures, types of constructors, inheritance and different type conversion mechanisms.
CO3	Analyze the importance of object oriented programming features like polymorphism, reusability, generic programming, data abstraction and the usage of exception handling.
CO4	Determine the use of object oriented features such as classes, inheritance and templates to develop C++ programs for complex problems.
CO5	Create a program in C++ by implementing the concepts of object-oriented programming.
Textbooks	
➢	E. Balaguruswamy, (2013), "Object Oriented Programming using C++", 6th Edition, Tata McGraw Hill.
Reference Books	
1	Bjarne Stroustrup, "The C++ Programming Language", Fourth Edition, Pearson Education.
2	Hilbert Schildt, (2009), "C++ - The Complete Reference", 4th Edition, Tata McGrawHill
NOTE: Latest Edition of Textbooks May be Used	
Web Resources	
1.	http:/fahad.cprogramming.blogspot.com/p/c-simple-examples.html
2.	http://www.sitesbay.com/cpp/cpp-polymorphism

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
Weightage ofcoursecontributed toeachPSO	15	14	11	15	15	10

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

	Learning Objectives
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

List of Exercises	

1. Working with Classes and Objects
2. Using Constructors and Destructors
3. Using Function Overloading
4. Using Operator Overloading
5. Using Type Conversions
6. Using Inheritance
7. Using Polymorphism
8. Using Console I/O
9. Using Templates
10.   Using Exceptions

CO	Course Outcomes
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 a solve various computing problems in C++ by incorporating OOPS conc
CO5	Develop a program in C++ with the concepts of object oriented progra 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
Weightage ofcoursecontributed toeachPSO	15	14	11	15	15	10

Title of the Course	Statisticsfor Data Science				
Elective Course1A					
		Year	I	**Credits**	3	**Course Code**	
		Semester	I				
Instructional Hours per week	**Lecture**		**Tutorial**	**Lab Practice**	**Total**	
	4			--	4	
Objectives of the Course	To develop knowledge and understand fundamental concepts in probability and statistics				
Learning Outcome	Students will be able to CO1: Organize, manage and present data. CO2: Understand, describe, and calculate the measures of data and correlation. CO3: Recognize and understand various probability distribution functions, calculate and interpret expected results CO4: Apply the methods of estimating a parameter. CO5: Understand the concept of probability and apply for simple events				

Course Outline	**UNIT-I:** **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**
	UNIT-II: **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** **Correlation: Karl Pearson coefficient of correlation, Spearman's rank correlation coefficient**
	UNIT-III: **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**

	Unit IV **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:** **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**
	UNIT-V : **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**
Skills acquired from this course	**Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill**
Recommended Text	**[1] Sheldon M. Ross, Introduction to Probability and Statistics for Engineers And Scientists, Elsevier Academic Press, UK, Fifth Edition, 2023** **[2]. Rohatgi V.K and Saleh E, An Introduction to Probability and Statistics, 3rd edition, John Wiley & Sons Inc., New Jersey, 2015.** **[3]. Gupta S.C and Kapoor V.K, Fundamentals of Mathematical Statistics, 11th edition, Sultan Chand & Sons, New Delhi, 2014.**

Reference Books	Jim Frost, Introduction to Statistics: An Intuitive Guide for Analyzing Data and Unlocking Discoveries
Website and e-Learning Source	https://onlinestatbook.com/2/ https://www.simplilearn.com/tutorials/statistics-tutorial https://towardsdatascience.com/fundamentals-of-statistics-for-data-scientists-and-data-analysts-69d93a05aae7

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

	L	T	P	C

EC1: Elective Course : 1 B

4   0   0   3

APPLIED MATHEMATICS

Course Objective:
1. To understand matrix operations
2. To study the basic operations of Octave

UNIT I: Linear Algebra: Matrix, Representation, Examples of matrix Data, Vectors, examples, Representation, Matrix Addition, Scalar Multiplication, Multiplication properties, Matrix Vector Multiplication, Matrix Multiplication, Inverse and Transpose.

Unit II: Applications of Matrix operations on Real Time Data, Parallel Matrix Multiplication, Dimensionality Reduction by Principal Component Analysis and Eigen Values, Eigen Vectors.

UNIT III Basic operations of Octave: Installation of Octave, Logical & Arithmetic Operations, Assignment of Different Variables, Assigning Matrices, Vector Representation, Histogram of matrices, Diagonal Matrices.

UNIT IV: Data Visualization and Processing using Octave: Finding the size of a Matrix, Loading Data into Octave, Viewing the Workspace of Octave, Accessing the elements of Matrix, Arithmetic operations on matrices- Addition, Multiplication, log, exponentiation, Transpose, Maximum and Minimum Value of a Matrix

Unit V: Control Statements in Octave, Visualizing Data in Octave-Plotting Data, giving labels, axes and titles, Victimization, Vector implementation, Advantages.

Course Outcome:

On successful completion of the course, the learners will be able to

1. **Acquire knowledge of processing using octave**

2. **Statistically analyse data**

3. **Compute solutions of linear equations and system of equations**

4. **Understand the basic concepts of Data Visualization**

5. **Understand matrices**

CO - PO - PSO Mapping

CO	PO					PSO					COGNITIVE LEVEL
	1	2	3	4	5	1	2	3	4	5	
CO 1	S	S	S	M	S	S	S	M	S	M	K – 1
CO 2	S	S	M	S	S	S	S	S	M	S	K – 4
CO 3	M	S	M	S	S	S	S	M	S	S	K – 5
CO 4	S	M	M	S	S	S	M	S	S	S	K – 3
CO 5	S	S	M	S	S	S	S	S	S	S	K – 5

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

Books:

1. <u>Jason Lachniet</u>, "Introduction to GNU Octave"
2. Lectures of Professor Dr. Andrew Ng, Stanford University, Coursera.
3. Gene H.Golub, Charles F.Van Loan, "Matrix Computations", John Hopkins University Press.
4. https://skymind.ai/wiki/eigenvector
5. Randolf H. Reiss, B.S, "Eigen Values and Eigen Vectors in Data dimension Reduction for Regression", San Marcos, Texas.
6. Gilbert Strang, "Linear Algebra and its Applications", Thomson Learning Inc., 4th Edition.
7. https://www.cs.utah.edu/~jeffp/M4D/M4D-v0.4.pdf

PHP SCRIPTING LABORATORY

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
	0	0	2	I	2	2	50	50	100

Learning Objectives	
LO1	Toenablethestudentstounderstand,analyzeandbuilddynamicwebpagesusingPHP and jQuery with MySql database

	Contents	No. of Hours
	IntroductiontoPHP:EmbeddingPHP in Web Pages 1. Workingwith Forms.	5
	2. StringManipulations 3. Functions 4. Sorting	10
	5. Classes andObjects 6. CookiesandSessions 7. Graphics	10
	Working with MySQL Database: Select data from a single table – Select data from multiple tables- Performing DML operations 8. Working with multiple tables	5
	TOTAL	30

CO	Course Outcomes
CO1	Demonstratesimple programsusingPHP
CO2	Applythe interfacesetup,styles&themesforthegiven application
CO3	Analyzetheproblemandaddnecessaryuserinterfacecomponents, multimedia componentsand webdatasourceintothe application
CO4	Evaluatethe resultsbyimplementingthe correcttechniques onthe webform
CO5	Constructwebapplicationswith thefacilitatedcomponentsin PHP

Textbooks

➤	**Kevin Tatroe, Peter MacIntyre, RasmusLerdorf, " Programming PHP",O'Reilly Publications,Third Edition**
➤	**Joel Murach, Ray Harris (2010), "PHP and MySQL", Shroff Publishers & Distributors**
➤	**CesarOtero, RobLorsen (2012), "Professional jQuery", John WileySons &Inc**
Reference Books
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, 2ndEdition**

NOTE: Latest Edition of Textbooks May be Used

Web Resources

1.	**http://www.w3schools.com/jquery/**
2.	**http://www.ccc.commnet.edu/faculty/sfreeman/cst%20250/jQuery Notes.pdf**
3.	**http://www.w3schools.com/php/**
4.	**http://www.tutorialspoint.com/php/**
5.	**http://www.tutorialspoint.com/mysql/**

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
Weightage ofcoursecontributed toeachPSO	15	11	11	12	11	13

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst.	Marks		
									CIA	External	Total
	Artificial Intelligence	Foundation Course	2	-	-	I	2	2	25	75	100

	Course Objective
C1	To learn various concepts of AI Techniques.
C2	To learn various Search Algorithm in AI.
C3	To learn probabilistic reasoning and models in AI.
C4	To learn about Markov Decision Process.
C5	To learn various type of Reinforcement learning.

UNIT	Contents	No. of Hours
I	Fundamentals of Artificial Intelligence : AI Techniques, Representation of Knowledge, Knowledge Based Systems, State Space Search. Production Systems	6
II	Search Algorithms : Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first search,	6
III	Generate & test, Hill Climbing, Heuristic search, A* and AO* Algorithms	6
IV	*Game playing: Minimax Search, Alpha-Beta Cutoffs, Waiting for Quiescence*	6
V	Propositional Logic: Representation, Inference-Resolution, Forward and Backward Chaining.	6
	Total	30

Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
1	Understand the various concepts of AI Techniques.	PO1
2	Understand various Search Algorithm in AI.	PO1, PO2
3	Understand probabilistic reasoning and models in AI.	PO4, PO6
4	Understand Markov Decision Process.	PO4, PO5, PO6

5	Understand various Reinforcement learning Techniques.	PO3, PO4

Text Book		
1	Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill	
2	Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach" , 3rd Edition, Prentice Hall.	
3	Carl Townsend, "Introduction to Prolog Programming"	
4	Ivan Bratko, "PROLOG Programming for Artificial Intelligence", Addison-Wesley, 2nd Edition.	
5	Klocksin and Mellish, "Programming with PROLOG"	
Reference Books		
1.	Trivedi, M.C., "A Classical Approach to Artifical Intelligence", Khanna Publishing House, Delhi.	
2.	SarojKaushik, "Artificial Intelligence", Cengage Learning India, 2011	
3.	David Poole and Alan Mackworth, "Artificial Intelligence: Foundations for Computational Agents", Cambridge University Press 2010	
Web Resources		
1.	https://github.com/dair-ai/ML-Course-Notes	
2.	https://web.cs.hacettepe.edu.tr/~erkut/ain311.f21/index.html	
3.	https://www.toolify.ai/?gclid=CjwKCAjwvdajBhBEEiwAeMh1U6tlqU1LXlRFbcghLMZVwICm_4PkIRcDRE-VYq_wTDcuaQeq_bCHnhoCcm4QAvD_BwE	
4.	ocw.upj.ac.id/files/Textbook-TIF212-Prolog-Tutorial-3.pdf	

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	1	2	1	2
CO2	3	3	2	2	3	3
CO3	3	3	2	3	3	2
CO4	3	2	3	2	2	3
CO5	3	2	2	2	3	3
Weightage ofcoursecontributedto EachPSO	15	12	10	11	12	13

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

FIRST YEAR –SEMESTER- II

Subject Code	Subject Name	Category	L	T	P	S	Credits	CIA	External	Total
	PROGRAMMING WITH PYTHON	CCI	4	1	-	II	4	25	75	100
Learning Objectives									
LO1	**To make students understand the concepts of Python programming.**									
LO2	**To apply the OOPs concept in PYTHON programming.**									
LO3	**To impart knowledge on demand and supply concepts**									
LO4	**To make the students learn best practices in PYTHON programming**									
LO5	**To know the costs and profit maximization**									

UNIT	Contents	No. of Hours
I	**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.**	**15**
II	**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.**	**15**
III	**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.**	**15**
IV	**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 –**	**15**

	Defining own modules. Lists: Creating a list -Access values in List-Updating values in Lists-Nested lists -Basic list operations-List Methods.	
V	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.	15
	TOTAL HOURS	**75**

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

	Textbooks
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.

	Reference Books
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.
	Web Resources
1.	https://www.programiz.com/python-programming
2.	https://www.guru99.com/python-tutorials.html
3.	https://www.w3schools.com/python/python_intro.asp
4.	https://www.geeksforgeeks.org/python-programming-language/
5.	https://en.wikipedia.org/wiki/Python_(programming_language)

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
CO 2	3	3	3	3	2	3
CO 3	3	3	3	3	2	2
CO 4	3	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightage of course contributed to each PSO	15	14	15	15	13	14

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	CIA	External	Total
	PYTHON PROGRAMMING LABORATORY	**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
1. Program using variables, constants, I/O statements in Python. 2. Program using Operators in Python. 3. Program using Conditional Statements. 4. Program using Loops. 5. Program using Jump Statements. 6. Program using Functions. 7. Program using Recursion. 8. Program using Arrays. 9. Program using Strings. 10. Program using Modules. 11. Program using Lists. 12. Program using Tuples. 13. Program using Dictionaries. 14. Program for File Handling.	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:

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

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

	L	T	P	C

EC2 : Elective Course A | **4** | **0** | **0** | **3** |

OPTIMIZATION TECHNIQUES

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 Queueing 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

OPTIMIZATION TECHNIQUES											
CO	**PO**					**PSO**					**COGNITIVE LEVEL**
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO1	S	S	S	M	S	S	S	M	S	S	K-2
CO2	S	S	M	S	S	S	S	S	S	S	K-1
CO3	S	S	M	S	S	S	S	S	S	S	K-3
CO4	S	S	M	S	S	S	S	S	S	S	K-5
CO5	S	S	M	S	S	S	S	S	S	S	K– 6

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.   **V**
   .Sundaresan, K.S.Ganapathy Subramanian, K.Ganesan, "Resource Management Techniques", Ninth Edition, A. R.Publications, 2015.

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst.	CIA	External	Total
										Marks	
	Computational Intelligence	Elective	4	-	-	-	3	4	25	75	100

	Course Objective
C1	To identify and understand the basics of AI and its search.
C2	To study about the Fuzzy logic systems.
C3	Understand and apply the concepts of Neural Network and its functions.
C4	Understand the concepts of Artifical Neural Network
C5	To study about the Genetic Algorithm.

UNIT	Details	No. of Hours
I	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.	12
II	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.	12
III	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,	12

IV	Artificial Neural Networks: Fundamental Concepts – Basic Models of Artificial Neural Networks – Important Terminologies of ANNs – McCulloch-Pitts Neuron – Linear Separability – Hebb Network.	12
V	Genetic Algorithm: Introduction – Biological Background – Genetic Algorithm Vs Traditional Algorithm – Basic Terminologies in Genetic Algorithm – Simple GA – General Genetic Algorithm – Operators in Genetic Algorithm	12
	Total	60

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
1	Describe the fundamentals of artificial intelligence concepts and searching techniques.	PO1
2	Develop the fuzzy logic sets and membership function and defuzzification techniques.	PO1, PO2
3	Understand the concepts of Neural Network and analyze and apply the learning techniques	PO4, PO6
4	Understand the artificial neural networks and its applications.	PO4, PO5, PO6
5	Understand the concept of Genetic Algorithm and Analyze the optimization problems using GAs.	PO3, PO8
Text Book		
1	S.N. Sivanandam and S.N. Deepa, "Principles of Soft Computing", 2nd Edition, Wiley India Pvt. Ltd.	
2	Stuart Russell and Peter Norvig, "Artificial Intelligence - A Modern Approach", 2nd Edition, Pearson Education in Asia.	
3	S. Rajasekaran, G. A. Vijayalakshmi, "Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications", PHI.	
Reference Books		
1.	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	
2.	Chin Teng Lin, C. S. George Lee," Neuro-Fuzzy Systems", PHI.	

Web Resources	
1.	https://www.javatpoint.com/artificial-intelligence-tutorial
2.	https://www.w3schools.com/ai/

Mapping with Programme Outcomes:

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

S-Strong   M-Medium L-Low

Subject Code	Subject Name	Category	L	T	P	S	Credits	CIA	External	Total
	DATA STRUCTURES	SEC	2	-	-	II	2	25	75	100

Learning Objectives	
LO1	Understand the meaning asymptotic time complexity analysis and various data structures
LO2	To enhancing the problem solving skills and thinking skills
LO3	To write efficient algorithms and Programs
LO4	To make the students learn best practices in programming
LO5	To understand how to handle the files in Data Structure

UNIT	Contents	No. Of. Hours
I	Arrays and ordered Lists Abstract data types – asymptotic notations – complexity analysis- Linked lists: Singly linked list – doubly linked lists-	6
II	Stacks – Queues – Circular Queues Trees – Binary Trees – Binary Tree Traversal – Binary Tree Representations – Binary Search Trees	6
III	Graphs - Representation of Graphs – Graph implementation – graph Traversals - Minimum Cost Spanning Trees	6
IV	Searching and Sorting Sorting – Insertion Sort, Quick Sort, Merge Sort Searching – Linear search, Binary search	6
V	Backtracking – 8-Queen"s problem - Graph Colouring– Branch And Bound:– Travelling Sales Person Problem	6
	TOTAL HOURS	30

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	To understand the asymptotic notations and analysis of time and space complexity To understand the concepts of Linked List, Stack and Queue.	PO1, PO2, PO3, PO4, PO5, PO6

CO2	To understand the Concepts of Trees and Graphs Perform traversal operations on Trees and Graphs. To enable the applications of Trees and Graphs.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	To apply searching and sorting techniques	PO1, PO2, PO3, PO4, PO5, PO6
CO4	To understand the concepts of Greedy Method To apply searching techniques.	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

	Textbooks
1	Seymour Lipshutz(2011),Schaum"s Outlines - Data Structures with C, Tata McGraw Hill publications.
2	Ellis Horowitz and SartajSahni (2010), Fundamentals of Computer Algorithms, Galgotia Publications Pvt., Ltd.
3	Dr. K. Nagesware Rao, Dr. Shaik Akbar, ImmadiMurali Krishna, Problem Solving and Python Programming(2018)

	Reference Books
1.	Gregory L.Heileman(1996), Data Structures, Algorithms and Object-Oriented Programming, McGraw Hill International Edition, Singapore.
2.	A.V.Aho, J.D. Ullman, J.E.Hopcraft(2000). Data Structures and Algorithms, Addison Wesley Publication.
3.	Ellis Horowitz and SartajSahni, Sanguthevar Raja sekaran (2010) ,Fundamentals of Computer Algorithms, Galgotia Publications Pvt.Ltd.

	Web Resources
1.	https://www.tutorialspoint.com/data_structures_algorithms/index.htm
2.	https://www.programiz.com/dsa
3.	https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/

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
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	1	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	3	2
Weightage of course contributed to each PSO	15	15	15	15	13	14

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

MULTIMEDIA LABORATORY (USING REACT)

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
	0	0	2	IV	2	2	50	50	100
Learning Objectives									
LO1	Toget the knowledge to write the programs using React								
LO2	To understand the usage of functions								
LO3	To understand the usage of mapping								
LO4	To understand the application of various components								
LO5	To understand the usage of audio and video players								
Prerequisites: None									
Contents									

1. Create an image gallery component that displays a list of images.

2. Create a video player component that can play, pause, and control the volume of a video.

3. Create an audio player component with play, pause, and volume controls.

4. Create a component that allows users to upload an image and preview it before submission.

5. Create a component that visualizes audio frequencies using the Web Audio API.

6. Create an image slider that automatically transitions between images.

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.

8. Create a component that allows users to draw annotations on an image.

9. Create an interactive map component using a mapping library like Leaflet.

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

CourseCode	Programming with Java		Credits 4
LectureHours:(L) perweek: 4	TutorialHours: (T)perweek	LabPractice Hours: (P)perweek	Total:(L+T+P) perweek: 4
CourseCategory:	Year&Semester: II & III	AdmissionYear:	

LearningObjectives:

- To provide fundamental knowledge of object-oriented programming.

  To equip the student with programming knowledge in Core Java from the basics

- To enable the students to use AWT controls, Event Handling and Swing for GUI.

CO1:Understand the basic Object-oriented concepts.

CO2:Implement inheritance, packages, interfaces and exception handling of Core Java.

CO3:Implement multi-threading and I/O Streams of Core Java

CO4: Implement AWT

CO5: Implement Event handling.

Units	Contents	RequiredHours
I	Introduction:ReviewofObject-Oriented concepts - HistoryofJava - Javabuzzwords - JVMarchitecture - Datatypes - Variables - Scope and lifetimeofvariables - arrays - operators - controlstatements - type conversion and casting - simple java program - constructors - methods - Static block - Static Data - StaticMethodStringand StringBufferClasses	12
II	Introducing Classes: Class Fundamentals – Declaring objects- Assigning object -Reference variables- Introducing Methods- Constructors- Garbage collection – Finalize() Method Methods and classes: Overloading Methods-Using objects as parameters Argument passing –Returning objects- Recursion- Access control – understanding static –Introducing final – String class- Inheritance: –Using super- creating Multilevel Hierarchy -	12

	Method overriding –Dynamic Method Dispatch – Using Abstract class –Using final with inheritance-The object class.		
III	Packages and interfaces: Packages –Access Protection – Importing packages-Interfaces. Exception Handling: Introduction- Exception Types – Uncaught Exceptions- Using try and catch – Multiple catch clauses –Nested try statements- throw – throws-finally. Multithreaded programming :Creating a Thread –Creating MultipleThreads – Using is Alive() and join() – Thread priorities	16	
IV	The Applet class: Applet Basics – Applet Architecture –Applet Skeleton- Applet Display method –Requesting Repainting – HTML APPLET tag- Passing Parameters to Applet. Layouts (Flow and Grid only)	10	
V	Event Handling: Event Handling Mechanisms – Delegation Event Model –Event classes(The Action Event ,Item Event , Key Event, Mouse Event) – Sources of Events - Event Listener Interfaces(Action Listener, Item Listener, Key Listener, Mouse Listener).	10	
Skillsacquired	Knowledge,ProblemSolving,Analyticalability,Professional Competency,ProfessionalCommunicationand Transferrable Skill		

LearningResources:

- **RecommendedTexts**

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

ReferenceBooks

1. Head First Java, O'Rielly Publications,

2. Y. Daniel Liang, *Introduction to Java Programming*, 7th Edition, Pearson Education India, 2010.

3. Programming with Java –C.Muthu

4. 2. Java Programming A Practical Approach, C.Xavier, TMH

5. 3. Programming in Java, Sachin Malhotra, Saurabh Choudhary, OXFORD University Press

6. 4. Programming with Java a primer 3/E E.BALAGURUSWAMY

7. 5. Core Java, Mahesh P. Matha, PHI Learning Private Limited

CourseCode	Java Programming Lab		Credits 3
LectureHours:(L) perweek	TutorialHours: (T)perweek	LabPractice Hours: 4	Total:(L+T+P) perweek: 4
CourseCategory:	Year&Semester:		AdmissionYear:

LearningObjectives:

- **To gain practical expertise in coding Core Java programs**

- **To become proficient in the use of AWT, Event Handling**

CourseOutcomes:(forstudents:Toknowwhattheyaregoingtolearn)
CO1:Code,debugand execute Javaprogramstosolvethegivenproblems
CO2:Implement multi-threading and exception-handling
CO3:Implement functionality using String and StringBuffer classes
CO4: Demonstrate Event Handling.
CO5: Createapplicationsusing SwingandAWT

Contents

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 that displays the number of characters, lines and words in a text**

3. **Writeaprogramtoperformthefollowingstringoperationsusing String class/ String Buffer class:**

   a. **StringConcatenation**

   b. **Searchasubstring**

   c. **Toextractsubstringfromgivenstring**

   d. **Reverseastring**

   e. **Deleteasubstringfrom thegiven string**

4. **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.

5. Writeathreadingprogramwhichusesthesamemethodasynchronouslytoprint thenumbers1to10usingThread1andtoprint90to100using Thread2.

6. Writeaprogram to demonstrate the useoffollowingexceptions.
    a. ArithmeticException
    b. NumberFormatException
    c. ArrayIndexOutofBoundException
    d. NegativeArraySizeException

7. Write a Java program that reads file name from the user, then displays information about whether the file exists, whether the file is readable or writable, the type of file and the length of the file in bytes

8. Writeaprogramtoacceptatextandchangeitssizeandfont.Include bolditalicoptions.Useframesandcontrols.

9. 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).

10. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divide by zero.

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
CO 2	3	3	3	3	2	3
CO 3	3	3	3	3	2	2
CO 4	3	3	3	3	2	3

CO 5	3	2	3	3	3	3
Weightage of course contributed to each PSO	15	14	15	15	13	14

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

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 - activation functions.

UNIT II
Neural Network Architecture: Single layer Feed-forward networks. Multilayer Feed-forward networks. Recurrent Networks.

UNIT III
Back propagation Networks: Back Propagation networks, Architecture of Back-propagation(BP) Networks, Back-propagation Learning, Variation of Standard Back propagation algorithms.

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.

Computer Architecture   L – 4   C - 3

UNIT I

Basic Computer OrganisationandDesign: Instruction codes - Computer Registers - Computer Instructions - Timing and Control - Instruction Cycle - Control Memory-Address Sequencing

UNIT II

Central Processing Unit: General Register Organization – Stack Organization – Instruction Formats – Addressing Modes – Data transfer and manipulation – Program Control.

UNIT III

Computer Arithmetic: Hardware Implementation and Algorithm for Addition, Subtraction, Multiplication, Division-Booth Multiplication Algorithm-Floating Point Arithmetic

UNIT IV

Input Output Organization: Input – Output Interface – Asynchronous data transfer – Modes of transfer – Priority Interrupt – Direct Memory Access (DMA).

Unit V

Memory Organisation: Memory Hierarchy - Main memory - Auxiliary memory - Associative memory - Cache memory - Virtual memory.

Text Book:

1. M. Morris Mano and Rajib Mall, Computer System Architecture, Pearson Education, 2017

Reference Books:

1. Computer System Architecture P.V.S. Rao PHI

2. Nirmala Sharma, ”Computer Architecture”, First Edition,2009,University Science Press

3. Nicholos Carter, ”Computer Architecture” ,2006, TMH Publication.

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst.	Marks		
									CIA	External	Total
	Office Automation Laboratory	Core Practical 2		Y	2	I	2	2	25	75	100

	Course Objective
C1	Understand the basics of computer systems and its components.
C2	Understand and apply the basic concepts of a word processing package.
C3	Understand and apply the basic concepts of electronic spreadsheet software.
C4	Understand and apply the basic concepts of database management system.
C5	Understand and create a presentation using PowerPoint tool.

	Exercises	
	MS – Word 1. Prepare a word document for spell checking and Thesaurus. 2. Apply Cut, Copy and Paste operations in a document. 3. Find a word and Replace with another in a document. 4. Insert Header with College Name, Footer with Page No., and Footnote in a document. 5. Insert mathematical symbols using Microsoft equation 3.0. 6. Preparing Newspaper format (Apply Alignment, Font, Property, Line spacing, Picture Format). 7. Prepare a Bio-Data and insert the contents of qualification within the table. 8. Mail Merge **MS – Excel** 1. Apply formulas and functions 2. Prepare a chart for population growth. 3.Apply ascending and descending order **MS – PowerPoint** 1. Create a power point presentation with 3 slides. 2. Create a design template with 3 slides. 3. Create a presentation with animation. 4. Create a power point presentation with 4 slides. Set slide	

	transition time of 3 seconds and Display your presentation. 5. Create a presentation with auto content wizard. **MS – Access** 1. Create an employee database. 2. Create a student database. Set primary key. 3. Prepare salary list. 4. Create a report.	

	Web Resources
1.	https://www.udemy.com/course/office-automation-certificate-course/
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 IV
L – 4   C - 4

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

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

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. (Separate programs)

3. Cartesian Product – Equi Join – Left Outer Join – Right Outer Join – Full Outer Join.

4. Set Operations – Creating Views – Creating Sequence – Indexing – AggregateFunctions – Analytic Functions – Nested Queries.(separate programs)

5. Creating Stored Procedures, Functions and Triggers (separate programs)

CourseCode:	Cloud Computing		Credits: 3
LectureHours:(L) perweek 4	Tutorial Hours: (T)perweek	LabPractice Hours: (P)perweek	Total:(L+T+P) perweek: 4
CourseCategory:Elective	Year&Semester: II Year IV Semester		AdmissionYear:

LearningObjectives:(forteachers:whattheyhavetodointheclass/lab/field)

- To impart fundamental concepts of Cloud Computing.

- To impart a working knowledge of the various cloud service types and their uses and pitfalls.

- 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.

- To provide know-how of the various aspects of application design, benchmarking and security on the Cloud.

CourseOutcomes:(forstudents:Toknowwhattheyaregoingtolearn)

CO1: To understand the concepts and technologies involved in Cloud Computing.

CO2: To understand the concepts of various cloud services and their implementation in the Amazon, Microsoft and Google cloud computing platforms.

CO3: To understand the aspects of application design for the Cloud.

CO4: To understand the concepts involved in benchmarking and security on the Cloud.

CO5: To understand the way in which the cloud is used in various domains.

Units	Contents	RequiredHours
I	Foundations of cloud: Inception and need for cloud computing: Motivations fromdistributedcomputingpredecessors - Evolution - Characteristics - Business Benefits – Challenges in cloud computing - Exploring the Cloud Computing Stack - Fundamental Cloud Architectures –	12
II	Service Delivery and DeploymentModels: Service Models (XaaS): Infrastructure as a Service (IaaS) - Platform as a Service (PaaS) -	12

	Software as a Service(SaaS) - DeploymentModels: Types of cloud - Public cloud - Private cloud - Hybrid cloud – Service levelagreements - Types of SLA – Lifecycle of SLA- SLA Management	
III	Cloud Resource Virtualization:Virtualization as Foundation of Cloud – UnderstandingHypervisors – Understanding Machine Image and Instances - Managing Instances – Virtual Machine Provisioning and Service Migrations Cloud Computing Applications and Paradigms:	17
IV	Resource Management and Scheduling in Cloud:Policies and Mechanisms for Resource Management – Stability of a Two-Level Resource Allocation Architecture SchedulingAlgorithms for ComputingClouds - Resource Management and Dynamic Application Scaling	12
V	Cloud Platforms and Application Development:Comparing Amazon web services, Google AppEngine, Microsoft Azure from the perspective of architecture (Compute, Storage Communication) services and costmodels. AdvancesisCloud: Media Clouds - Security Clouds - ComputingClouds - Mobile Clouds – FederatedClouds – HybridClouds	12

LearningResources:

- **RecommendedTexts**

 1. Rajkumar Buyya, James Broberg, Andrzej, M. Goscinski, Cloud Computing: Principles and Paradigms, Wiley, 1st Edition, 2013.

 2. Sosinsk, Barrie, Cloud Computing Bible, John Wiley & Sons, 1st Edition, 2011.

 3. Arshdeep Bahga, Vijay Madisetti, *Cloud Computing – A Hands On Approach*, Universities Press (India) Pvt. Ltd., 2018.

- ReferenceBooks

1. Anthony T Velte, Toby J Velte, Robert Elsenpeter, *Cloud Computing: A Practical Approach*, Tata McGraw-Hill, 2013.

2. Barrie Sosinsky, *Cloud Computing Bible*, Wiley India Pvt. Ltd., 2013.

3. David Crookes, *Cloud Computing in Easy Steps*, Tata McGraw Hill,

2012.

4. Dr. Kumar Saurabh, *Cloud Computing*, Wiley India, Second Edition 2012.

5. Marinescu, Dan C. Cloud Computing: Theory and Practice. Morgan Kaufmann, 2017.

6. Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, Mc Graw Hill Education, 1st Edition, 2017

7. Buyya, Rajkumar, Christian Vecchiola, and S. Thamarai Selvi. Mastering Cloud Computing: Foundations and Applications Programming, Tata Mcgraw Hill, 1st Edition, 2017.

Web References: 1. https://www.youtube.com/watch?v=-8O32k26RWA

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

CourseCode	Human – Computer Interaction		Credits	
LectureHours:(L) perweek	TutorialHours: (T)perweek	LabPractice Hours: (P)perweek	Total:(L+T+P) perweek	
CourseCategory:	Year&Semester:		AdmissionYear:	
Pre-requisite				

LearningObjectives:(forteachers:whattheyhavetodointheclass/lab/field)
•   To learn the foundations of Human Computer Interaction.
• To become familiar with the design technologies for individuals and persons with disabilities.
• To be aware of mobile HCI.
• To learn the guidelines for user interface

CourseOutcomes:(forstudents:Toknowwhattheyaregoingtolearn)

CO1:Design effective dialog for HCI

CO2: Design effective HCI for individuals and persons with disabilities

CO3:designing multimedia/ ecommerce/ e-learning Web sites

CO4: Assess the importance of user feedback.

Units	Contents	RequiredHours
I	**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**	**1 2**
II	. **DESIGN & 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,**	**1 2**

	guidelines, rules. Evaluation Techniques – Universal Design	
III	**MODELS AND THEORIES: HCI Models :** **Cognitive models:- Socio-Organizational issues and stakeholder requirements - Communication and collaboration models- Hypertext, Multimedia and WWW.**	1 2
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: – Designing Web Interfaces -Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow**	1 2

LearningResources:

- **RecommendedTexts**
    1. **Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, ”Human -Computer Interaction‖”, III Edition, Pearson Education, 2004 (UNIT I, II & III)**
    2. **. Brian Fling, ―”Mobile Design and Development”, I Edition, O'Reilly Media Inc., 2009 (UNIT – IV)**
    3. **. Bill Scott and Theresa Neil, ―Designing Web Interfaces‖, First Edition, O'Reilly, 2009. (UNIT-V)**

- **ReferenceBooks**
    1. **Shneiderman, "Designing the User Interface: Strategies for Effective Human-Computer Interaction", V Edition, Pearson Education**

- **Webresources**

Web Design Laboratory   P – 2   C - 2

Objective: To highlight the basic concepts of HTML and help the student to equip with the

programming skills in implementing and developing web based applications

1. Create a website using internal links and images.

2. Design a calendar using table tag.

3. Create a HTML document to display a list of five flowers and link each one to another document displaying brief description of the flower, Add pictures wherever possible.

4. Write an HTML code to display a list of 5 cars in a frame, Link each one to a brief description in second frame. The left frame should display the list and the right frame should display the paragraph about the list item.

5. Create a simple HTML Form covering major form elements.

6. Embed Audio and Video in an HTML page.

7. Rotate an element using CSS.

8. Build a simple quiz.

CourseCode:	Software Engineering		Credits: 4
Lecture Hours:(L) perweek: 4	Tutorial Hours: (T)perweek	Lab Practice Hours: (P)perweek	Total:(L+T+P) perweek: 5
CourseCategory:CC9	Year&Semester: III Year V Semester		AdmissionYear:
Pre-requisite	Basic Knowledge on Software Applications		

Learning Objectives:(forteachers: what they have to do in the class/lab/field)

• To understand the software engineering concepts and to create a system model in real life applications

CourseOutcomes:(forstudents:Toknowwhattheyaregoingtolearn)

CO1:Gain basic knowledge of analysis and design of systems

CO2: Ability to apply software engineering principles and techniques

CO3:Model a reliable and cost-effective software system

CO4: Ability to design an effective model of the system

CO5:Perform Testing at various levels and produce an efficient system.

Units	Contents	Required Hours
I	Introduction: The software engineering discipline, programs vs. software products, emergence of software engineering, Notable changes in software development practices, computer systems engineering. Software Life Cycle Models: Classical waterfall model, iterative waterfall model, prototyping model, evolutionary model, spiral model,	12

	comparison of different life cycle models.	
II	Requirements Analysis and Specification: Requirements gathering and analysis, Software requirements specification (SRS) Software Design: Functional independence - cohesion and coupling, software design approaches, object- oriented vs function-oriented design	1 2
III	Function-Oriented Software Design: Overview of SA/SD methodology, structured analysis, data flow diagrams (DFD's), structured design, detailed design. User-Interface design: Good interface; basic concepts; types of user interfaces; component based GUI development, a user interface methodology.	1 2
IV	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.	1 2
V	Software Maintenance: Characteristic of software maintenance; software reverseengineering;software maintenance process models; estimation of maintenance cost; 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;	1 2

architecture of a CASE environment.	

LearningResources:

- **RecommendedTexts**
  1. Rajib Mall, Fundamentals of Software Engineering, Fifth Edition, Prentice-Hall of India, 2018

- **ReferenceBooks**
  1. Richard Fairley, Software Engineering Concepts, Tata McGraw-Hill publishing company Ltd, Edition 1997.
  2. Roger S. Pressman, Software Engineering, Seventh Edition, McGraw-Hill.

     James A. Senn, Analysis & Design of Information Systems, Second Edition, McGraw-Hill International Editions.

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

MACHINE LEARNING

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
	4	0	0	-	4	5	25	75	100

Learning Objectives	
LO1	To comprehend the raw data and to design the same with the appropriate machine learning algorithms for a meaningful representation of data..

Unit	Contents	No. of Hours
I	Introduction: Learning Problems – Perspectives and Issues – Concept Learning – VersionSpaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search	12
II	Workflow and Types of Machine Learning Algorithms: Process of Machine Learning - Machine Learning Workflow– Types of Common Machine Learning Algorithms– Performance Metrics.	12
III	Concepts: Data Pre-processing– Feature Engineering– Regression Concepts– Classification algorithms– Clustering algorithms	12
IV	Instant Based Learning: K- Nearest Neighbour Learning – Locally weighted Regression – Self Organizing Map – Vector Quantization - Locally Weighted Learning.	12
V	Advanced Learning: Neural Network Representation – Perceptrons – Multilayer Networks, Activation Functions, Gradient Descent Rule, Stochastic Gradient Descent Optimization, Back Propagation Algorithm	12
	TOTAL	60

CO	Course Outcomes
CO1	Outline the importance of machine learning in terms of designing intelligent machines
CO2	Identify suitable machine learning techniques for the real time

	applications
CO3	Analyze the theoretical concepts and how they relate to the practical aspects of machine learning.
CO4	Assess the significance of principles, algorithms and applications of machine learning through a hands-on approach
CO5	Compare the machine learning techniques with respective functionality

Textbooks	
➢	1. "Machine Learning", Tom M. Mitchell, McGraw-Hill Education (India) Private Limited, 2013. 2. "Introduction to Machine Learning (Adaptive Computation and Machine Learning)", EthemAlpaydin, The MIT Press, 2004. 3. Ethem Alpaydın, "Introduction to Machine Learning" Third Edition, MIT, 2014. https://www.tutorialspoint.com/machine_learning_with_python/machine_learning_with_python_tutorial.pdf

Reference Books	
	1. Bertt Lantz, "Machine Learning with R," Packt Publishing, 2013
	2. Jason Bell, "Machine Learning: Hands-On for Developers and Technical Professionals," Wiley Publication, 2015.
	"Machine Learning: An Algorithmic Perspective, Stephen Marsland, CRC Press, 2009.

Web Resources	
	1. https://www.expertsystem.com/machine-learning-definition/
.	2. https://searchenterpriseai.techtarget.com/definition/machine-learning-ML

MAPPING TABLE						
CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	2	2	2
CO2	2	3	3	3	3	2
CO3	2	2	3	3	3	3
CO4	3	2	2	3	2	3
CO5	3	3	3	2	3	3

Weightageofcoursecontributedtoea chPSO	13	12	13	13	13	13

Data Science & Big Data   L – 4   C - 4

Unit I- Data Science Fundamentals

Data Science – Fundamentals and Components – Data Scientist – Terminologies Used in Big Data Environments – Types of Digital Data – Classification of Digital Data

Introduction to Big Data – Characteristics of Data – Evolution of Big Data

Unit II – Big Data Analytics – Classification of Analytics – Top Challenges Facing Big Data – Importance of Big Data Analytics – Data Analytics Tools. Linear Regression – Polynomial Regression – Multivariate Regression

Unit III Introduction to Hadoop

Introducing Hadoop –Hadoop Overview – RDBMS versus Hadoop – HDFS (Hadoop Distributed File System): Components and Block Replication – Processing Data with

Hadoop – Introduction to MapReduce – Features of MapReduce

Unit III -Introduction to NoSQL

Introduction to NoSQL: CAP theorem – MongoDB: RDBMS Vs MongoDB – Mongo DB Database Model – Data Types and Sharding – Introduction to Hive – Hive Architecture – Hive Query Language (HQL).

Unit IV- Data Science using Python

Introduction to Essential Data Science Packages: Numpy, Scipy, Jupyter, Statsmodels and Pandas Package – Data Munging: Introduction to Data Munging, Data Pipeline and Machine Learning in Python

Unit V- Data Visualization using Python

Data Visualization Using Matplotlib – Interactive Visualization with Advanced Data Learning Representation in Python.

Text Book
Seema Acharya and Subhashini Chellapan. (2015). Big Data and Analytics, 2nd Edition, Wiley Publishers.

DT Editorial Services. (2015). Big Data, Black Book, 1st Edition Dream Tech Press.

Suggested Readings:

1. Frank Pane. (2017). Hands on Data Science and Python Machin Learning, 1st Edition Packt Publishers.

2. Yuxi (Hayden) Liu. (2017). Python Machine Learning by Example, 2nd Edition, Packt Publication.

3. Alberto Boschetti and Luca Massaron, (2016). Python Data Science Essentials, 2nd Edition, Packt Publishers.

Websites:

1. www.nptel.ac.in/courses/106/106/106106179/

2. www.nptel.ac.in/courses/106/106/106106212/

3. www.nptel.ac.in/noc/courses/noc17/SEM2/no17-mg24/

4. www.nptel.ac.in/courses/106/104/106104189/

5. www.coursera.org/specializations/advanced-data-science-ibm

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
Weightage of course contributed to each PSO	14	13	14	14	14	13

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

MACHINE LEARNING LABORATORY   P – 4   C -3

Exercises using Python

1. Find the standard deviation for speed of a cars using numpy

2. Find the percentile of a marks of students

3. Draw the histogram for Normal Distribution

 4. Draw the scatter Plot

5. Polynomial Regression

6. Draw the decision tree.

7. Create Table and insert values using Python MySQL

 8. Construct the query for retrieving relevant information from the table Python MySQL

9. Execute Linear Regression using suitable Training and Testing data set for predicting the cost of a flat.

Android Applications Development Laboratory   P – 4   C - 2

List of Exercises

1. Create "hello world" application to display "hello world" in the middle of the screen in the emulator as well as android phone

2. Create an android app to display various android lifecycle phases

3. Create an android app with first activity having edit text and send button. On click of send button, use explicit intent to send the text within edit text to a second activity and displayed within text view

4. Create an android app with first activity having edit text and send button. On click of send button, use implicit intent that uses send action, and let user select app from app chooser and navigate to that application.

5. Create a calculator app that performs addition, subtraction, division and multiplication operation on numbers.

CourseCode	Mini Project		Credits:4
LectureHours:(L) perweek	TutorialHours: (T)perweek	LabPractice Hours: 4	Total:(L+T+P) perweek:6
CourseCategory:	Year&Semester:		AdmissionYear:
Units	Contents		RequiredHours
	Students (Individual or maximum three in a group) will take a specific problem involving Database (storage, retrieval, query and report) for the Mini Project and submit a report. Further each student will participate in regular project review with group project guide / Faculty.		
Extended Professio nalCompo nent(isap artof Internalc omponent only,	Questionsrelatedtotheabovetopics,fromvariou scompetitiveexaminationsUPSC/TRB/NET/U GC– CSIR/GATE/TNPSC/otherstobesolved(Tobedi scussedduringtheTutorialhour) Notto be included inthe ExternalExaminationquestion paper		
Skillsacq uired	Knowledge,ProblemSolving,Analyticalability, ProfessionalCompetency,ProfessionalCommu nicationandTransferrable Skill		

Cognitive Computing L – 4 C - 3

UNIT I   12 Hours
Introduction: Cognitive science and cognitive Computing with AI, Cognitive Computing - Cognitive Psychology - The Architecture of the Mind - The Nature of Cognitive Psychology – Cognitive architecture – Cognitive processes – The Cognitive Modeling Paradigms - Declarative / Logic based Computational cognitive modeling – connectionist models – Bayesian models.

UNIT II   12 Hours
Introduction to Knowledge-Based AI – Human Cognition on AI – Cognitive Architectures
Intelligent Decision making, Fuzzy Cognitive Maps, Learning algorithms: Non linear Hebbian Learning – Data driven NHL

UNIT III   12Hours
Hybrid learning, Fuzzy Grey cognitive maps, Dynamic Random fuzzy cognitive Maps. Machine learning Techniques for cognitive decision making

UNIT IV   12 Hours
Hypothesis Generation and Scoring - Natural Language Processing - Representing Knowledge - Taxonomies and Ontologies - Deep Learning.

UNIT V   12 Hours
Big Data and Cognitive Computing : Dealing with human-generated data, defining big data, architectural foundation, analytical data warehouses, Hadoop, data in motion and streaming data, integration of big data with traditional data

Text Books
1 Hurwitz, Kaufman, and Bowles, Cognitive Computing and Big Data Analytics, Wiley, Indianapolis, IN, 2005, ISBN: 978-1-118-89662-4.
1   Masood, Adnan, Hashmi, Adnan ,Cognitive Computing Recipes-Artificial Intelligence Solutions Using Microsoft Cognitive Services and TensorFlow, 2015
2   Judith H Hurwitz, Marcia Kaufman, Adrian Bowles , "Cognitive computing and Big
3   Data Analytics" , Wiley

Reference Books
1 Peter Fingar, Cognitive Computing: A Brief Guide for Game Changers, PHI Publication, 2015
2 GerardusBlokdyk ,Cognitive Computing Complete Self-Assessment Guide, 2018
3 Rob High, Tanmay Bakshi, Cognitive Computing with IBM Watson: Build smart applications using Artificial Intelligence as a service, IBM Book Series, 2019

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.

UNITII   **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.

UNITIII   **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 Struture. 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. Addision 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 MclverMcHoes

Semester VI

CourseCode	R Programming		Credits 4
LectureHours:(L) perweek 5	TutorialHours: (T)perweek	LabPractice Hours: (P)perweek	Total:(L+T+P) perweek 5
CourseCategory: Pre-requisite	Year&Semester:		AdmissionYear:

LearningObjectives:(forteachers:whattheyhavetodointheclass/lab/field)
- To understand and able to use basic programming concepts

- To automate data analysis, working collaboratively and openly on code

- To know how to generate dynamic documents

CourseOutcomes:(forstudents:Toknowwhattheyaregoingtolearn)
CO1:To understand the problem solving approaches
CO2: To learn the basic programming constructs in R Programming
CO3:To learn the basic programming constructs in R Programming
CO4:To use R Programming data structures - lists, tuples, dictionaries.
CO5:To do input/output with files in R Programming.

Units	Contents	RequiredHours
I	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	15

II	**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 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	15
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	15

	Distributions R PROGRAMMING	
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	1 5

LearningResources:

- **RecommendedTexts**
  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
- **ReferenceBooks**

1. Garrett Grolemund, 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.

- **Webresources**

CourseCode:	Data Communication & Networking		Credits:4
LectureHours:(L) perweek: 5	TutorialHours: (T)perweek	LabPractice Hours: (P)perweek	Total:(L+T+P) perweek: 4
CourseCategory:	Year&Semester:		AdmissionYear:

LearningObjectives:

- To understand the concept of Data communication and Computer network

- To get a knowledge on routing algorithms.

- To impart knowledge about networking and inter networking devices
- To gain the knowledge on Security over Network communication

CourseOutcomes:(forstudents:Toknowwhattheyaregoingtolearn)

CO1: To Understand the basics of Network architecture, OSI & TCP/IP reference models

CO2: To gain knowledge on Telephone systems and Satellite communications

CO3: To impart the concept of Elementary data link protocols

CO4: To analyze the characteristics of Routing and Congestion control algorithms

CO5: To understand network security & defines protocols such as FTP, HTTP, Telnet, DNS

Units	Contents	RequiredHours
I	Introduction – DATA COMMUNICATIONS – NETWORKS - PROTOCOLS AND STANDARDS - Network Models - THE OSI MODEL - TCP/IP PROTOCOL SUITE	12
II	Bandwidth Utilization: Multiplexing and Spreading – MULTIPLEXING - SPREAD SPECTRUM Transmission Media - GUIDED MEDIA - UNGUIDED MEDIA: WIRELESS Svvitching - CIRCUIT-SWITCHED NETWORKS	12

	- DATAGRAM NETWORKS - VIRTUAL-CIRCUIT NETWORKS	
III	Data Link Layer: Error Detection and Correction - Types of Errors -BLOCK CODING - CYCLIC CODES – CHECKSUM	1 2
IV	Network Layer: Internet Protocol – IPv4 – IPv6 -Delivery, Forwarding, and Routing Transport Layer - PROCESS-TO-PROCESS DELIVERY - USER DATAGRAM PROTOCOL (UDP) – TCP – SCTP - Congestion Control and Quality of Service	1 2
V	Application Layer: DO/nain Name Svstem - DOMAIN NAME SPACE - Remote Logging, Electronic Mail, and File Transfer – HTTP - SIMPLE NETWORK MANAGEMENT PROTOCOL (SNMP)	1 2
Extended Professio nalCompo nent(isap artof Internalc omponent only,	Questionsrelatedtotheabovetopics,fromvariou scompetitiveexaminationsUPSC/TRB/NET/U GC– CSIR/GATE/TNPSC/otherstobesolved(Tobedi scussedduringtheTutorialhour) Notto be included inthe ExternalExaminationquestion paper	
Skillsacq uired	Knowledge,ProblemSolving,Analyticalability, ProfessionalCompetency,ProfessionalCommu nicationandTransferrable Skill	

LearningResources:

- **RecommendedTexts**
- B. A. Forouzan, "Data Communications and Networking", Tata McGraw Hill, 4th Edition, 2017.

- **ReferenceBooks**
1. A. S. Tanenbaum, "Computer Networks", 4th Edition, Prentice-Hall of India, 2008.
2. F. Halsall, "DataCommunications, Computer Networks and Open Systems", Pearson Education, 2008.

3. D. Bertsekas and R. Gallagher, "Data Networks", 2nd Edition, PHI, 2008.

4. Lamarca, "Communication Networks", Tata McGraw- Hill, 2002

- **Webresources**

CourseCode	R Programming Laboratory		Credits 4
LectureHours:(L) perweek	Tutorial Hours: (T)perweek	LabPractice 4 Hours: (P)perweek	Total:(L+T+P) perweek
CourseCategory:	Year&Semester:		AdmissionYear:
Pre-requisite			

LearningObjectives:(forteachers:whattheyhavetodointheclass/lab/field)
- Acquire programming skills in core R Programming
- Acquire Object-oriented programming skills in R Programming.
- Develop the skill of designing graphical-user interfaces (GUI)
- Acquire R Programming skills to move into specific branches

CourseOutcomes:(forstudents:Toknowwhattheyaregoingtolearn)

CO1:To understand the problem solving approaches

CO2: To learn the basic programming constructs in R Programming

CO3:To practice various computing strategies for R Programming -based solutions to real world problems

CO4:To use R Programming data structures - lists, tuples, dictionaries.

CO5:To do input/output with files in R Programming

LIST OF EXERCISES:

1. Program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.

2. Program, to find the area of rectangle, square, circle and triangle by accepting suitable input
   parameters from user.

3. Write a program to find list of even numbers from 1 to n using R-Loops.

4. Create a function to print squares of numbers in sequence.

5. Write a program to join columns and rows in a data frame using cbind() and rbind() in R.

6. Implement different String Manipulation functions in R.

7. Implement different data structures in R (Vectors, Lists, Data Frames)

8. Write a program to read a csv file and analyze the data in the file in R.

9. Create pie chart and bar chart using R.

10. Create a data set and do statistical analysis on the data using R.

11. Program to find factorial of the given number using recursive function

12. Write R program to count the number of even and odd numbers from array of N numbers

CourseCode	Project		Credits:4
LectureHours:(L) perweek	TutorialHours: (T)perweek	LabPractice Hours: 6	Total:(L+T+P) perweek:6
CourseCategory:	Year&Semester:		AdmissionYear:
Units	Contents		RequiredHours
	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.		
Extended Professio nalCompo nent(isap artof Internalc omponent only,	Questionsrelatedtotheabovetopics,fromvariou scompetitiveexaminationsUPSC/TRB/NET/U GC– CSIR/GATE/TNPSC/otherstobesolved(Tobedi scussedduringtheTutorialhour) Notto be included inthe ExternalExaminationquestion paper		
Skillsacq uired	Knowledge,ProblemSolving,Analyticalability, ProfessionalCompetency,ProfessionalCommu nicationandTransferrable Skill		

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst.	Marks		
									CIA	External	Total
	Pattern Recognition	Specific Elective	Y	4	-	-	3	4	75	25	100

	Course Objective										

CO1	To learn the fundamentals of Pattern Recognition techniques
CO2	To learn the various Statistical Pattern recognition techniques
CO3	To learn the linear discriminant functions and unsupervised learning and clustering
CO4	To learn the various Syntactical Pattern recognition techniques
CO5	To learn the Neural Pattern recognition techniques

UNIT	Details	No. of Hours	Course Objective
I	**PATTERN RECOGNITION OVERVIEW: Pattern recognition, Classification and Description-Patterns and feature Extraction with Examples-Training and Learning in PR systems-Pattern recognition Approaches**	12	CO1
II	**STATISTICAL PATTERN RECOGNITION: Introduction to statistical Pattern Recognition-supervised Learning using Parametric and Non-Parametric Approaches.**	12	CO2
III	**LINEAR DISCRIMINANT FUNCTIONS AND UNSUPERVISED LEARNING AND CLUSTERING: Introduction-Discrete and binary Classification Problems-Techniques to directly Obtain linear Classifiers - Formulation of Unsupervised Learning Problems-Clustering for unsupervised**	12	CO3

	learning and classification			
IV	**SYNTACTIC PATTERN RECOGNITION:** Overview of Syntactic Pattern Recognition-Syntactic recognition via parsing and other grammars–Graphical Approaches to syntactic pattern recognition-Learning via grammatical inference.	12	CO4	
V	**NEURAL PATTERN RECOGNITION:** Introduction to Neural Networks-Feedforward Networks and training by Back Propagation-Content Addressable Memory Approaches and Unsupervised Learning in Neural PR	12	CO5	
	Total			

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
1	understand the concepts, importance, application and the process of developing Pattern recognition over view	PO1
2	to have basic knowledge and understanding about parametric and non-parametric related concepts.	PO1, PO2
3	To understand the framework of frames and bit images to animations	PO4, PO6
4	Speaks about the multimedia projects and stages of requirement in phases of project.	PO4, PO5, PO6
5	Understanding the concept of cost involved in multimedia planning, designing, and producing	PO3, PO8

Text Book	
1	Robert Schalkoff, "Pattern Recognition: Statistical Structural and Neural Approaches", John wiley& sons.
2	Duda R.O., P.E.Hart& D.G Stork, " Pattern Classification", 2nd Edition, J.Wiley.
3	Duda R.O.& Hart P.E., "Pattern Classification and Scene Analysis", J.wiley.
4	Bishop C.M., "Neural Networks for Pattern Recognition", Oxford

	University Press.
Reference Books	
1.	1. Earl Gose, Richard johnsonbaugh, Steve Jost, "Pattern Recognition and Image Analysis", Prentice Hall of India, Pvt Ltd, New Delhi.
Web Resources	
1.	https://www.geeksforgeeks.org/pattern-recognition-introduction/
2.	https://www.mygreatlearning.com/blog/pattern-recognition-machine-learning/

Mapping with Programme Outcomes:

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

S-Strong   M-Medium L-Low

CourseCode	Robotics and Its Applications		Credits 3
LectureHours:(L) perweek 4	TutorialHours: (T)perweek	LabPractice Hours: (P)perweek	Total:(L+T+P) perweek 4
CourseCategory:	Year&Semester:		AdmissionYear:

LearningObjectives:

- **To make the students familiar with the various drive systems of robots, sensors and their applications in robots**
- **To introduce the parts of robots, basic working concepts and types of robots**

CourseOutcomes:(forstudents:Toknowwhattheyaregoingtolearn)

CO1:Describe the different physical forms of robot architectures

CO2: Kinematically model simple manipulator and mobile robots

CO3:Mathematically describe a kinematic robot system.

CO4: Analyze manipulation and navigation problems using knowledge of coordinate frames, kinematics, optimization, control, and uncertainty.

CO5:Program robotics algorithms related to kinematics, control, optimization, and uncertainty.

Units	Contents	RequiredHours
I	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.	12
II	Actuators and sensors :Types of actuators,	12

	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 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.	12
IV	Path Planning :Introduction, path planning-overview-road map path planning-cell decomposition path planning potential field path planning-obstacle avoidance-case studies	12
	Vision system: Robotic vision systems-image representation-object recognition-and categorization-depth measurement- image data compression-visual inspection-software considerations	
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	12

	handling-continuous arc welding-spot welding-spray painting-assembly operation-cleaning-etc.	
Extended Professio nalCompo nent(isap artof Internalc omponent only,	Questionsrelatedtotheabovetopics,fromvariou scompetitiveexaminationsUPSC/TRB/NET/U GC– CSIR/GATE/TNPSC/otherstobesolved(Tobedi scussedduringtheTutorialhour) **Notto be included in the ExternalExaminationquestion paper**	
Skillsacq uired	Knowledge,ProblemSolving,Analyticalability, ProfessionalCompetency,ProfessionalCommu nicationandTransferrable Skill	

LearningResources:

- **RecommendedTexts**
  1. RicharedD.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**

COMPUTER GRAPHICS

L	T	P	C
4	0	0	4

COURSE OBJECTIVE:

1. To develop skills and knowledge about computer graphics
2. To understand 2D and 3D transformations.

Unit I

Overview of Graphics System: Video Display Devices – Input Devices - Hard Copy Devices – Graphics Software.

Output Primitives: Points and Lines –Line drawing algorithms – DDA algorithm- Bresenham's line algorithm- Circle drawing algorithms: properties of circles – Mid-point circle algorithm

Unit II

Attributes of Output Primitives: Line attributes – Curve attributes – Character attributes.

Two- Dimensional Geometric Transformation: Basic Transformations – Matrix Representations and homogenous coordinates – Composite and other Transformations.

Unit III

Two-Dimensional Viewing: The viewing pipeline, viewing co-ordinate reference frame – Window to view port co-ordinate transformation – Two-dimensional viewing function.

Clipping Operations: Point clipping – Line clipping (only Cohen-Sutherland line clipping) – Polygon Clipping (only Sutherland-Hodgeman polygon clipping).

Unit IV

Interactive Input Methods: Input of graphical data – Input functions – Three dimensional display methods. Three Dimensional Geometric and Modeling Transformations: Translation - Rotation - Scaling

Unit V

Three Dimensional Viewing: Viewing Pipeline, Projections. Visible-surface deduction methods: Back- face deduction – Depth buffer method- A-Buffer Method – Scanline Method.

COURSE OUTCOME:

On successful completion of the course, the learners will be able to

1. Explore the core concepts of computer graphics
2. Analyze viewing, projection, modelling and transformation
3. Interpret the mathematical foundation of the concepts of computer graphics.
4. Understand the working of graphics display devices
5. Appreciate the working of clipping algorithms

CO - PO - PSO Mapping

COMPUTER GRAPHICS											
CO	**PO**					**PSO**					**COGNITIVE LEVEL**
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	
CO 1	S	S	S	M	S	S	S	S	S	S	K - 2
CO 2	S	S	S	S	S	S	S	S	M	S	K - 6
CO 3	S	M	S	S	S	S	S	S	S	S	K - 4
CO 4	S	M	M	S	S	S	S	S	S	S	K - 6
CO 5	S	S	M	S	S	S	S	S	S	S	K – 6

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

Text Book:

Computer Graphics C version, Second Edition, Donald Hearn, M.Pauline Baker, Pearson Publications.

Reference Books

1. Express Learning - Computer Graphics and Multimedia-ITL Education Solution Ltd.

2. Computer Graphics-A programming Approach 2/e-Steven Harrington-Mc Graw Hill Education Private Limited.

3. Computer Graphics, Multimedia and Animation - Malay K. Pakhira – PHI

CourseCode	Simulation and Modeling		Credits 3
LectureHours:(L) Per week 4	Tutorial Hours: (T)per week	LabPractice Hours: (P)perweek	Total:(L+T+P) perweek
CourseCategory: Pre-requisite	Year&Semester:		AdmissionYear:

LearningObjectives:(forteachers:whattheyhavetodointheclass/lab/field)
        In this course, modeling and simulation (M&S) methodologies considering the theoretical aspects. A wide range of Modeling and Simulation concepts that will lead you to develop your own M&S applications. Students learn the methodologies and tools for simulation and modeling of a real time problem/ mathematical model.

CourseOutcomes:(forstudents:Toknowwhattheyaregoingtolearn)

CO1:Introduction To Modeling & Simulation, Input Data Analysis and Modeling.

CO2: Random Variate and Number Generation. Analysis of Simulations and methods.

CO3:Comparing Systems via Simulation

CO4: Entity Body Modeling, Visualization, Animation.

CO5: Algorithms and Sensor Modeling.

Recap:(notforexamination)Motivation/previouslecture/relevantportionsrequiredforthe
course)[Thisisdoneduring2Tutorialhours)

Units	Contents	RequiredHours
I	Introduction To Modeling & Simulation – – Complexity Types – Model Types – Simulation Types – M&S Terms and Definitions Input Data Analysis – Simulation Input Modeling – Input Data Collection - Data Collection Problems - – Input Modeling Strategy - Histograms -Probability	12

	Distributions - Selecting a Probability Distribution.	
II	Random Variate Generation – Random Numbers – Random Number Generators – General principles – Inverse Transform Method –Acceptance Rejection Method –Composition Method –Relocate and Rescale Method - Specific distributions-Output Data Analysis – Introduction -Types of Simulation With Respect to Output Analysis - Stochastic Process and Sample Path - Sampling and Systematic Errors - Mean, Standard Deviation and Confidence Interval - Analysis of Finite-Horizon Simulations - Single Run - Independent Replications - Sequential Estimation – Analysis of Steady-State Simulations - Removal of Initialization Bias (Warm-up Interval) - Replication-Deletion Approach - Batch-Means Method .	12
III	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	12

	Approach	
IV	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.	1 2
V	Optimization Algorithms – Genetic Algorithms – Simulated Annealing Examples: Sensor Systems Modeling – Human Eye Modeling – Optical Sensor Modeling – Radar Modeling.	1 2

LearningResources:

- **RecommendedTexts**

  1. Jy 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.

- **Webresources**

CourseCode:	Graph Theory and its applications		Credits: 3
LectureHours:(L) perweek: 4	TutorialHours: (T)perweek	LabPractice Hours: (P)perweek	Total:(L+T+P) perweek: 4
CourseCategory: Elective	Year&Semester: III Year & VI Semester	AdmissionYear:	
Pre-requisite	Basic knowledge in data and representations		
Linksto otherCourses			

LearningObjectives:(forteachers:whattheyhavetodointheclass/lab/field)

1. Definition of Graph, sub graph their representations, degree and algebraic operations.
2. Connected graphs, weighted graphs and shortest paths
3. Trees: Characterizations, spanning tree, minimum spanning trees
4. Eulerian and Hamiltonian graphs: Characterization, Necessary and sufficient conditions
5. Special classes of graphs: Bipartite graphs, line graphs, chordal graphs.

CourseOutcomes:(forstudents:Toknowwhattheyaregoingtolearn)

CO1: To Introduce the fundamental concepts in graph theory Graphs, subgraphs, walks, Euler graphs, Hamiltonian Paths Tree Properties , Hamiltonian paths and circuits

CO2: Understanding the concepts of Circuits, Cut set and its Properties, Network Flows, Isomorphism and Combinatorial and Planar Graphs.

CO3: Applying the concept of Colouring with Chromatic Number, Directed Graphs, Matching, Covering Pattern and Euler Graphs

CO4: Analysing the Various Concepts of Representation of Graphs, Euler Paths Circuit, Kruskals and Prims Algorithms, Connected Components.

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.

Recap:(notforexamination)Motivation/previouslecture/relevantportionsrequiredforthe

course)[Thisisdoneduring2Tutorialhours)

Units	Contents	RequiredHours
I	**INTRODUCTION:** Graph-mathematical definition- 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 Directed Graph – undirected graphs	1 2
II	**CONNECTIVITY AND PLANARITY:** Introduction	1

	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.	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	GRAPH: REPRESENTATION & TRAVERSAL: 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 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	

Extended ProfessionalComponent	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminationsUPSC/TRB/NET/UGC–CSIR/GATE/TNPSC/otherstobesolved,Notto be included in the ExternalExamination question paper	
Skillsacquiredfrom the Course	Knowledge,ProblemSolving,Analyticalability, ProfessionalCompetency,ProfessionalCommunicationandTransferrable Skill	

LearningResources:

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

SOFT SKILLS FOR EMPLOYABILITY

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
	-	-	-	II	2	-	0	100	100
Learning Objectives									
LO1	Thecourse aimsto acquaintthestudentswithsome very relevantand 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,appearingforinterviewsandhandlingbothaftercampusissues thatpeoplenormallyfacewhilesetting foot on the professional sphere								
Prerequisites: None									
Unit	Contents								
I	MindingtheMind:ThisUnitwillfocusonmeditationtechniquesand mentalconditioning 1.1UnderstandingYOU,whichdenotes'YourOwnUniverse',whereinap ersonwill beencouragedtoself-introspectandcriticallyanalyseoneself. 1.2Self-Analysis 1.3IceBreaker 1.4WarmingUp								
II	TheCharmingSkills:ThisUnitwillfocusontrainingthestudentsto developandenhancetheirsocialskills,etiquetteandbasicpersonalgroo ming. 2.1Introduction 2.2SocialSkill 2.3Etiquette(Thiswillbebroad-baseddelvingonvariousetiquettesnecessaryfor variedareassuchasgeneralconversation,tableparty,officialmeetsand socialmedia)								

III	**TheCommunicationMechanism:ThisUnitwillfocuson developingskillsinbothverbalandnon-verbalcommunications(bodylanguage, framingemails,andsocialmediacommunications).Moreover,inputson importanceofgraphologywillbetaught.** **3.1IntroductiontoCommunication** **3.2TypesofCommunication** **3.3PublicSpeaking** **3.4GroupConversation** **3.5Letterwritingandemail**

IV	**TheNegotiator: This unit willfocuson inculcatinggoodnegotiationsandconflictmanagementskills.**
	3.6**IntroductiontoNegotiation**
	   3.6.1**TheNegotiationClockFace**
	   3.6.2**AssertivenessMatters**
	   3.6.3**TraitsofNegotiations**
	   3.6.4**FactorsthatMakeaDifference**
	   3.6.5**TacticsandValues**

V	**CampustoCorporate:ThisUnitwill focusontrainingaboutpreparation of resumes, appearing for interviews and handling both after campus issues that people normally face while setting foot on the professional sphere.** 4.1**TheDoorstep** 4.2**ResumePreparation/PortfolioManagement** 4.3**Interviews:TheDifferentTypesandHowtofacethesame**

CO	Course Outcomes
CO1	**The students will be able to appreciate the significanceofsoftskills.**
CO2	**The students will be able to get the personalityaugmentationwithreferencetotheirpersonallife.**
CO3	**The students will be able to get the personalityaugmentationwithreferencetotheirprofessionallife.**
CO4	**The students will get the professional efficiency.**
CO5	**Thecoursemodulewill enhancetheemployabilityquotientofthestudents**
	Textbooks
1.	*Bezborah,P.*,SoftSkillsandPersonalityDevelopment.Banalata,Dibrugarh.

2.	*HartelyC.B..,TheGentlemen'sBookofEtiquetteandManualofPoliteness* .JuliaMiller.
3.	*Rai,U.,EnglishLanguageCommunicationSkills,HimalayaPublishingHo* use
ReferenceBooks	
1.	*Amen,K.K.andRuiz,M.S.,HandWritingAnalysis–* TheCompleteBasicBook.NewPageBooks, New Jersey.
2.	*Gates,S.,TheNegotiationBook.TJInternationalLimited,Cornwall.*
3.	*Wainright.G.R.,UnderstandBodyLanguage.HodderEducation,London.*

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	3	2	2
CO2	3	3	2	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	2	3	2	2
CO5	3	3	2	3	2	2
Weightage of course contributed to each PSO	15	14	11	15	10	10

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 typecasting & 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/

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 and 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 Rdition, 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, ITL 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.