SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
DEPARTMENT OF IT

Semester/Year		V/III		Program		B.Tech – Artificial Intelligence and Data Science			
Subject Category	DC	Subject Code:		AI 501	Subject Name		Fuzzy Logic		

Maximum Marks Allotted							Contact Hours			Total Credits
Theory				Practical						
ES	MS	Assignment	Quiz	ES	LW	Quiz	Total Marks	L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:
Basic Knowledge of Electronic Devices, Electronic Circuits

Course Objective:
1. To develop the fundamental concepts such as fuzzy sets, operations and fuzzy relations.
2. To lean about the fuzzification of scalar variables and the defuzzification of membership functions.
3. To learn three different inference methods to design fuzzy rule based system.
4. To develop fuzzy decision making by introducing some concepts and also Bayesian decision methods
5. To learn different fuzzy classification methods.

UNITs	Descriptions	Hrs.
I	**Classical sets :** Operations and properties of classical sets, Mapping of classical sets to the functions. Fuzzy sets - Membership functions, Fuzzy set operations, Properties of fuzzy sets. **Classical and Fuzzy** **Relations:** Cartesian product, crisp relations-cardinality, operations and properties of crisp relations. Fuzzy relations-cardinality, operations, properties of fuzzy relations, fuzzy Cartesian product and Composition, Fuzzy tolerance and equivalence relations, value assignments and other format of the composition operation	8
II	**Fuzzification and Defuzzification:** Features of the membership functions, various forms, fuzzification, defuzzification to crisp sets, - cuts for fuzzy relations, Defuzzification to scalars. Fuzzy logic and approximate reasoning, Other forms of the implication operation.	8
III	**Fuzzy Systems :** Natural language, Linguistic hedges, Fuzzy (Rule based) System, Aggregation of fuzzy rules, Graphical techniques of inference,Membership value assignments: Intuition, Inference, rank ordering, Fuzzy Associative memories.	8
IV	**Fuzzy decision making :** Fuzzy synthetic evaluation, Fuzzy ordering, Preference and consensus, Multi objective decision making, Fuzzy Bayesian, Decision method, Decision making under Fuzzy states and fuzzy actions.	8
V	**Fuzzy Classification :** Classification by equivalence relations-crisp relations, Fuzzy relations, Cluster analysis, Cluster validity, C-Means clustering, Hard C-Means clustering, Fuzzy C-Means algorithm, Classification metric, Hardening the Fuzzy C-Partition	8
Total Hours		40

Course Outcomes:

CO1. Understand the basic ideas of fuzzy sets, operations and properties of fuzzy sets and also about fuzzy relations.

CO2. Understand the basic features of membership functions, fuzzification process and defuzzification process.

CO3. design fuzzy rule-based system.

CO4. know about combining fuzzy set theory with probability to handle random and non-random uncertainty, and the decision-making process.

CO5. gain the knowledge about fuzzy C-Means clustering.

Text Book	

1. Timothy J.Ross - Fuzzy logic with engineering applications, 3rd edition, Wiley,2010.

2. George J.KlirBo Yuan - Fuzzy sets and Fuzzy logic theory and Applications, PHI, New Delhi,1995.

Reference Books-

S.Rajasekaran, G.A.Vijayalakshmi - Neural Networks and Fuzzy logic and Genetic Algorithms, Synthesis and Applications, PHI, New Delhi,2003.

List/Links of e-learning resource

http://www.nptel.ac.in/syllabus/syllabus.php?subjectId=111106048*B*.

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO11	PO12	PSO-1	PSO2
CO-1	3	3	2	3	1							2	3	
CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-4		2	3	3										
CO-5		3	2	3										

Suggestive list of experiments:

1. To learn the fundamentals of the fuzzy logic
2. To experiment the basic operations of fuzzy logic
3. To learn about the Fuzzy inference system (FIS) with an example
4. To learn about the Fuzzy inference system (FIS) with an example
5. To study about the fuzzy control and its applications.
6. To learn about the Neural Networks and Perceptron with an example
7. To study about the Multilayer Perceptron and Application
8. To study about Probabilistic Neural Networks and its application

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	Ramratan Ahirwal & Rashi Kumar
Subject handled by department	Department IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

Semester/Year	V/III	Program		B.Tech – Artificial Intelligence and Data Science
Subject Category	DC	Subject Code:	AI 502	Subject Name	Data Science Analytics

Maximum Marks Allotted							Total Marks	Contact Hours			Total Credits
Theory				Practical							
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:
- Data Science,
- Machine Learning

Course Objective:

1. To provide the knowledge and expertise to become a proficient data scientist;
2. Demonstrate an understanding of statistics and machine learning concepts that are vital for data science;
3. Produce Python code to statistically analyze a dataset;
4. Critically evaluate data visualizations based on their design and use for communicating stories from data;

UNITs	Descriptions	Hrs.
I	**Statistical Analysis System(SAS)**: Collection of Data, Sample Measurement and Scaling Techniques, Statistical Derivatives and Measures of Central Tendency, Measures of Variation and Skewness, Correlation and Simple Regression, Time Series Analysis, Index Numbers, Probability and Probability Rules Probability Distributions, Tests of Hypothesis–I, Tests of Hypothesis – II, Chi-Square Test	8
II	**Apache Spark**: Introduction, Features, Spark built on Hadoop,Components of Spark: Apache Spark Core, Spark SQL, Spark Streaming, MLlib (Machine Learning Library), GraphX **BigML: Web Interface, Command Line Interface, API, Creating a deep learning model with BigML**	8
III	**Data-Driven Documents (D3.js)**: Introduction, Web Standards: HyperText Markup Language (HTML), Document Object Model (DOM), Cascading Style Sheets (CSS), Scalable Vector Graphics (SVG), JavaScript. **MatLab**: Matlab Environment Setup, Syntax, Variables, Commands, M-files, Datatypes and Operators.	8

IV	**Natural Language Toolkit (NLTK)**:Tokenizing Text, Training Tokenizer & Filtering Stopwords, Looking up words in Wordnet Stemming & Lemmatization, Natural Language Toolkit - Word Replacement, Synonym & Antonym Replacement. **TensorFlow**: Convolutional Neural Networks, TensorBoard Visualization, TensorFlow - Word Embedding, TensorFlow - Linear Regression	8	
V	**Tableau**: Design Flow, File Types, Data Types, Data Terminology, Data source, worksheet and calculations. **Scikit-learn**: Introduction, Modelling Process, Data Representation, Estimator	8	

		API, Conventions, Linear Modeling	
Total Hours			4 0

Course Outcomes:

CO1: To explain how data is collected, managed and stored for data science.

CO2: To understand the key concepts in Big data science, including their real-world applications and the toolkit used for Big Data

CO3: To implement data collection and management scripts using D3.js.

CO4: Examine the techniques of NLTK toolkit and Tensor flow.

CO5: Identification of various applications of Tableau.

Text Book

1. Statistical Data Analysis Using SAS: Intermediate Statistical Methods (Springer Texts in Statistics)

2. Big Data and Analytics, 2ed | IM | BS | e Paperback – 1 January 2019 by Subhashini Chellappan Seema Acharya (Author)

Reference Books-

  1. Big Data For Dummies by Judith S. Hurwitz, Alan Nugent

List/Links of e-learning resource

● https://archive.nptel.ac.in/courses/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO11	PO12	PSO-1	PSO2
CO-1	3	3	2	3	1							2	3	
CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-		2	3	3										

4														
CO-5		3	2	3										

Suggestive list of experiments:

1.	Test of Significance : Application of t test for single mean, t-test for independent samples, paired t test, F-test, Chi- square test

2.	Analysis of Variance(One way and Two way classification) :Analysis of CRD and RBD as an example of one way and two way ANOVA

3. Sampling Methods: Procedures of selecting a simple random sample

4. Install Apache Hadoop

5. Develop a MapReduce program to calculate the frequency of a given word in a given file.

6. Coding a Chart, the D3.js way

7. Lexical analysis: Word and text tokenizer;

8. Naive Bayes / Decision tree classifier with NLTK.

9.	Build a neural network machine learning model that classifies images, Train this neural network, Evaluate the accuracy of the model.

10. Data formatting and insertion into Tableau, Worksheet layout, Dashboards, Stories Modern tool for data

Recommendation by Board of studies on	
Approval by Academic council on	

Compiled and designed by	Ramratan Ahirwal & Rashi Kumar
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

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DEPARTMENT OF IT

Semester/Year	V/III		Program			B.Tech – Artificial Intelligence and Data Science			
Subject Category	DC	Subject Code:		AI 503	Subject Name	Cloud Computing			

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks	L	T	P	
ES	MS	Assignment	Quiz	ES	LW	Quiz					
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:
- Basic Knowledge of algorithms, Discrete Mathematics Computer Networks.

Course Objective:

1 To learn how to use Cloud Services.
2. To implement Virtualization
3. To implement Task Scheduling algorithms.
4. Apply Map-Reduce concept to applications.
5. To build Private Cloud.
6. Broadly educate to know the impact of engineering on legal and societal issues involved

UNITs	Descriptions	Hrs.
I	Introduction Cloud, Types – NIST model, Cloud Cube model, Deployment models Service models ,Reference model, Characteristics, Benefits and advantages ,Cloud Architecture Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications, Connecting to Cloud by Clients Services and Applications, Types.	8
II	Abstraction and Virtualization (access, application, CPU, storage), Mobility patterns (P2V, V2V, V2P, P2P, D2C, C2C, C2D, D2D) ,Load Balancing, Network resources, Application Delivery Controller and Application Delivery Network, Google Cloud. Hypervisors: Virtual machine technology and types, VMware vSphere Machine Imaging Distinction between SaaS and PaaS.	8
III	Application frameworks Google Web Services ,Google Applications Portfolio – Indexed search, Dark Web, Aggregation and disintermediation, Productivity applications and service, Adwords, Google Analytics, Google Translate, Google Toolkit, features of Google App Engine service, Amazon Web Service components and services: Amazon Elastic Cloud, Amazon Simple Storage system, Amazon Elastic Block Store.	8
IV	Windows Azure platform: Microsoft's approach, architecture, and main elements, AppFabric, Content Delivery Network, SQL Azure, and Windows Live services, Types of services, Consulting, Configuration, Customization and Support Cloud Management. network management systems ,vendors, Monitoring cloud computing deployment stack , Lifecycle management cloud services .	8
V	Cloud security concerns, service boundary Security of data, Brokered cloud storage access, Storage location sand tenancy, encryption, and auditing and compliance Identity management. Service Oriented Architecture, message-based transactions, Protocol stack for an SOA architecture, Event-driven SOA, System abstraction Cloud Bursting,	8

	Applications, APIs.	
Total Hours		40

Course Outcomes:

CO1: Describe the principles of cloud computing from existing technologies.
CO2: Implement different types of Virtualization technologies and Abstraction
 CO3: Elucidate the concepts of Google Cloud Computing architecture.
CO4: Analyze the issues in Resource provisioning and Security governance in clouds
CO5: Choose among various cloud technologies and Service Oriented Architecture.

Text Book

1. Cloud Computing – Second Edition by Dr. Kumar Saurabh, Wiley India

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

Reference Books-

1.	Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, McGraw Hill Education (India) Private Limited, 2013.
 2. Cloud computing: A practical approach, Anthony T. Velte, Tata Mcgraw-Hill
 3. Cloud Computing, Miller, Pearson
 4. Building applications in cloud:Concept, Patterns and Projects, Moyer, Pearson

List/Links of e-learning resource

● https://nptel.ac.in/courses/117103063/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

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CO-1	3	3	2	3	1							2	3	
CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-4		2	3	3										
CO-5		3	2	3										

Suggestive list of experiments:

1. Create Amazon Account to store images.
2. Create Google Account to store files and programs.
3. Create IBM cloud account and access storage space.
4. Create Microsoft Azure Account and working on Azure Cloud
5. Create salesforce.com Account and working onTrailhead.com

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	Ramratan Ahirwal & Rashi Kumar
Subject handled by department	Department of IT

	SAMRAT ASHOK TECHNOLOGICAL INSTITUTE (Engineering College), VIDISHA M.P. (An Autonomous Institute Affiliated to RGPV Bhopal) DEPARTMENT OF IT									

Semester/Year			Program		Program B.Tech – Artificial Intelligence and Data Science Subject Name Human Computer Interaction					
Subject Category		DE-1	Subject Code:	AI-504-A						

Maximum Marks Allotted							Contact Hours			Total Credits
Theory				Practical						
ES	MS	Assignment	Quiz	ES	LW	Quiz	Total Marks	L	T	P
60	20	10	10				100	3	0	0

(Total Credits: 3)

Prerequisites:
- Basic Knowledge of algorithms, Discrete Mathematics

Course Objective:

1. To learn the foundations of Human Computer Interaction.
2. To become familiar with the design technologies for individuals and persons with disabilities.
3. To be aware of mobile HCI.
4. To learn the guidelines for user interface.

UNITs	Descriptions	Hrs.
I	FOUNDATIONS OF HCI: The Human: I/O channels – Memory – Reasoning and problem solving; The Computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. - Case Studies	8
II	DESIGN AND SPFTWARE PROCESS: Interactive Design: Basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process: Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design	10
III	MODELS AND THEORIES HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements – Communication and collaboration models-Hypertext, Multimedia and WWW.	12
IV	MOBILE HCI Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools. - Case Studies	8
V	WEB INTERFACE DESIGN Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow - Case Studies.	7
Total Hours		45

Course Outcomes:

CO-1 Design effective dialog for HCI

CO-2 Design effective HCI for individuals and persons with disabilities.

CO-3 Assess the importance of user feedback.

CO-4 Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.

CO-5 Develop meaningful user interface.

Text Book

Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, ―Human Computer Interaction‖, 3rd Edition, Pearson Education, 2004 (UNIT I, II & III)

2. Brian Fling, ―Mobile Design and Development‖, First Edition, O'Reilly Media Inc., 2009 (UNIT – IV)

3. Bill Scott and Theresa Neil, ―Designing Web Interfaces‖, First Edition, O'Reilly, 2009. (UNIT-V)

Reference Books-

List/Links of e-learning resource

- https://archive.nptel.ac.in/courses/106/106/106106131/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO$_{11}$	PO$_{12}$	PSO
CO-1	3	3	2	3	1							2	3
CO-2		3	3	2	3								
CO-3	2	3	3	3	2								
CO-4		2	3	3									
CO-5		3	2	3									

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	Prof. Ramratan Ahirwal & Rashi Kumar
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

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DEPARTMENT OF IT

Semester/Year		V/III		Program		B.Tech – Artificial Intelligence and Data Science			
Subject Category	DE-1	Subject Code:		AI 504 - B	Subject Name	Image Processing			

Maximum Marks Allotted							Contact Hours			Total Credits
Theory				Practical						
ES	MS	Assignment	Quiz	ES	LW	Quiz	Total Marks	L	T	P	
60	20	10	10				100	3	0	0	3

Prerequisites:

Basic Knowledge of algorithms, Discrete Mathematics

Course Objective:

1. To study the image fundamentals and mathematical transforms necessary for image processing.
2. To study the image enhancement techniques
3. To study image restoration procedures.
4. To study the image compression procedures.

UNITs	Descriptions	Hrs.
I	**Digital Image Fundamentals** A simple image model, Sampling and Quantization. Relationship between pixels. Imaging geometry. Image acquisition systems, Different types of digital images.	8
II	**Image Transformations Introduction** to Fourier transforms, Discrete Fourier transforms, Fast Fourier transform, Walsh transformation, Hadmord transformation, Discrete Cosine Transformation.	8
III	**Image Enhancement** Filters in spatial and frequency domains, Histogram based processing. Image subtraction, Averaging, Image smoothing, Nedion filtering, Low pass filtering, Image sharpening by High pass filtering	8
IV	**Image Encoding and Segmentation** Encoding: Mapping, Quantizer, Coder. Error free compression, Lossy Compression schemes. JPEG Compression standard. Detection of discontinuation by point detection, Line detection, edge detection, Edge linking and boundary detection, Local analysis, Global processing via Hough transforms and graph theoretic techniques.	8
V	**Mathematical Morphology** Binary, Dilation, crosses, Opening and closing, Simple methods of representation, Signatures, Boundary segments, Skeleton of a region, Polynomial approximation.	8
Total Hours		40

Course Outcomes:

CO-1: Ability to apply principles and techniques of digital image processing in applications related to design and analysis of digital imaging systems.

CO-2: Ability to analyze and implement image processing algorithms to real problems.

CO-3: Gaining of hands-on experience in using software tools for processing digital images.

CO-4: Interpret image segmentation and representation techniques.

CO-5: Apply Mathematical Morphology using Polynomial approximation.

Text Book	

1. Thomas Cormen, Charles Leiserson, Ronald Rivest and Cliford Stein, "Introduction to Algorithms", PHI, 3rd edition.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Universities Press.

Reference Books-

1. Sonka, Digital Image Processing & Computer Vision, Cengage Learning.
2. Jayaraman, Digital Image Processing, TMH.
3. Pratt, Digital Image Processing, Wiley India.
4. Annadurai, Fundamentals of Digital Image Processing,Pearson Education

List/Links of e-learning resource

1. www.nptel.co.in

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO2
CO-1	3	3	2	3	1							2	3	
CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-4		2	3	3										
CO-5		3	2	3										

Suggestive list of experiments:

NO LAB

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	Ramratan Ahirwal & Rashi Kumar
Subject handled by department	Department of IT

		SAMRAT ASHOK TECHNOLOGICAL INSTITUTE			
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		(An Autonomous Institute Affiliated to RGPV Bhopal)			
		DEPARTMENT OF IT			

Semester/Year		V/III		Program			B.Tech – Artificial Intelligence and Data Science			
Subject Category	DE-1	Subject Code:		AI 504 - C		Subject Name	**Information Retrieval**			

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10				100	3	0	0	3

Prerequisites:	
Basic Knowledge of algorithms.	
Course Objective:	
1. To facilitate students to understand android SDK	
2. To help students to gain a basic understanding of Android application development	
3. To inculcate working knowledge of Android Studio development tool	

UNITs	Descriptions	Hrs.
I	Introduction - Goals and history of IR - The impact of the web on IR - The role of artificial intelligence (AI) in IR – Basic IR Models Boolean and vector space retrieval models – Ranked Retrieval – Text similarity metrics –TF IDF (term frequency/inverse document frequency) weighting - Cosine Similarity.	8
II	Basic Tokenizing - Indexing and Implementation of Vector Space Retrieval - Simple tokenizing – stop word removal and stemming – Inverted Indices – Efficient processing with sparse vectors – Query Operations and Languages - Relevance feedback – Query expansion – Query languages.	8
III	Experimental Evaluation of IR Performance metrics Recall, Precision and F measure – Evaluations on benchmark text collections - Text Representation - Word statistics – Zipf's law – Porter stemmer - Morphology – Index term Selection using thesauri -Metadata and markup languages- Web Search engines – spidering – metacrawlers – Directed, spidering – Link analysis shopping agents	8
IV	Text Categorization and Clustering - Categorization algorithms - Naive Bayes – Decision trees and nearest neighbor- Clustering algorithms - Agglomerative clustering – k Means – Expectation Maximization (EM) - Applications to information filtering – Organization and relevance feedback.	8
V	Recommender Systems - Collaborative filtering - Content based recommendation of documents and products - Information Extraction and Integration - Extracting data from text – XML – semantic web – Collecting and integrating specialized information on the web.	8
Total Hours		40
Course Outcomes:		

CO-1: Identify and design the various components of an Information Retrieval system.

CO-2: Apply machine learning techniques to text classification and clustering which is used

for efficient Information Retrieval.

CO-3: Analyze the Web content structure.

CO-4: Design an efficient search engine.

CO-5: Build an Information Retrieval system using the available tools.

Text Book	

3. Neural Network, Fuzzy 1ogic,and Genetic Algorithms Synthesis and Applications, S.Rajsekaran ,G.A VijayalakshmiPai

Reference Books-

1. Neural Networks: A Comprehensive Foundation (2nd Edition), Simon Haykin, Prentice Hall.

2. Elements of artificial neural networks by Kishan Mehrotra, Chilukuri K. Mohan and Sanjay Ranka.

3. Neural networks and fuzzy systems by Bart Kosko, Prentice Hall of India.

4. S. Fundam   tats of artificial neural networks by Mohammad H. I-lassoun, Prentice Hall of India.

List/Links of e-learning resource

1.   https://mrcet.com/pdf/Lab%20Manuals/MOBILE%20APPLICATION%20DEVELO PMENT%20LAB.pdf

2.www.nptel.ac.in

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO11	PO12	PSO-1	PSO2
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CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-4		2	3	3										
CO-5		3	2	3										

Suggestive list of experiments:

NO LAB

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	Ramratan Ahirwal & Rashi Kumar
Subject handled by department	Department of IT

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DEPARTMENT OF IT

Semester/Year		V/III	Program			B.Tech – Artificial Intelligence and Data Science				
Subject Category	OE-III	Subject Code:		OE-505-A	Subject Name		Fuzzy Logic			

Maximum Marks Allotted							Total Marks	Contact Hours			Total Credits
Theory				Practical							
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10				100	3	0	0	3

Prerequisites:

Basic Knowledge of Electronic Devices, Electronic Circuits

Course Objective:

6. To develop the fundamental concepts such as fuzzy sets, operations and fuzzy relations.

7. To lean about the fuzzification of scalar variables and the defuzzification of membership functions.

8. To learn three different inference methods to design fuzzy rule based system.

9. To develop fuzzy decision making by introducing some concepts and also Bayesian decision methods

10.   To learn different fuzzy classification methods.

UNITs	Descriptions	Hrs.
I	**Classical sets :** Operations and properties of classical sets, Mapping of classical sets to the functions. Fuzzy sets - Membership functions, Fuzzy set operations, Properties of fuzzy sets. **Classical and Fuzzy** **Relations:** Cartesian product, crisp relations-cardinality, operations and properties of crisp relations. Fuzzy relations-cardinality, operations, properties of fuzzy relations, fuzzy Cartesian product and Composition, Fuzzy tolerance and equivalence relations, value assignments and other format of the composition operation	8
II	**Fuzzification and Defuzzification:** Features of the membership functions, various forms, fuzzification, defuzzification to crisp sets, - cuts for fuzzy relations, Defuzzification to scalars. Fuzzy logic and approximate reasoning, Other forms of the implication operation.	8
III	**Fuzzy Systems :** Natural language, Linguistic hedges, Fuzzy (Rule based) System, Aggregation of fuzzy rules, Graphical techniques of inference,Membership value assignments: Intuition, Inference, rank ordering, Fuzzy Associative memories.	8
IV	**Fuzzy decision making :** Fuzzy synthetic evaluation, Fuzzy ordering, Preference and consensus, Multi objective decision making, Fuzzy Bayesian, Decision method, Decision making under Fuzzy states and fuzzy actions.	8
V	**Fuzzy Classification :** Classification by equivalence relations-crisp relations, Fuzzy relations, Cluster analysis, Cluster validity, C-Means clustering, Hard C-Means clustering, Fuzzy C-Means algorithm, Classification metric, Hardening the Fuzzy C-Partition	8
Total Hours		40

Course Outcomes:

CO1.   Understand the basic ideas of fuzzy sets, operations and properties of fuzzy sets and also about fuzzy relations.

CO2.   Understand the basic features of membership functions, fuzzification process and defuzzification process.

CO3.   design fuzzy rule-based system.

CO4.   know about combining fuzzy set theory with probability to handle random and non-random uncertainty, and the decision-making process.

CO5.   gain the knowledge about fuzzy C-Means clustering.

Text Book	

3. Timothy J.Ross - Fuzzy logic with engineering applications, 3rd edition, Wiley,2010.

4. George J.KlirBo Yuan - Fuzzy sets and Fuzzy logic theory and Applications, PHI, New Delhi,1995.

Reference Books-

S.Rajasekaran, G.A.Vijayalakshmi - Neural Networks and Fuzzy logic and Genetic Algorithms, Synthesis and Applications, PHI, New Delhi,2003.

List/Links of e-learning resource

http://www.nptel.ac.in/syllabus/syllabus.php?subjectId=111106048B.

Modes of Evaluation and Rubric

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COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO11	PO12	PSO-1	PSO2
CO-1	3	3	2	3	1							2	3	
CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-4		2	3	3										
CO-5		3	2	3										

Suggestive list of experiments:

NO LAB

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	Ramratan Ahirwal & Rashi Kumar
Subject handled by department	Department IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

(Engineering College), VIDISHA M.P.

(An Autonomous Institute Affiliated to RGPV Bhopal)

DEPARTMENT OF IT

Semester/Year	V/III		Program		B.Tech – Artificial Intelligence and Data Science
Subject Category	OE-III	Subject Code:	OE- 505 - B	Subject Name	Computer Graphics and Multimedia

Maximum Marks Allotted							Contact Hours			Total Credits
Theory				Practical						
ES	MS	Assignment	Quiz	ES	LW	Quiz	Total Marks	L	T	P	
60	20	10	10				100	3	0	0	3

Prerequisites:

Knowledge of Higher Mathematics , Basic Electronics, Algorithms and Discrete Mathematics,

Course Objective:

1. Understand the basic concepts of computer graphics and its applications.
2. Apply and analyze the algorithms to draw graphics output primitives.
3. Apply and create 2-D & 3-D transformation on various objects.

UNITs	Descriptions	Hrs.
I	Basic of Computer Graphics, Applications of computer graphics, Display devices, Cathode Ray Tube, quality of phosphors, CRTs for color display, beam penetration CRT, The Shadow - Mask CRT, Direct View Storage Tube,LED and LCD. Graphics input devices, Graphics software and standards, Output primitives, attributes of output primitives, point and line style, color and intensity, Area filling algorithms, Scan line algorithm, boundary fill & flood fill algorithm, Antialiasing techniques.	8
II	Line drawing- various algorithms and their comparison, circle generation - Bresenham's midpoint circle drawing algorithm, 2D transformation- Basic Transformations, Matrix Representation and Homogeneous Coordinates, translation, scaling, rotation, reflection, sheering, composite transformation, Window to view port transformation, line clipping algorithm; Cohen Sutherland, polygon clipping; Sutherland hodgman algorithm.	8
III	Need for 3-Dimensional imaging, techniques for 3-Dimesional displaying, 3D transformation, projection and its types, Curve- parametric and non parametric functions, Bezier (Bernstein Polynomials) Curves, Cubic-Splines, B-Splines, Need for hidden surface removal, Back face detection, Z-buffer method, Painter's algorithm.	8
IV	Shading Algorithms-Phong's shading model, Gouraud shading, Shadows and background, illumination, light sources, illumination methods (ambient, diffuse reflection, specular reflection), Color models: properties of light, XYZ, RGB, YIQ and CMY color models.	8
V	Multimedia systems-An introduction, multimedia hardware and architecture, Data and file format standard i.e. RTF, TIFF, MIDI, JPEG, MPEG, Video- AVI, 3GP, MOV, MPEG, Compression standards, Multimedia Authoring.	8
Total Hours		40

Course Outcomes:

CO-1: To understand the Graphics systems, its applications, hardware & software requirement.				

CO-1: To understand the Graphics systems, its applications, hardware & software requirement.

CO-2: To apply scan conversion algorithms of various graphics output primitives.

CO-3: To understand the basic principles of homogeneous coordinate systems, 2-dimensional & 3- dimensional computer graphics systems.

CO-4: To create geometrical transformation on 2-dimensional & 3-dimensional objects.

CO-5: To apply window into viewport, clipping algorithms of graphics objects against a window.

Text Book	
1. Computer Graphics C Version, Donald Hearn & M. Pauline Baker , Pearson Education, New Delhi, 2004 (Chapters 1 to 12 except 10-9 to 10-22).	

Reference Books-

1. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics- Principles and practice, Second Edition in C, Pearson Education, 2007.
2. OpenGL ES 3.0 Programming Guide 2nd Edition (English, Paperback, Budi Rijanto Purnomo, Dan Ginsburg), PEARSON.
3. Rogers, "Procedural elements of Computer Graphics", Tata McGraw Hill. Parekh, "Principles of multimedia", Tata McGraw Hill.

List/Links of e-learning resource

1.www.nptel.ac.in

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO11	PO12	PSO-1	PSO2	
CO-1	3	3	2	3	1							2	3		
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CO-4		2	3	3											
CO-5		3	2	3											

Suggestive list of experiments:

NO LAB

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	Ramratan Ahirwal & Rashi Kumar
Subject handled by department	Department of IT

Semester/Year		V/III		Progra m		B.Tech – Artificial Intelligence and Data Science			
Subject Category	OE-III	Subject Code:		OE 505 - C	Subject Name	Software Engineering			

Maximum Marks Allotted							Contact Hours			Total Credit s
Theory				Practical			Total Marks	L	T	P
ES	MS	Assign ment	Quiz	ES	LW	Quiz				
60	20	10	10				100	3	0	0	3

Prerequisites:
Programming Basics

Course Objective:

4. To understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices.
5. To understand project management and risk management associated with various types of projects.
6. To know the basics of testing and understanding the concept of software quality assurance and software configuration management process.

UNI Ts	Descriptio ns	H rs.
I	**Introduction to Software Engineering:** Definition, Software Engineering-Layered Technology, Software Characteristics and Components, **Software Model:** Software Development of Life Cycle Model (SDLC), The Waterfall Model, Iterative Waterfall Model, Prototyping Model, Spiral Model, RAD Model. **Selection Criteria of Model**: Characteristics of Requirements, Status of Development, Users Participation, Type of Project and Associated Risk	8
II	**Requirement Engineering:** Definition, Requirement Engineering Activity , **Types of Requirement-** Functional and Non-functional Requirements, User and System Requirements, Requirement Elicitation Methods, Requirement Analysis Methods, Requirement Documentation (SRS), Requirement Validation, Requirement Management.	8
III	**Design Concept, Principle and Methods:** Design Fundamentals, Design Principles, Effective Modular Design, Design Representations, Architectural Design, Procedural Design, Data Directed design, Real Time Design, Object Oriented Design, Coupling and Cohesion.	8
IV	**Software Metrics, Project Management and Estimation:** Metrics in Process and Project Domains, Software Measurement, Software Quality Metrics, **Project Management-** Basics-People, Product, Process, Project, **Estimation-** Software Project Estimation, Decomposition Techniques- Function Point Estimation, Line of Code (LOC) Based estimation, Empirical Estimation, COCOMO Model, Project Scheduling Techniques.	8

V	**Software Testing:** Definitions, Software Testing Life Cycle (STLC), , Test Case Design, Strategic Approach to Software Testing- Verification & Validation , Strategic Issues, Criteria for Completion of Testing, Unit Testing, Integration Testing, Validation Testing, System Testing, Black Box Testing Techniques, White Box Testing Techniques, Acceptance Testing	8
Total Hours		40

Course Outcomes:

CO1. explain the various fundamental concepts of software engineering.

CO2. develop the concepts related to software design & analysis.

CO3. compare the techniques for software project management & estimation.

CO4. choose the appropriate model for a real life software project.

CO5. design the software using modern tools and technologies

Text Book	
1. Software Engineering for Absolute Beginners, by Nico Loubser	

Reference Books-

   7.   Clean Code by Uncle Bob Martin

   8.   Design Patterns, by Erich Gamma.

List/Links of e-learning resource

1.www.nptel.ac.in

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid semester Tests, Quiz/Assignments, term work, end semester practical examination.

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CO-5		3	2	3										

Suggestive list of experiments:

NO LAB

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	Ramratan Ahirwal & Rashi Kumar
Subject handled by department	Department of IT

<table>
<tr><td colspan="12" align="center">SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)
DEPARTMENT OF IT</td></tr>
</table>

Semester/Year			**VI/III**		**Program**			**B.Tech – Artificial Intelligence and Data Science**			
Subject Category	**DLC**		**Subject Code:**	**AI 506**	**Subject Name**			**Advanced Data Science Lab I**			

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				**Practical**			**Total Marks**				
ES	**MS**	**Assignment**	**Quiz**	**ES**	**LW**	**Quiz**		**L**	**T**	**P**	
				30	10	10	50			4	2

Prerequisites:
- Basic Knowledge of algorithms, Discrete Mathematics

Course Objective:
- How to use R for analytical programming
- How to implement data structure in R
- R loop functions and debugging tools
- Object-oriented programming concepts in R
- Data visualization in R
- How to perform error handling
- Writing custom R functions

UNITs	Descriptions	Hrs.
I	FUNDAMENTALS OF R: Installation of R & R Studio, Features of R, Variables in R, Constants in R, Operators in R, Datatypes and R Objects, Accepting Input from keyboard, Important Built-in functions	8
II	VECTORS: Creating Vectors, Accessing elements of a Vector, Operations on Vectors, Vector Arithmetic	8
III	CONTROL STATEMENTS: I statement, if…else statement, if else() function, switch() function, repeat loop, while loop, for loop, break statement, next statement	8
IV	FUNCTIONS IN R: Formal and Actual arguments, Named arguments, Global and local variables, Argument and lazy evaluation of functions, Recursive functions	8
V	MATRICES: Creating matrices, Accessing elements of a Matrix, Operations on Matrices, Matrix transpose	8
Total Hours		40

Course Outcomes:

CO1: Demonstrate how to install and configure RStudio

CO2: Explain critical R programming concepts

CO3: Explain the use of data structure and loop functions

CO4: Analyze data and generate reports based on the data

CO5: Apply OOP concepts in R programming

Text Book

R for data science : Import, Tidy, Transform, Visualize, And Model Data by Hadley Wickham (Author), Garrett Grolemund (A

Reference Books-

The Book of R: A First Course in Programming and Statistics by Tilman M. Davies (Author)
Experiment List:

Downloading, installing and setting path for R.
Give an idea of R Data Types.
R as a calculator: Perform some arithmetic operations in R.
Demonstrate the process of creating a user defined function in R.
Perform some logical operations in R.
Write an R script to change the structure of a Data frame.
Write an R script to demonstrate loops.
Write an R script to demonstrate conditional statements: if, if else, switch.
Write an R script to convert a vector to factors.
Write an R script to expand a data frame.
Experiments (Intermediate-R)
Demonstrate the following aggregate functions in R: sum, mean, count, min, max.
Write an R script to read and write different files.
Write an R script to find subset of a dataset.
Elucidate the process of data exploration in R using read(),summary(),nrow(),ncol(),str().
Write an R script to demonstrate R objects.

Modes of Evaluation and Rubric

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Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	Prof. Ramratan Ahirwal & Rashi Kumar
Subject handled by department	Department of IT