MANONMANIAM SUNDARANAR UNIVERSITY

B.Sc.,
ARTIFICIAL INTELLIGENCE

SYLLABUS

2024 – 2025

Introduction

B.Sc. Artificial Intelligence

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 Data Science 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." Most of the work on building such kinds of systems has taken place in the field called "Artificial Intelligence (AI)." AI systems are developed, undergo experimentation, and are improved.

The course is enabled to include several interdisciplinary areas like: Machine Learning, Deep Learning, Natural Language Processing, Robotics, Artificial Intelligence in Business and Society and The Future of Artificial Intelligence, Operating systems, Databases, Business Intelligence, Big Data, Probability and Statistics, Data Optimization, Statistical Simulation and Data Analysis, Management Decision Analysis, Decision Models and Predictive Analysis. Artificial Intelligence Has Gained Paramount Importance in the computer science domain. 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 programme is designed so that students have in-depth knowledge of the many approaches, aptitudes, methodologies, and instruments needed to deal with corporate data.

LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK GUIDELINES BASED REGULATIONS FOR UNDER GRADUATE PROGRAMME	
Programme:	**B.Sc., Artificial Intelligence**
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; Communicate with others using appropriate media; confidently share one's views; 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; 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 and apply 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; 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.**

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PSO 1	S	S	L	S	S	S	M	S
PSO 2	S	S	S	S	S	L	S	S
PSO3	M	S	M	S	M	S	L	S
PSO 4	S	S	S	S	S	S	S	S
PSO 5	L	S	S	S	S	S	S	M

PSO 5: Enhance skills of analytical and critical thinking to analyze effectiveness of economic policies.

S – Strong, M- Medium, L- 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 education and scientific front, practical training, devising mathematical models and algorithms for providing solutions to real life situations. The curriculum also facilitates peer learning with advanced mathematical topics in the final semester, catering to the needs of stakeholders with research aptitude.

- ➢ The General Studies and Mathematics based problem solving skills are included as mandatory components in the 'Training for Competitive Examinations' course at the final semester, a first of its kind.

- ➢ The curriculum is designed so as to strengthen the Industry-Academia interface and provide more job opportunities for the students.

- ➢ The Industrial Statistics course is newly introduced in the fourth semester, to expose the students to real life problems and train the

students on designing a mathematical model to provide solutions to the industrial problems.

➢ The Internship during the second year vacation will help the students gain valuable work experience that connects classroom knowledge to real world experience and to narrow down and focus on the career path.

➢ Project with viva-voce component in the fifth semester enables application of conceptual knowledge to practical situations. The 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.

ValueadditionsintheRevampedCurriculum:

Semester	NewlyintroducedComponents	Outcome/ Benefits
I	FoundationCourse To ease the transition of learning from higher secondary to higher education, providing an overview of the pedagogy of learning Literature and analyzing the world through the literary lens gives rise to a new perspective.	➢ Instill confidence ➢ Createinterestforthesubject
I,II,III,IV	SkillEnhancementpapers(Discipline centric /Generic/Entrepreneurial)	➢ Industry readygraduates ➢ Skilledhumanresource ➢ Equippedwithessentialskillsto be employable
		➢ Trainingonlanguageandcommunication skills enable to gain knowledge and exposureinthecompetitiveworld.
		➢ Discipline centric skillwillimprovetheTechnical know-how ofsolvingreallife problems.
	Electivepapers	➢ Strengthening the domainknowledge ➢ Developingaresearchframework and presenting their independent and Intellectual ideaseffectively.

Skillsacquiredfromthe Courses	Knowledge, Problem Solving, Analytical ability,ProfessionalCompetency,Professio nalCommunicationandTransferrable Skill

2024-'25   Artificial Intelligence

Semester-I

Part	List of Courses	Credit	Hours per week (L/T/P)
Part-I	Language – Tamil	3	6
Part-II	English	3	6
Part-III	Core –Programmingwith C++	4	5
	Core Practical -- C++ Programming Laboratory	4	5
	Elective EC1- Numerical Methods/ Applied Mathematics	3	4
Part-IV	SEC 1 Practical -PHP Scripting Laboratory	2	2
	Foundation Course FC Digital Logic	2	2
		21	30

Semester-II

Part	List of Courses	Credit	Hours per week (L/T/P)
Part-I	Language – Tamil	3	6
Part-II	English	3	4
Part-III	Core Artificial Intelligence & Knowledge Representation	4	5
	Core Practical: Data Structures Laboratory	4	5
	Elective Course 1: Optimization Techniques / Computational Intelligence	3	4
Part-IV	SEC2 : Data Structures	2	2
	SEC-3 : Practical –Multimedia Laboratory	2	2
	Naan Muthalvan – Language Proficiency for Employability	2	2
		23	30

Semester III

Part	List of Courses	Credit	No. of Hours
Part-1	Language – Tamil	3	6
Part-2	English	3	6

Part	List of Courses	Credit	No. of Hours
Part-3	Core Course- Programming with Python	4	4
	Core Practical Python Programming Laboratory	3	4
	Elective: Data Science & Big Data/ Operating Systems	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 Practical: Data Base Management Systems Laboratory	3	4
	Elective- Data Mining & Data Warehousing / Bio-Inspired Computing	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	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 Computer Networks	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 Deep Learning/ Cognitive Computing	3	4
Part-4	Naan Muthalvan	2	2
	Internship / Industrial Visit / Field Visit/ Knowledge Updation Activity	2	-
		28	30

Semester-VI

Part	List of Courses	Credit	No. of Hours
Part-3	Core Course 6 1 Data Analytics using R	4	5
	Core Course 6 2 Robotics& its Applications	4	5
	Core Practical 6 1 Data Analytics using R Laboratory	4	4
	Elective 6.1 Network Security/ Advanced Excel	3	4
	Elective 6.2 User Interface Design/ Pattern Matching	3	4
	Project	4	6
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/ 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)

Semester	Title of the Paper
II	Soft Skills for Employability
III	Digital Skills for Employability – Office Fundamentals
IV	Web Designingwith 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
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 ofcoursecontributedtoeachPSO	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, queu to solve various computing problems in C++ by incorporating OOP
CO5	Develop a program in C++ with the concepts of object oriented pr to 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 of course contributed to each PSO	15	14	11	15	15	10

EC1: Elective Course 1 A NUMERICAL METHODS

COURSE OBJECTIVE:

1. To introduce the concept of solving equations using different methods

L	T	P	C
4	0	0	3

2. To understand the use of Assignment and Transportation problems

Unit I:
Curve Fitting: Introduction, Method of Least squares, Curve Fitting, Fitting a Straight Line

Unit II:
Solution of Algebraic and Transcendental Equations: Bisection method, Regula Falsi method, Newton Raphson Method

Unit III:
Solution of Simultaneous Linear Equations: Solution of Simultaneous Linear Equations: Gauss Elimination method, Gauss-Jordan method, Gauss Seidel Method, Jacobi's method

Unit IV:
Numerical Differentiation & Integration: Differentiation: Using Newton's Forward Difference, Newton's Backward Difference, Newton's Divided Difference (First Order Differentiation only)
Integration: Using Trapezoidal rule, Simpson's 1/3 & Simpson's 3/8 rules

Unit V:
Solution of Ordinary Differential Equations: Runge-Kutta 2nd Order and 4th Order methods, Predictor-Corrector Methods: Milne and Adam's methods.

COURSE OUTCOME:
On successful completion of the course, the learners will be able to
1. Obtain numerical solutions of algebraic and transcendental equations
2. Solve system of linear equations numerically using direct and iterative methods
3. Solve ordinary differential equations
4. Compute integration using Simpson's & Trapezoidal Rule
5. Apply numerical methods in real life problems

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	S	K – 2
CO 2	S	S	M	S	S	S	S	S	S	S	K – 6
CO 3	S	S	M	S	S	S	S	S	S	S	K – 4
CO 4	S	S	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 BOOKS

1. B.S. Grewal, "Numerical Methods in Engineering & Science", Khanna Publishers, Fifth Edition, April 1999.

2. M.K. Venkataraman, "Numerical Methods in Science & Engineering", National Publishing Co., 2005'

APPLIED MATHEMATICS

L T P C
4 0 0 3

UNIT I: Linear Algebra: Matrix, Representation, Examples of matrix Data, Vectors, examples, Representation, Matrix Addition, Scalar Multiplication, Matrix 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 V: 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	H	H	H	M	H	H	H	M	H	M	K – 1
CO 2	H	H	M	H	H	H	H	H	M	H	K – 4
CO 3	M	H	M	H	H	H	H	M	H	H	K – 5
CO 4	H	M	M	H	H	H	M	H	H	H	K – 3
CO 5	H	H	M	H	H	H	H	H	H	H	K – 5

(Table title: APPLIED MATHEMATICS)

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

Books:

1. Jason Lachniet, "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	II	2	2	50	50	100

Learning Objectives	
LO1	Toenablethestudentstounderstand,analyzeandbuilddynamicwebpagesusing PHP and jQuerywith MySql database

	Contents	No. of Hours
	Introduction to PHP: 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/jQueryNotes.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 ofcoursecontributedt oeachPSO	15	11	11	12	11	13

Digital Logic

L T P C
2 0 0 2
Objective: To understand the concept of digital systems, to operate on various number systems
and simplify Boolean functions and to distinguish logical and combinational circuits.

Unit – I: Number Systems   **6 hours**
Binary Number System – Binary to Decimal Conversion – Decimal to Binary Conversion – Octal
Numbers – Hexadecimal Numbers
Unit – II: Codes and Digital Logic   **6 hours**
The ASCII Code – The Excess-3 Code – The Gray Code. Digital Logic: Basic gates NOT, OR , AND – Universal Logic Gates NOR,NAND

Unit – III: Combinational Logic Circuits   **6 hours**
Boolean Laws and Theorems – Sum of Products Method – Truth Table to Karnaugh Map – Pairs,
Quads and Octets – Karnaugh Simplifications – Don't Care Conditions – Product of Sums
Unit – IV: **6 hours**
Binary Arithmetic: Unsigned Binary Numbers – Sign-Magnitude Numbers — 2's Complement - Binary Addition – Binary Subtraction
Unit – V:
Flip-Flops   **6 hours**
RS Flip Flops – D Flip Flops - JK Flip - T Flip flop - JK Master Slave Flip Flops.

Text Book:
Digital Principles and Applications, by Albert Paul Malvino& Donald P.Leach, Seventh Edition, Tata
McGraw Hill Education Private Limited
Reference Book:
1. Fundamentals of Digital Circuits, A.Anand Kumar, Second Edition, PHI Learning Private Limited
2. Digital design, M.Morris Mano, Third Edition, Pearson Education

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Artificial Intelligence & Knowledge Representation	Core	4	1	-	II	4	5	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	Introduction: Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graph structures, State space representation, Search graph and Search tree	15
II	Search Algorithms : Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first search, A* algorithm, Game Search	15
III	Probabilistic Reasoning : Probability, conditional probability, Bayes Rule, Bayesian Networks- representation, construction and inference, temporal model, hidden Markov model.	15
IV	Reinforcement Learning : Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning	15
V	Parallel and Distributed AI: Psychological Modelling – Parallelism in Reasoning Systems – Distributed Reasoning Systems - Hopfield networks, neural networks	15
	Total	75

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	Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach" , 3rd Edition, Prentice Hall.
2	Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill
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

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 ofcoursecontribute dto EachPSO	15	12	10	11	12	13

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	DATA STRUCTURES LABORATORY		-	-	5	II	4	50	50	100

Objectives

To predict the performance of different algorithms in order to guide design decisions, provide theoretical estimation for the required resources of an algorithm to solve a specific computational problem

LIST OF PROGRAMS	Required Hour
1. Perform stack operations 2. Perform queue operations 3. Perform tree traversal operations 4. Search an element in an array using linear search. 5. Search an element in an array using binary search 6. Sort the given set of elements using Merge Sort. 7. Sort the given set of elements using Quick sort. 8. Sort the given set of elements using Insertion sort. 9. Create a Linked list and perform insertion and deletion 10. Create a Doubly Linked list and perform insertion and deletion	**75**

Course Outcomes	
CO	On completion of this course, students will
CO1	To understand the concepts of Linked List, Stack and Queue.
CO2	Concepts of Trees and Graphs. Perform traversal operations on Trees and Graphs. To enable the applications of Trees and Graphs.
CO3	To apply searching and sorting techniques
CO4	To determine the concepts of Greedy Method To apply searching techniques.
CO5	Usage of File handlings in python, Concept of reading and writing files, Do programs using files.

LearningResources:

- **RecommendedTexts**

1. Ellis Horowitz , Sartaj Sahni, Susan Anderson Freed, Second Edition , "Fundamentals of Data in C", Universities Press

2. E. Horowitz, S. Sahni and S. Rajasekaran,   Second Edition ,"Fundamentals of Computer Algorithms " Universities Press

- **ReferenceBooks**

1.   Seymour Lipschutz ,"Data Structures with C", First Edition, Schaum's outline series in computers, Tata McGraw Hill.

2.   .2. R.Krishnamoorthy and G.Indirani Kumaravel, Data Structures using C, Tata McGrawHill – 2008.

3.   A.K.Sharma, Data Structures using C , Pearson Education India,2011.

4.   . G. Brassard and P. Bratley, "Fundamentals of Algorithms", PHI, New Delhi, 1997.

5.   4, . A.V. Aho, J.E. Hopcroft, J.D. Ullmann,, "The design and analysis of Computer

6.   Algorithms", Addison Wesley, Boston, 1974

7.   5. Thomas H. Cormen, C.E. Leiserson, R L.Rivest and C. Stein, Introduction to Algorithms, Third edition, MIT Press, 2009

8.   Sanjoy Dasgupta, C.Papadimitriou and U.Vazirani , Algorithms , Tata McGraw-Hill, 2008.

Course Outcomes	
CO	On completion of this course, students will
CO1	Implement data structures using C
CO2	Implement various types of linked lists and their applications
CO3	Implement Tree Traversals
CO4	Implement various algorithms in C
CO5	Implement different sorting and searching algorithms

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

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

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

Course objectives:

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

Course Outcome:

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

CO2. Analyze the usage of Sequencing Problems.

CO3. Evaluate 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.

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.	Marks		
									CIA	External	Total
	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 –	12

	Simple GA – General Genetic Algorithm – Operators in Genetic Algorithm	
	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
									Marks	
	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
	To apply searching and sorting techniques	PO1, PO2,

CO3		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.	

MULTIMEDIA LABORATORY (USING REACT)

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

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.

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

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	PROGRAMMING WITH PYTHON		4	-	-	II	4	25	75	100
Learning Objectives									

	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 – Defining own modules. Lists: Creating a list -Access values in List-Updating values in Lists-Nested lists -Basic list operations-List Methods.**	15
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	Marks		
								CIA	External	Total
	PYTHON PROGRAMMING LABORATORY	CCII	-	-	4	II	3	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.**
	Analyze various concepts of PYTHON language to solve the problem in an

| CO4 | 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

Data Science & Big Data   L – 4   C - 3

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 (HadoopDistributed 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 DataLearning 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

OPERATING SYSTEMS   L – 4   C - 3

UNIT I   **12 Hours**

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

UNIT II   **12 Hours**

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

UNIT III   **12 Hours**

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

UNIT IV   **12 Hours**

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

UNIT V   **12 Hours**

Mass-Storage Structure: Mass-Storage Structure-Disk Structure - Disk Scheduling - Disk Management -RAID 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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	CIA	External	Total
									Marks		
	Office Automation Laboratory	SEC		Y	2	I	2	2	50	50	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 – Data Manipulation Language – Insert – Delete – Update –Transaction Control Language – Commit – Rollback – Save Points.

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

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

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

CourseCode:	Data Mining and Data Warehousing		Credits:3
LectureHours:(L) perweek: 4	TutorialHours: (T)perweek	LabPractice Hours: (P)perweek	Total:(L+T+P) perweek: 4
CourseCategory: EC-6	Year&Semester :III& V		AdmissionYear:

LearningObjectives:(forteachers:whattheyhavetodointheclass/lab/field)

- **To provide the knowledge on DataMining and Warehousing concepts and techniques.**
- **Tostudythebasicconceptsofclusteranalysis**
- **Tostudyasetoftypicalclusteringmethodologies,algorithms, andapplications**

CourseOutcomes:(forstudents:Toknowwhattheyaregoingtolearn)

CO1:To understand the basic concepts and the functionality of the various data mining and data warehousing component

CO2: To know the concepts of Data mining system architectures

CO3:To analyse the principles of association rules

CO4: To get analytical idea on Classification and prediction methods.

CO5: To Gain knowledge on Cluster analysis and its methods.

Recap:(notforexamination)Motivation/previouslecture/relevantportionsrequired forthe

course)[Thisisdoneduring2Tutorialhours)

Units	Contents	RequiredHours
I	**DATA WAREHOUSING AND DATA MINING** **UNIT I: Data Warehousing and Online Analytical Processing** **Data Warehouse – Major Features of a Data Warehouse – Operational Database Systems and Data Warehouses – Three-tier Data Warehousing Architecture – Data Warehouse Models – Extraction, Transformation, and Loading –**	**1 2**

	Metadata Repository – Multidimensional Data Model – Schemas for Multidimensional Data Models – Concept Hierarchies – OLAP Operations.	
II	UNIT II: Data Mining Fundamentals Data Mining – Knowledge Discovery from Databases – Data Objects and Attribute Types – Mean, Median, and Mode – Range, Quartiles, and Interquartile Range – Outliers – Variance and Standard Deviation – Data Preprocessing – Major Tasks in Data Preprocessing – Forms of Data Preprocessing – Data Cleaning – Missing Values – Noisy Data – Data Cleaning as a Process.	12
III	UNIT III: Mining Frequent Patterns, Associations, and Correlations Market Basket Analysis – Frequent Itemsets, Closed Itemsets, and Association Rules – Apriori Algorithm – Pattern-Growth Approach for Mining Frequent Itemsets – Mining Frequent Itemsets Using the Vertical Data Format – Mining Closed and Max Patterns – Correlation Analysis.	12
IV	UNIT IV: Classification Classification – General Approach to Classification – Decision Tree Induction – Basic Algorithm for Inducing a Decision Tree from Training Tuples – Attribute Selection Measures: Information Gain – Gain Ratio – Gini Index.	12
V	UNIT V: Clustering Cluster Analysis – Requirements for Cluster Analysis – Overview of Basic Clustering Methods Partitioning Methods: k-means clustering – k-medoids clustering – Hierarchical Methods: Agglomerative versus Divisive Hierarchical Clustering – Balanced Iterative Reducing and	12

Clustering using Hierarchies – Chameleon – Probabilistic Hierarchical Clustering.	

LearningResources:

- **RecommendedTexts**
- Jiawei Han, Micheline Kamber and Jian Pei, Data Mining Concepts and Techniques, Third Edition, Morgan Kaufmann Publishers, 2012.

- /Han and M. Kamber, "Data Mining Concepts and Techniques", 2001, Harcourt India Pvt. Ltd, New Delhi.
- ReferenceBooks
- K.P. Soman, Shyam Diwakar, V. Ajay "Insight into Data Mining Theory and Practice ",
    Prentice Hall of India Pvt. Ltd, New Delhi
- Parteek Bhatia, 'Data Mining and Data Warehousing: Principles and Practical Techniques',
    Cambridge University Press, 2019

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

BIO-INSPIRED COMPUTING   L – 4   C - 3

OBJECTIVES:

- To Learn bio-inspired theorem and algorithms
- To Understand random walk and simulated annealing
- To Learn genetic algorithm and differential evolution
- To Learn swarm optimization and ant colony for feature selection
- To understand bio-inspired application in image processing

UNIT I INTRODUCTION
Optimisation, Modelling, and Simulation Problems Evolutionary Computing Evolutionary Algorithm Representation, Mutation, and Recombination Fitness, Selection, and Population Management

UNIT II RANDOM WALK AND ANEALING
Random variables - Isotropic random walks - Levy distribution and flights - Markov chains - step sizes and search efficiency
importance of randomization- Eagle strategy-Annealing and Boltzmann Distribution - parameters -SA algorithm - Stochastic Tunneling.

UNIT III GENETIC ALOGORITHMS AND DIFFERENTIAL EVOLUTION
Genetic Algorithms - Evolution Strategies - Evolutionary Programming - Genetic Programming - Learning Classifier Systems - Differential Evolution
Evolutionary Algorithm Parameters= EAs and EA Instances - Designing Evolutionary Algorithms

UNIT IV SWARM OPTIMIZATION Swarm intelligence - PSO algorithm - accelerated PSO - implementation - convergence analysis - binary PSO
Ant colony optimization -toward feature selection. – Bee colony optimization

UNIT V
FIREFLY ALGORITHM
The Firefly algorithm - - implementation - Cuckoo Search Algorithm – Bat Algorithm – Feature Selection

OUTCOME:
Upon completion of the course, the students should be able to

- Explain random walk and simulated annealing
- Implement and apply genetic algorithms
- Explain swarm intelligence and ant colony for feature selection
- Apply bio-inspired techniques in image processing.

Text Book
1. Xin-She Yang, "Nature Ispired Optimization Algorithm,Elsevier First Edition 2014

2. **Eiben,A.E.,Smith,James E, "Introduction to Evolutionary Computing", Springer 2015.**
3. **Yang ,Cui,XIao,Gandomi,Karamanoglu ,"Swarm Intelligence and Bio-Inspired Computing", Elsevier First Edition 2013**

REFERENCES:

1. **Helio J.C. Barbosa, "Ant Colony Optimization - Techniques and Applications", Intech 2013**
2. **Xin-She Yang ,Jaao Paulo papa, "Bio-Inspired Computing and Applications in Image Processing",Elsevier 2016**

CourseCode		Web Design Laboratory		Credits 2
LectureHours:(L) perweek		TutorialHours: (T)perweek	Lab Practice Hours: (P)per week 2	Total:(L+T+P) perweek
CourseCategory:		Year&Semester:		AdmissionYear:
	Contents			

1. Introduction to HTML. Create a basic web page

2. Create a static webpage using table tags of HTML

3. Create a static web page which defines all text formatting tags of HTML in tabular format

4. Create webpage using list tags of HTML

5. Create webpage to include image using HTML tag

6. Create webpage with frames

7. Create employee registration webpage using HTML form objects

8. Create webpages with Hyperlinks

SEMESTER V

CourseCode:	Software Engineering			Credits: 4
LectureHours:(L) perweek: 4	TutorialHours: (T)perweek	LabPractice 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			
LearningObjectives:(forteachers:whattheyhavetodointheclass/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	RequiredHours
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, comparison of different life cycle models.	12
II	Requirements Analysis and Specification: Requirements gathering and analysis, Software requirements	12

	specification (SRS) **Software Design: Functional independence - cohesion and coupling, software design approaches, object-oriented vs function-oriented design**	
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 reverse engineering; 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; architecture of a CASE environment.**	1 2

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	4	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 – Version Spaces 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
Weightageofcoursecontributedtoeach PSO	13	12	13	13	13	13

CourseCode:	Computer Networks		Credits:4
LectureHours:(L) perweek: 4	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 - DATAGRAM NETWORKS - VIRTUAL-CIRCUIT NETWORKS	12
III	Data Link Layer: Error Detection and Correction - Types of Errors -BLOCK CODING - CYCLIC CODES – CHECKSUM	12
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	12

	Service	
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
Skillsacquired	Knowledge,ProblemSolving,Analyticalability,ProfessionalCompetency,ProfessionalCommunication andTransferrable 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, "Data Communications, 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

Subject Code	Subject Name	Category	L	T	P	S	Instruction Hours	Credits	CIA	External	Total
									Marks		
	MACHINE LEARNING LABORATORY		-	-	4	-		3	50	50	100

Learning Objectives: To apply the concepts of Machine Learning to solve real-world problems and to implement basic algorithms in clustering & classification applied to text & numeric data

LAB EXERCISES

1. Solving Regression & Classification using Decision Trees
2. Bayesian Inference in Gene Expression Analysis
3. Pattern Recognition Application using Bayesian Inference
4. Bagging, Boosting applications using Regression Trees
5. Data & Text Classification using Neural Networks
6. Using Weka tool for SVM classification for chosen domain application
7. Data & Text Clustering using K-means algorithm

Course Outcomes

CO	On completion of this course, students will
CO1	Effectively use the various machine learning tools
CO2	Understand and implement the procedures for machine learning algorithms
CO3	Design Python programs for various machine learning algorithms
CO4	Apply appropriate datasets to the Machine Learning algorithms
CO5	Analyze the graphical outcomes of learning algorithms with specific datasets

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	2
CO 2	3	3	3	2	3	3
CO 3	3	3	3	3	3	3
CO 4	2	3	3	3	3	3
CO 5	3	3	3	3	3	3

									Marks		
									14	15	14

Weightage of course contributed to each PSO	14	15	15	14	15	14

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	ANDROID APPLICATIONS DEVELOPMENT LABORATORY	Core	-	-	4	-	2	50	50	100

Learning Objectives:

LO1. To explain user defined functions and the concepts of class.

LO2. To demonstrate the creation cookies and sessions

LO3. To facilitate the creation of Database and validate the user inputs

Lab Exercises	Required Hours

1. **Develop a Simple Calculator that uses radio buttons and text view.**

2. **Develop an application that uses Intent and Activity.**

3. **Develop an application that uses Dialog Boxes.**

4. **Develop an application to display a Splash Screen.**

5. **Develop an application that uses Layout Managers.**

6. **Develop an application that uses different types of Menus.**

7. **Develop an application that sends messages from one mobile to another mobile.**

8. **Develop an application that uses to send E-mail. Develop an application that plays Audio and Video.**

9. **Develop an application for Simple Animation.**

10.   **Develop an application for Login Page using SQLite.**

Course Outcomes	
CO	On completion of this course, students will able to
CO1	Understand the concepts of dialogs.
CO2	Analyze Concepts of Layout Managers. Perform sending email on audio and video To enable the applications of audio and video.
CO3	To apply Local File Storage and Development of files.
CO4	To determine the concepts of Simple Animation To apply searching pages.
CO5	Usage of Student mark sheet- preparation in MAD. Concepts of processing Sqlite are implemented.

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

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

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

DEEP LEARNING L- 4 C – 3

Unit I: Basics of artificial neural networks (ANN): Artificial neurons, Computational

models of neurons, Structure of neural networks, Functional units of ANN for pattern

recognition tasks

Feedforward neural networks: Pattern classification using perceptron, Multilayer

feedforward neural networks (MLFFNNs), Backpropagation learning, Empirical risk

minimization, Regularization, Autoencoders

Unit II: Deep neural networks (DNNs): Difficulty of training DNNs, Greedy layer wise

training, Optimization for training DNNs, Newer optimization methods for neural

networks (AdaGrad, RMSProp, Adam), Second order methods for training, Regularization

methods (dropout, drop connect, batch normalization)

Unit III: Convolution neural networks (CNNs): Introduction to CNNs – convolution,

pooling, Deep CNNs, Different deep CNN architectures – LeNet, AlexNet, VGG,

PlacesNet, training a CNNs: weights initialization, batch normalization, hyperparameter

optimization, Understanding and visualizing CNNs.

Unit IV: Recurrent neural networks (RNNs): Sequence modeling using RNNs,

Backpropagation through time, Long Short Term Memory (LSTM), Bidirectional LSTMs,

Bidirectional RNNs, Gated RNN Architecture - Generative models: Restricted Boltzmann

Machines (RBMs), Stacking RBMs, Belief nets.

Unit V: Learning sigmoid belief nets, Deep belief nets Under complete - Auto encoder,

Regularized Auto encoder, stochastic Encoders and Decoders, Contractive Encoders.

Applications: Applications in vision, speech and natural language processing

Recommended Texts:

1. S. Haykin, Neural Networks and Learning Machines , Prentice Hall of India, 2016

2. Ian Goodfellow, Yoshua Bengio and Aaron Courville, " Deep Learning", MIT

Press, 2017

Reference Books:

1. Satish Kumar, Neural Networks - A ClassRoom

2. B. Yegnanarayana, Artificial Neural Networks, Prentice- Hall of India, 1999

3. Giancarlo Zaccone, Md. RezaulKarim, Ahmed Menshawy "Deep Learning with

TensorFlow: Explore neural networks with Python", Packt Publisher, 2017.

4. Antonio Gulli, Sujit Pal "Deep Learning with Keras", Packt Publishers, 2017.

5. Francois Chollet "Deep Learning with Python", Manning Publications, 2017.

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Web References:

</div>

https://www.youtube.com/watch?v=aPfkYu_qiF4&list=PLEAYkSg4uSQ1r2XrJ_G
BzzS6I-f8yfRU

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   12   Hours
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

Semester VI

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst.	Marks		
									CIA	External	Total
	Data Analytics using R	Core	4	1	-	-	4	5	25	75	100
Course Objective											
C1	To understand the problem solving approaches										
C2	To learn the basic programming constructs in R Programming										
C3	To learn the basic programming constructs in R Programming										
C4	To use R Programming data structures - lists, tuples, and dictionaries.										
C5	To do input/output with files in R Programming.										
UNIT	Contents							No. of Hours			
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,							15			

	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	
III	**LISTS- Lists: Creating Lists, General List Operations, List Indexing Adding and Deleting List Elements, Getting the Size of a List, Extended Example: Text Concordance Accessing List Components and Values Applying Functions to Lists, Data Frames, Creating Data Frames, Accessing Data Frames, Other Matrix-Like Operations**	**15**
IV	**FACTORS AND TABLES - Factors and Levels, Common Functions Used with Factors, Working with Tables, Matrix/Array-Like Operations on Tables , Extracting a Sub table, Finding the Largest Cells in a Table, Math Functions, Calculating a Probability, Cumulative Sums and Products, Minima and Maxima, Calculus, Functions for Statistical Distributions R PROGRAMMING .**	**15**
V	**OBJECT-ORIENTED PROGRAMMING S Classes, S Generic Functions, Writing S Classes, Using Inheritance, S Classes, Writing S Classes, Implementing a Generic Function on an S Class, visualization,**	**15**

	Simulation, code profiling, Statistical Analysis with R, data manipulation	
	Total	**75**

Course Outcomes		Programme Outcomes
CO	**On completion of this course, students will**	
1	Work with big data tools and its analysis techniques.	**PO1**
2	Analyze data by utilizing clustering and classification algorithms.	**PO1, PO3**
3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	**PO2, PO6**
4	Perform analytics on data streams.	**PO4, PO5, PO6**
5	Learn NoSQL databases and management.	**PO5, PO6**

Text Book	
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

Reference Books	
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.

Web Resources	
1.	https://www.simplilearn.com

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

CourseCode		Robotics and Its Applications	Credits 4
LectureHours:(L) perweek 4	TutorialHours: (T)perweek 1	LabPractice Hours: (P)perweek	Total:(L+T+P) perweek 5
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 :Introduction, brief history, components of robotics, classification, workspace, work-envelop, motion of robotic arm, end-effectors and its types, service robot and its application, Artificial Intelligence in Robotics.	1 5
II	Actuators and sensors :Types of actuators, stepper-DC-servo-and brushless motors- model of a DC servo motor-types of transmissions-purpose of sensor-internal and external sensor-common sensors-encoders tachometers-strain gauge based force torque sensor-proximity and distance measuring sensors	1 5

	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.**	**1 5**
IV	**Path Planning :Introduction, path planning-overview-road map path planning-cell decomposition path planningpotential field path planning-obstacle avoidance-case studies** **Vision system: Robotic vision systems-image representation-object recognition-and categorization-depth measurement- image data compression-visual inspection-software considerations**	**1 5**
V	**Application : Ariel robots-collision avoidance robots for agriculture-mining-exploration-underwater-civilian- and military applications-nuclear applications-space applications-Industrial robots-artificial intelligence in robots-application of robots in material handling-continuous arc welding-spot welding-spray painting-assembly operation-cleaning-etc.**	**1 5**

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst.	Marks		
									CIA	External	Total
	Data Analytics using R Laboratory	Core	-	-	4	-	4	4	50	50	100

	Course Objective
C1	To understand problem solving approaches
C2	To learn the basic programming constructs in R Programming
C3	To practice various computing strategies for R Programming -based solutions to real world problems
C4	To use R Programming data structures - lists, tuples, and dictionaries.
C5	To do input/output with files in R Programming.

Sl. No	Contents	
1.	convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.	60
2.	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.	join columns and rows in a data frame using cbind() and rbind()	
6.	Implement different String Manipulation functions	
7.	Implement different data structures (Vectors, Lists, Data Frames)	
8	Write a program to read a csv file and analyze the data in the file	
9	Create pie chart and bar chart for a data set	
10	Create a data set and do statistical analysis on the data	

11	Program to find factorial of the given number using recursive function	
12	count the number of even and odd numbers from array of N numbers.	
	Total	**60**

	Course Outcomes	**Programe Outcome**
CO	**On completion of this course, students will**	
1	Acquire programming skills in core R Programming	PO1,PO4,PO5
2	Acquire Object-oriented programming skills in R Programming.	PO1, PO4,PO6
3	Develop the skill of designing graphical-user interfaces (GUI) in R Programming	PO1,PO3,PO6
4	Acquire R Programming skills to move into specific branches	PO3,PO4
5		PO1,PO5,PO6
Text Book		
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	
Reference Books		
1	Garrett Grolemund, Hadley Wickham,"Hands-On Programming with R: Write Your Own Functions and Simulations" , 1st Edition, 2014	
2.	Venables ,W.N., and Ripley,"S programming", Springer, 2000.	
Web Resources		
1.	https://www.simplilearn.com	

CourseCode	Project			Credits:4
LectureHours:(L) perweek	TutorialHours: (T)perweek	LabPractice Hours: 6		Total:(L+T+P) perweek:4
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.			
ExtendedProfessional Component(isapartof Internalcomponent only,	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminationsUPSC/TRB/NET/UGC–CSIR/GATE/TNPSC/otherstobesolved(TobediscussedduringtheTutorialhour) Notto be included inthe ExternalExaminationquestion paper			
Skillsacquired	Knowledge,ProblemSolving,Analyticalability,ProfessionalCompetency,ProfessionalCommunication andTransferrable Skill			

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	CIA	External	Total
									Marks		
	Network Security	Core	5	-	-	-	4	5	25	75	100

Course Objectives	
CO1	To familiarize on the model of network security, Encryption techniques
CO2	To understand the concept of Number Theory , theorems
CO3	To understand the design concept of cryptography and authentication
CO4	To develop experiments on algorithm used for security
CO5	To understand about virus and threats, firewalls, and implementation of Cryptography

UNIT	Contents	No. of Hours
I	Model of network security – Security attacks, services and attacks – OSI security architecture – Classical encryption techniques – SDES – Block cipher PrinciplesDES – Strength of DES – Block cipher design principles – Block cipher mode of operation – Evaluation criteria for AES – RC4 - Differential and linear cryptanalysis – Placement of encryption function – traffic confidentiality.	15
II	Number Theory – Prime number – Modular arithmetic – Euclid's algorithm - Fermet's and Euler's theorem – Primality – Chinese remainder theorem – Discrete logarithm – Public key cryptography and RSA – Key distribution – Key management – Diffie Hellman key exchange – Elliptic curve cryptography	15
III	Authentication requirement – Authentication function – MAC – Hash function – Security of	15

	hash function and MAC – SHA - HMAC – CMAC - Digital signature and authentication protocols – DSS.	
IV	Authentication applications – Kerberos – X.509 Authentication services - E- mail security – IP security - Web security	15
V	Intruder – Intrusion detection system – Virus and related threats – Countermeasures – Firewalls design principles – Trusted systems – Practical implementation of cryptography and security	15
	Total	75

Course Outcomes

Course Outcomes	On completion of this course, students will;	
CO1	Analyze and design classical encryption techniques and block ciphers.	PO1, PO3, PO6
CO2	Understand and analyze public-key cryptography, RSA and other public-key cryptosystems such as Diffie-Hellman Key Exchange, ElGamal Cryptosystem, etc	PO1,PO2,PO3,PO5
CO3	Understand key management and distribution schemes and design User Authentication	PO4, PO5
CO4	Analyze and design hash and MAC algorithms, and digital signatures.	PO1, PO2, PO3, PO6
CO5	Know about Intruders and Intruder Detection mechanisms, Types of Malicious software,	P02, PO6

Reference Text :	
1.	William Stallings, "Cryptography & Network Security", Pearson Education, Fourth Edition 2010.

References	
1.	CharlieKaufman,RadiaPerlman,MikeSpeciner,"NetworkSecurity,Privatecommunicationinpublicworld",PHISecondEdition,2002
2.	Bruce Schneier, Neils Ferguson, "Practical Cryptography", Wiley Dreamtech India Pvt Ltd, First Edition, 2003.
3.	DouglasRSimson"Cryptography–Theoryandpractice",CRCPress,FirstEdition,1995

Web Resources	
1.	https://www.javatpoint.com/computer-network-security
2.	https://www.tutorialspoint.com/information_security_cyber_law/network_security.htm
3.	https://www.geeksforgeeks.org/network-security/

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	2	2	2	3	3
Weightageofcoursecontributedtoeach PSO	14	12	13	13	14	13

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	CIA	External	Total
										Marks	
	Advanced Excel	Specific Elective	Y	-	-	-	2	2	25	75	100

Course Objective	
C1	Handle large amounts of data
C2	Aggregate numeric data and summarize into categories and subcategories
C3	Filtering, sorting, and grouping data or subsets of data
C4	Create pivot tables to consolidate data from multiple files
C5	Presenting data in the form of charts and graphs

UNIT	Details	No. of Hours	Course Objective
I	Basics of Excel- Customizing common options- Absolute and relative cells- Protecting and un-protecting worksheets and cells- Working with Functions - Writing conditional expressions - logical functions - lookup and reference functions- VlookUP with Exact Match, Approximate Match- Nested VlookUP with Exact Match- VlookUP with Tables, Dynamic Ranges- Nested VlookUP with Exact Match- Using VLookUP to consolidate Data from Multiple Sheets	6	C1
II	Data Validations - Specifying a valid range of values - Specifying a list of valid values- Specifying custom validations based on formula - Working with Templates Designing the structure of a template- templates for standardization of worksheets - Sorting and	6	C2

	Filtering Data -Sorting tables- multiple-level sorting- custom sorting- Filtering data for selected view - advanced filter options- Working with Reports Creating subtotals- Multiple-level subtotal.		
III	Creating Pivot tables Formatting and customizing Pivot tables- advanced options of Pivot tables- Pivot charts- Consolidating data from multiple sheets and files using Pivot tables- external data sources- data consolidation feature to consolidate data- Show Value As % of Row, % of Column, Running Total, Compare with Specific Field- Viewing Subtotal under Pivot- Creating Slicers.	6	C3
IV	More Functions Date and time functions- Text functions- Database functions- Power Functions - Formatting Using auto formatting option for worksheets- Using conditional formatting option for rows, columns and cells- WhatIf Analysis - Goal Seek- Data Tables- Scenario Manager.	6	C4
V	Charts - Formatting Charts- 3D Graphs- Bar and Line Chart together- Secondary Axis in Graphs- Sharing Charts with PowerPoint / MS Word, Dynamically- New Features Of Excel Sparklines, Inline Charts, data Charts- Overview of all the new features.	6	C5
	Total	30	

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
1	Work with big data tools and its analysis techniques.	PO1
2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO2
3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO4, PO6
4	Perform analytics on data streams.	PO4, PO5, PO6
5	Learn NoSQL databases and management.	PO3, PO8

Text Book	
1	**Excel 2019 All**
2	**Microsoft Excel 2019 Pivot Table Data Crunching**
Web Resources	
1.	**https://www.simplilearn.com**
2	**https://www.javatpoint.com**
3	**https://www.w3schools.com**

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

User Interface design   L – 4 C - 3

Unit I: The User Interface-

Introduction, Overview, The importance of user interface – Defining the user interface, The importance of Good design, Characteristics of graphical and web user interfaces, Principles of user interface design

Unit II: The User Interface Design process-

Obstacles, Usability, Human characteristics in Design, Human Interaction speeds, Business functions-Business definition and requirement analysis, Basic business functions, Design standards - Principles of Good Interface and Screen Design

Unit III: System menus and navigation schemes-

Structures of menus, Functions of menus, Contents of menus, Formatting of menus, Phrasing the menu, Selecting menu choices, Navigating menus, Kinds of graphical menus.

Unit IV: Windows –

Characteristics, Components of window, Window presentation styles, Types of window, Window management, Organizing window functions, Window operations.

Unit V: Device and Screen based controls-

Interaction Devices Selection- Operable controls, Text controls, Selection controls, Operable controls, Custom control, Presentation controls Comparison of GUI Controls - Control Selection Criteria - Choosing a Control Form

Course Outcomes:
The student will be able to :
   • **Design the User Interface, design, menu creation, windows creation and connection between menus and windows.**

Textbooks:
        1. Wilbert O. Galitz, "The Essential Guide to User Interface Design", John Wiley & Sons, Second Edition 2002.

Reference Books:
   1. Ben Sheiderman, "Design the User Interface", Pearson Education, 1998.
   2. Alan Cooper, "The Essential of User Interface Design", Wiley- Dream Tech Ltd.,2002

CourseCode	Pattern Recognition		Credits 3
LectureHours:(L) Perweek 4	TutorialHours: (T)perweek	LabPractice Hours: (P)perweek	Total:(L+T+P) Perweek 3
CourseCategory:	Year&Semester:		AdmissionYear:
Pre-requisite			

LearningObjectives:
To study the Pattern Recognition techniques and its applications

CourseOutcomes:(forstudents:Toknowwhattheyaregoingtolearn)

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

Recap:(notforexamination)Motivation/previouslecture/relevantportionsrequired forthe course)[Thisisdoneduring2Tutorialhours)

Units	Contents	RequiredHours
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
II	**STATISTICAL PATTERN RECOGNITION:** Introduction to statistical Pattern Recognition-supervised Learning using Parametric and Non-Parametric Approaches.	12
III	**LINEAR DISCRIMINANT FUNCTIONS AND UNSUPERVISED LEARNING AND CLUSTERING:** Introduction-Discrete and binary Classification Problems-Techniques to directly Obtain linear	12

	Classifiers - Formulation of Unsupervised Learning Problems-Clustering for unsupervised 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
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
Skillsacquired from the Course	Knowledge,ProblemSolving,Analyticalability,Prof essionalCompetency,ProfessionalCommunication andTransferrable Skill	

LearningResources:
- RecommendedTexts
    1. Robert Schalkoff, "Pattern Recognition: Statistical Structural and Neural Approaches", John wiley& sons.
- ReferenceBooks
    1. Earl Gose, Richard johnsonbaugh, Steve Jost, "Pattern Recognition and Image Analysis",   Prentice Hall of India, Pvt Ltd, New Delhi.
    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.

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	The course aims to acquaint the students with some very relevant and necessary soft skills and also to help them to develop their personality as well as to be self-motivated.								
LO2	To get the knowledge about the meditation techniques and mental conditioning								
LO3	To get the knowledge about the social skills and etiquette								
LO4	To get the knowledge about the communication and negotiation skills								
LO5	To get the knowledge about the preparation of resumes, appearing for interviews and handling both after campus issues that people normally face while setting foot on the professional sphere								

Prerequisites: None

Unit	Contents
I	Minding the Mind: This Unit will focus on meditation techniques and mental conditioning 1.1 Understanding YOU, which denotes 'Your Own Universe', wherein a person will be encouraged to self-introspect and critically analyse oneself. 1.2 Self-Analysis 1.3 IceBreaker 1.4 Warming Up
II	The Charming Skills: This Unit will focus on training the students to develop and enhance their social skills, etiquette and basic personal grooming. 2.1 Introduction 2.2 Social Skill 2.3 Etiquette (This will be broad-based delving on various etiquettes necessary for varied areas such as general conversation, table party, official meets and social media)
III	The Communication Mechanism: This Unit will focus on developing skills in both verbal and non-verbal communications (body language, framing emails, and social media communications). Moreover, inputs on importance of graphology will be taught. 3.1 Introduction to Communication 3.2 Types of Communication

	3.3 PublicSpeaking **3.4** GroupConversation **3.5** Letterwritingandemail

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.Julia* **Miller.**
3.	*Rai,U.,EnglishLanguageCommunicationSkills,HimalayaPublishingHouse*
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/
https://www.javatpoint.com/automation-tools

Web Design with HTML

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

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

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

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

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

Text Book:
World Wide Web Design with HTML, C. Xavier, TMH, 2001

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

Internet & E-Commerce

Unit I

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

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

Unit II

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

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

Unit III

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

Unit IV

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

Unit V

Internet Security: Internet Threats – Identity theft and Cybersquatting – Hacking – Spamming and Spoofing – Phishing and Pharming – Denial of Service – spyware – Viruses and worms-

Security solutions – Firewalls and Intrusion Prevention Systems –Internet Security Precautions-

Text Book:

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

1. Internet, World Wide Web, How to program, 4th Edition, Paul Deital, Harvey M Deitel, Pearson

2. Learning Internet & Email, 4th Revised 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 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.