SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE
(AUTONOMOUS)

(Approved by AICTE, New Delhi, Affiliated to JNTUK, Kakinada)

Accredited by NAAC with 'A+' Grade

Recognised as Scientific and Industrial Research Organisation

SRKR MARG, CHINA AMIRAM, BHIMAVARAM – 534204 W.G.Dt., A.P., INDIA

Regulation: R23	

ARTIFICIAL INTELLEGENCE AND DATA SCIENCE (Minors)

(Applicable for CE, ECE, EEE&ME)

COURSE STRUCTURE

(With effect from 2023-24 admitted Batch onwards)

Course Code	Course Name	Year/ Sem	Cr	L	T	P	C.I.E	S.E.E	Total Marks
B23ADM101	Fundamentals of Artificial Intelligence	II-II	3	3	0	0	30	70	100
B23ADM201	Fundamentals of Data Science	III-I	3	3	0	0	30	70	100
B23ADM301	Cloud Computing	III-II	3	3	0	0	30	70	100
B23ADM401	Introduction to Prompt Engineering & Gen AI	IV-I	3	3	0	0	30	70	100
B23ADM501	*MOOCS-I	II-II to IV-I	3	--	--	--	--	--	100
B23ADM601	*MOOCS-II	II-II to IV-I	3	--	--	--	--	--	100
		TOTAL	**18**	**12**	**0**	**0**	**120**	**280**	**600**

*Two MOOCS courses of any ARTIFICIAL INTELLEGENCE AND DATA SCIENCErelated Program Core Courses from NPTEL/SWAYAM with a minimum duration of12 weeks (3 Credits) courses other than the courses offered need to be takenby prior information to the concern. These courses should be completed between II Year II Semester to IV Year I Semester.

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23ADM101	**Minors**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE

(Minor Degree course in AIDS)

Course Objectives:

1.	To have a basic proficiency in a traditional AI language including an ability to write simple to intermediate programs and an ability to understand code written in that language
2.	To understand the basic issues of knowledge representation and blind and heuristic search, as well as an understanding of other topics such as minimax, resolution that play an important role in AI programs
3.	To have a basic understanding of some of the more advanced topics of AI

Course Outcomes: At the end of the course Students will be able to

S.No	Outcome	Knowledge Level
1	**Describe** the basic foundations & applications of AI.	K2
2	**Apply** problem solving strategies to generate the best AI solutions using state space search.	K3
3	**Use** AI languages to represent knowledge base for problem solving.	K3
4	**Use** AI tools to represent knowledge base in real world problems.	K3
5	**Apply** uncertainty and fuzzy logic techniques to solve AI problems	K3

SYLLABUS

UNIT-I (10 Hrs)	**Introduction**, history, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, development of AI languages, current trends.
UNIT-II (10 Hrs)	**Problem solving**: state-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative deepening A*, constraint satisfaction Problem reduction and game playing: Introduction, problem reduction, game playing, alpha beta pruning, two-player perfect information games.
UNIT-III (10 Hrs)	**Logic concepts**: Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic.
UNIT-IV (8 Hrs)	**Knowledge representation**: Introduction, approaches to knowledge representation, knowledge representation using semantic networks, extended semantic networks for KR, knowledge representation using frames Advanced knowledge representation techniques:

	Introduction, conceptual dependency theory, script structure
UNIT-V (12Hrs)	**Expert system and applications**: Introduction phases in building expert systems, expert system versus traditional systems Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks **Fuzzy sets and fuzzy logic**: Introduction, fuzzy sets, fuzzy set operations, types of membership functions

Textbooks:	
1.	Artificial Intelligence- Saroj Kaushik, CENGAGE Learning.
2.	Artificial intelligence, A modern Approach, 2nded, Stuart Russel, Peter Norvig, PEA.
Reference Books:	
1.	Artificial Intelligence- Deepak Khemani, TMH, 2013.
2.	Introduction to Artificial Intelligence, Patterson, PHI.
3.	Artificial intelligence, structures and Strategies for Complex problem solving, George F Lugar, 5th ed, PEA.

					Course Code:B23ADM101
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R23**
		II B.Tech. II Semester MODEL QUESTION PAPER			
		FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE			
		(Minor Degree course in AIDS)			
Time: 3 Hrs.					**Max. Marks: 70 M**
		Answer Question No.1 compulsorily			
		Answer **ONE Question** from **EACH UNIT**			
		Assume suitable data if necessary			
					10 x 2 = 20 Marks
			CO	**KL**	**M**
1.	**a).**	Mention any two applications of AI.	**1**	**2**	**2**
	b).	What is an intelligent system? Give an example.	**1**	**2**	**2**
	c).	What is alpha-beta pruning?	**2**	**2**	**2**
	d).	What is the difference between breadth-first and depth-first search?	**2**	**2**	**2**
	e).	Define resolution refutation.	**3**	**2**	**2**
	f).	What is propositional logic?	**3**	**2**	**2**
	g).	What is a conceptual dependency?	**4**	**2**	**2**
	h).	Mention the use of frames in knowledge representation.	**4**	**2**	**2**
	i).	List any two phases of building expert systems.	**5**	**2**	**2**
	j).	What is the key difference between traditional systems and expert systems?	**5**	**2**	**2**
					5 x 10 = 50 Marks
		UNIT-1			
2.	**a).**	List various categorizations of artificial intelligence systems. Explain each.	**1**	**2**	**5**
	b).	Explain various fields in foundations of AI.	**1**	**2**	**5**
		OR			
3.	**a).**	Describe the working of a simple AI game – Tic-Tac-Toe.	**1**	**3**	**5**
	b).	What are the applications of Artificial Intelligence?	**1**	**2**	**5**
		UNIT-2			
4.	**a).**	Describe Iterative Deepening A* algorithm.	**2**	**3**	**5**
	b).	Describe the mini max algorithm with an example	**2**	**3**	**5**
		OR			
5.	**a).**	Explain Constraint Satisfaction Problem (CSP) and solve a Cryptarithmetic puzzle (TWO+TWO=FOUR), show the steps involved in finding the solution.	**2**	**3**	**5**

	b).	What is meant by search strategy? Explain any two search strategies that come under uniformed search	**2**	**2**	**5**
		UNIT-3			
6.	**a).**	Consider the following problem. • John likes all kinds of food. • Apples are food. • Chicken is food. • Anything any one eats and isn't killed by is food. • Bill ate peanuts and still alive. • Sue eats everything Bill eats. i) Convert the formulas into clause form. ii) Prove that "John likes peanuts" using resolution.	**3**	**3**	**10**
		OR			
7.	**a).**	Prove the following theorem using deductive inference rules From A → B ∧ C, A infer C, from A ∧ B, A → C infer C.	**3**	**3**	**5**
	b).	What is predicate logic? Explain the predicate logic representation with reference to suitable example	**3**	**3**	**5**
		UNIT-4			
8.	**a).**	Define frames. Explain knowledge representation using frames?	**4**	**2**	**5**
	b).	Describe your chair using a semantic net?	**4**	**3**	**5**
		OR			
9.	**a).**	Develop a frame based system for university application?	**4**	**2**	**5**
	b).	How do you represent visiting a restaurant in the form of a Script? Explain	**4**	**3**	**5**
		UNIT-5			
10.	**a).**	What is Expert system? Explain its Phases.	**5**	**2**	**5**
	b).	Explain Fuzzy sets with example.	**5**	**2**	**5**
		OR			
11.	**a).**	Explain various types of membership functions used in fuzzy logic with diagrams.	**5**	**2**	**5**
	b).	Discuss Bayesian belief networks with an example.	**5**	**2**	**5**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE : Questions can be given as A,B splits or as a single Question for 10 marks

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23ADM201	**Minors**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

FUNDAMENTALS OF DATA SCIENCE

(Minor Degree course in AIDS)

Course Objectives:

1	Impart knowledge on basics of data science, data manipulation and exploratory data analysis concepts that are vital for data science.
2	Develop skills for applying tools and techniques to analyze, visualize and interpret data.

Course Outcomes: At the end of the course Students will be able to

S.No	Outcome	Knowledge Level
1	**Demonstrate** knowledge on the concepts of data science to perform mathematical computations using efficient storage and data handling methods in NumPy.	K2
2	**Apply** Data Preparation and Exploration methods using Pandas to perform data manipulation.	K3
3	**Apply** Data Cleaning and preparation of data.	K3
4	**Apply** data visualization techniques using Matplotlib and Seaborn	K3
5	**Apply** methods to analyze and interpret time series data to extract meaningful statistics.	K3

SYLLABUS

UNIT-I (10 Hrs)	**INTRODUCTION TO DATA SCIENCE:** Basic terminologies of data science, Types of data, five steps of data science, Arrays and vectorized computation using NumPy - The NumPy ndarray: A multidimensional array object, Universal functions: Fast element-wise Array functions, Array-oriented Programming with arrays, File input and output with arrays, Linear algebra, Pseudo random number generation.
UNIT-II (10 Hrs)	**DATA EXPLORATION WITH PANDAS:** Process of exploring data, Panda's data structures – Series, Data frame, Index objects; Essential functionality, Summarizing and computing descriptive statistics – Correlation and covariance, Unique values, Value counts and membership; Data loading, Storage, and file formats - Reading and writing data in text format.
UNIT-III (10 Hrs)	**DATA CLEANING, PREPARATION AND DATA WRANGLING:** Handling missing data, Data transformation, String manipulation - String object methods, Data wrangling: Hierarchical indexing, Combining and merging datasets: join, Combine and reshape and pivoting.

UNIT-IV (10 Hrs)	**DATA VISUALIZATION WITH MATPLOTLIB:** Plotting and visualization- A brief matplotlib API primer, Plotting with Pandas and Seaborn, Other python visualization tools, **Apply**: General split-apply-combine, Data aggregation and Group operations Group By mechanics.
UNIT-V (8 Hrs)	**TIME SERIES ANALYSIS:** Date and time data types and tools, Time series basics. Date ranges, Frequencies, Re-sampling and frequency Conversion: Down sampling, up sampling and interpolation, Re-sampling with periods.
Textbooks:	
1.	Wes McKinney, Python for Data Analysis, O 'Reilly, 2nd Edition, 2017
Reference Books:	
1.	Sinan Ozdemir, Principles of Data Science, Packt Publishers, 2nd Edition, 2018.
2.	Rachel Schutt, Cathy O'Neil,Doing Data Science: Straight Talk from the Frontline, O'Reilly, 2014.
e-Resources	
1	https://swayam.gov.in/nd1_noc19_cs60/preview
2	https://towardsdatascience.com/
3	https://www.w3schools.com/datascience/
4	https://github.com/jakevdp/PythonDataScienceHandbook
5	https://www.kaggle.com

		Course Code:B23ADM201			
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R23**
		III B.Tech. I Semester MODEL QUESTION PAPER			
		FUNDAMENTALS OF DATA SCIENCE			
		(Minor Degree course in AIDS)			
Time: 3 Hrs.					**Max. Marks: 70 M**
		Answer Question No.1 compulsorily			
		Answer **ONE Question** from **EACH UNIT**			
		Assume suitable data if necessary			
					10 x 2 = 20 Marks
			CO	**KL**	**M**
1.	**a).**	Define arrange,array,reshape functions	**1**	**2**	**2**
	b).	Create N-dimn Array	**1**	**3**	**2**
	c).	Explain pandas data structures	**2**	**2**	**2**
	d).	Define stack ,unstuck functions	**2**	**2**	**2**
	e).	Describe merge methods	**3**	**2**	**2**
	f).	Define Hierarchical indexing	**3**	**2**	**2**
	g).	Explain data visualization tools	**4**	**2**	**2**
	h).	Difference between pivot, cross tabulation	**4**	**2**	**2**
	i).	Types of moving window functions	**5**	**2**	**2**
	j).	Describe resample.	**5**	**2**	**2**
					5 x 10 = 50 Marks
		UNIT-1			
2.	**a).**	Explain Linear algebra with Numpy	**1**	**2**	**5**
	b).	Build in detail about Data Science process with necessary examples	**1**	**2**	**5**
		OR			
3.	**a).**	Explain Required steps of data science	**1**	**2**	**5**
	b).	Explain Arrays and vectorized computation using NumPy with example.	**1**	**2**	**5**
		UNIT-2			
4.	**a).**	How many types of files in data science? Explain each with examples .	**2**	**2**	**5**
	b).	Explain Correlation and covariance with examples.	**2**	**2**	**5**
		OR			
5.	**a).**	Explain Data loading, Storage using pandas.	**2**	**2**	**5**
	b).	Make a pandas Data Frame with two-dimensional list using python.	**2**	**3**	**5**

		UNIT-3			
6.	**a).**	Is regular expressions important for data science? What are the applications of regular expression?	**3**	**2**	**10**
		OR			
7.	**a).**	Explain about Data Wrangling and uses of data wrangling.	**3**	**2**	**5**
	b).	Apply a methods join, Combine and reshape - Hierarchical indexing using student sample data.	**3**	**3**	**5**
		UNIT-4			
8.	**a).**	Define Data Visualization what are the benefits of data visualization	**4**	**2**	**5**
	b).	Explain Data aggregation and Group operations Group By mechanics.	**4**	**2**	**5**
		OR			
9.	**a).**	Apply Different types of plots with examples.	**4**	**3**	**5**
	b).	How can we visualize more than three dimensions of data in a single chart?	**4**	**2**	**5**
		UNIT-5			
10.	**a).**	What sis resampling and describe the methods of Down sampling, up sampling with examples.	**5**	**2**	**5**
	b).	Describe the various tools used to represent the time data types	**5**	**2**	**5**
		OR			
11.	**a).**	Describe various applications of time series data and list out the basics of time series data	**5**	**2**	**5**
	b).	Explain the various methods for Moving window functions	**5**	**2**	**5**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE : Questions can be given as A,B splits or as a single Question for 10 marks

Course Code	Category	L	T	P	C	C.I.E.	S.E.E.	Exam
B23ADM301	**Minors**	**3**	**--**	**--**	**3**	**30**	**70**	**3 Hrs.**

CLOUD COMPUTING

(Minor Degree course in AIDS)

Course Objectives:

1	Examine the system models for cloud computing.
2	Understand the concepts of virtualization, hardware and storage
3	Identify cloud platform architecture and programming.
4	Develop cloud applications

Course Outcomes: At the end of the course Students will be able to

S.No	Outcome	Knowledge Level
1	**Define**, understand, and explain the concepts of cloud computing environment and various Virtualization techniques.	K2
2	**Explore** and understand various services provided by Cloud Computing	K2
3	**Illustrate** various Cloud application development frame	K2
4	**Understand** various cloud maintenance techniques	K2
5	**Develop** cloud-based applications by applying Amazon, Microsoft, Salesforce.com etc., frameworks.	K3

SYLLABUS

UNIT-I (10 Hrs)	**Introduction to cloud computing**: Cloud computing components, Infrastructure services, storage applications, database services – introduction to SaaS, PaaS, IaaS, IdaaS, data storage in cloud. **Virtualization:** enabling technologies, types of virtualizations, server virtualization, desktop virtualization, memory virtualization, application and storage virtualization-tools and products available for virtualization.
UNIT-II (10 Hrs)	**SAAS and PAAS**: Getting started with SaaS, SaaS solutions, SOA, PaaS and benefits. **IaaS and Cloud Data Storage**: understanding IaaS, improving performance for load balancing, server types within IaaS, utilizing cloud-based NAS devices, cloud based data storage, backup services, cloud-based block storage and database services.
UNIT-III (10 Hrs)	**Cloud Application development**: Client server distributed architecture for cloud designing cloud-based solutions, coding cloud-based applications, traditional Apps vs cloud Apps, client-side programming, server-side programming overview fundamental treatment of web application frameworks.

UNIT-IV (10 Hrs)	**Cloud Governance and economics**: Securing the cloud, disaster recovery and business continuity in the cloud, Managing the cloud, migrating to the cloud, governing and evaluating the clouds business impact and economics.
UNIT-V (8 Hrs)	**Inside Cloud:** Introduction to MapReduce and Hadoop-overview of big data and its impact on cloud. Google: Google App Engine, Google Web Toolkit **Microsoft:** Azure Services Platform, Windows live, Exchange Online, Share Point Services
Textbooks:	
1.	Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile, Security and More, Kris Jamsa, Jones & Bartlett Publishers, Paperback edition,2013
2.	Cloud Computing, A Practical Approach, 1st Edition, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH,2017
Reference Books:	
1.	Hadoop MapReduce cookbook, Srinath Perera and Thilina Gunarathne, Packet publishing.
e-Resources	
1.	https://onlinecourses.nptel.ac.in/noc21_cs15/preview

		Course Code:B23ADM301			
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R23**
		III B.Tech. II Semester MODEL QUESTION PAPER			
		CLOUD COMPUTING			
		(Minor Degree course in AIDS)			
Time: 3 Hrs.					**Max. Marks: 70 M**
		Answer Question No.1 compulsorily			
		Answer **ONE Question** from **EACH UNIT**			
		Assume suitable data if necessary			
					10 x 2 = 20 Marks
			CO	**KL**	**M**
1.	**a).**	Compare traditional applications and cloud-based applications.	**1**	**1**	**2**
	b).	What are the benefits of using PaaS for application development?	**1**	**1**	**2**
	c).	What is virtualization? Explain the different types of virtualizations used in cloud computing.	**2**	**1**	**2**
	d).	List commonly used tools and products for virtualization.	**2**	**1**	**2**
	e).	Write a short note on cloud-based block storage.	**3**	**1**	**2**
	f).	Explain the concept of Infrastructure as a Service (IaaS) with a real-world cloud provider example.	**3**	**1**	**2**
	g).	Explain client-side programming vs server-side programming with examples.	**4**	**1**	**2**
	h).	How do cloud-based solutions differ from traditional on-premises systems?	**4**	**1**	**2**
	i).	Explain the MapReduce programming model.	**5**	**1**	**2**
	j).	Discuss the impact of big data on cloud infrastructure and services.	**5**	**1**	**2**
					5 x 10 = 50 Marks
		UNIT-1			
2.	**a).**	What is Cloud Computing? Explain Cloud Components with neat diagrams.	**1**	**2**	**5**
	b).	Distinguish Full Virtualization and Para Virtualization.	**1**	**2**	**5**
		OR			
3.	**a).**	Apply and Distinguish Full Virtualization and Para Virtualization in high-performance computing applications.	**1**	**2**	**5**
	b).	Illustrate the concept of logical clocks and message delivery rules with neat diagram	**1**	**2**	**5**
		UNIT-2			
4.	**a).**	Analyze open SaaS solutions and mashups with real-time examples.	**2**	**2**	**5**

		Apply Service-Oriented Architecture diagrams in developing cloud application.			
	b).	Build a PaaS application using Google App Engine and Force.com?	**2**	**2**	**5**
		OR			
5.	**a).**	Apply IaaS concepts for improving performance through Load Balancing with neat diagrams.	**2**	**2**	**5**
	b).	Analyze different types of servers in IaaS. Apply IaaS solution concepts to build on Rackspace.	**2**	**2**	**5**
		UNIT-3			
6.	**a).**	Discuss Client-Server Distributed Architecture in the Cloud.	**3**	**2**	**5**
	b).	Distinguish between Traditional Apps and Cloud Apps.	**3**	**2**	**5**
		OR			
7.	**a).**	Apply design principles to build cloud-based solutions.	**3**	**2**	**5**
	b).	Design a web application framework using.	**3**	**2**	**5**
		UNIT-4			
8.	**a).**	Write an analysis document on Business Continuity and Disaster Recovery in the cloud.	**4**	**2**	**5**
	b).	Explain cloud management strategies.	**4**	**2**	**5**
		OR			
9.	**a).**	Analyze the concept of Data Storage Wiping for preventing data access.	**4**	**2**	**5**
	b).	Discuss cloud migration strategies.	**4**	**2**	**5**
		UNIT-5			
10.	**a).**	Write an analysis document on MapReduce and Hadoop.	**5**	**2**	**5**
	b).	Analyze and assess Big Data and its impact on the Cloud.	**5**	**2**	**5**
		OR			
11.	**a).**	Summarize features of the Google Web Toolkit	**5**	**2**	**5**
	b).	Elaborate on SharePoint services and Exchange Online.	**5**	**2**	**5**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE : Questions can be given as A,B splits or as a single Question for 10 marks