


DEPARTMENT OF INFORMATION TECHNOLOGY

**SAMRAT ASHOK TECHNOLOGICAL INSTITUTE VIDISHA (M.P.)
(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV
Bhopal)**

**Department Of Information Technology
Programme -AIADS
Scheme-2022-23 (w.e.f. July-2024)**

Proposed for Approval V Semester to VII Semester

DEPARTMENT OF INFORMATION TECHNOLOGY

		SAMRAT ASHOK TECHNOLOGICAL INSTITUTE VIDISHA (M.P.) (A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV Bhopal)												
		Scheme of Examination (Semester-II)												
		for Batch Admitted in session - 2022-23												
		Bachelor of Technology (B. Tech.) – Artificial Intelligence and Data Science												
Subject Code	Subject Category	Subject Name	Maximum Marks Allotted							Contact Hrs.			Total Credits	
			Theory				Practical			Total Marks	L	T		P
			ES	MS	Assignment	Quiz	ES	LW	Quiz					
PYE101	BSC	Applied Physics	60	20	10	10	30	10	10	150	3	0	2	4
CSA103	ESC	Problem Solving and Data Structure	60	20	10	10	30	10	10	150	3	0	2	4
ITC101	ITC	Python Programming	60	20	10	10	30	10	10	150	3	0	2	4
CSA104	ESC	Principles of Software System	60	20	10	10				100	3	0	0	3
MAB102	BSC	Statistics: Probability Distribution and Differential Equations	60	20	10	10	–		–	100	3	1	0	4
CSL110	ESC	Computer Workshop (Linux Lab)					30	10	10	50	1	0	2	2
MAC102	MAC*	Disaster Management	–	–		–	30	10	10	50	0	0	2	Grade
ILC100	ILC	Extracurricular Activities	It is a one credit per year activity endorse in eight semester marksheet											
Total			300	100	50	50	150	50	50	750	16	1	8	21


MST: Minimum two mid semester tests to be conducted during Semester, MAC: Mandatory courses classes will be conducted in off hours (Weekends)

ILC	Internship-I (60 Hrs) Institute Level	Non-Credit
HEC	NSS/NCC/NSO	Non-Credit




Abbreviations: ES -End Semester, MS- Mid Semester, LW- Laboratory Work/Assignment, (L: Lecture, T: Tutorial, P: Practical)
 BSC- Basic Science Course, ESC- Engineering Science Course, HSMC- Humanities Science and Management Course, MAC- Mandatory, Audit Course, AC- Audit Course,
 HEC- Holistic Education Course, ITC- Information Technology Course, ILC-Institute Level Course, DC- Department Course, DE-Department Elective, OC- Open Course, DLC-
 Department Laboratory, PROJ- Project Work

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		SAMRAT ASHOK TECHNOLOGICAL INSTITUTE VIDISHA (M.P.) (A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV Bhopal) Scheme of Examination (Semester-II) Bachelor of Technology (B. Tech. –AIADS) for Batch Admitted in session - 2023-24														
		Subject Code	Subject Category	Subject Name	Maximum Marks Allotted							Contact Hrs.			Total Credits	
					Theory				Practical			Total Marks	L	T		P
					ES	MS	Assignment	Quiz	ES	LW	Quiz					
PYB101	BSC	Applied Physics	60	20	10	10	30	10	10	150	3	0	2	4		
CSA103	ESC	Problem Solving and Data Structure	60	20	10	10	30	10	10	150	3	0	2	4		
ITC101	ITC	Python Programming	60	20	10	10	30	10	10	150	3	0	2	4		
CSA104	ESC	Principles of Software System	60	20	10	10				100	3	0	0	3		
MAB102	BSC	Statistics: Probability Distribution and Differential Equations	60	20	10	10	--	--	--	100	3	1	0	4		
CSL110	ESC	Computer Workshop(Linux Lab)	--	--	--	--	30	10	10	50	1	0	2	2		
MAC102	MAC	Disaster Management					30	10	10	50	0	0	2	Grade		
ILC100	ILC	Extracurricular Activities	It is a one credit per year activity to be endorsed in eight semester mark sheet.													
Total			300	100	50	50	150	50	50	750	16	1	8	21		
MST: Minimum two mid semester tests to be conducted during Semester, MAC: Mandatory courses classes will be conducted in off hours (Weekends)																

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		SAMRAT ASHOK TECHNOLOGICAL INSTITUTE VIDISHA (M.P.) (A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV Bhopal)													
		Scheme of Examination (Semester-III)-AIADS													
		for Batch Admitted in session - 2022-23													
		Bachelor of Technology (B. Tech.) – Artificial Intelligence and Data Science													
Subject Code	Subject Category	Subject Name	Maximum Marks Allotted								Contact Hrs. per week			Total Credits	
			Theory				Practical				Total Marks	L	T		P
			ES	MS	Assignment	Quiz	ES	LW	Quiz						
MAB-301	BSC	Discrete Mathematics	60	20	10	10	--	--	--	100	3	1	0	4	
AI-302	DC	Analysis and Design of Algorithms	60	20	10	10	30	10	10	150	3	0	2	4	
AI-303	DC	OOPs	60	20	10	10	30	10	10	150	3	0	2	4	
AI-304	DC	Operating System	60	20	10	10	30	10	10	150	3	0	2	4	
OE-305	OE	OE-I	60	20	10	10	--	--	--	100	3	0	0	3	
AI-306	DL	Internet Programming	--	--	--	--	30	10	10	50	0	0	4	2	
AI-307	ILC	Internship-I (60 Hrs) Institute Level (Evaluation)	--	--	--	--	-	50	--	50	-	-	2	2	
Total			300	100	50	50	120	90	40	750	15	1	12	23	
	ILC	Extracurricular Activities	Based on participation in extra curriculum activities, one credit per year to be endorsed in the eight semester mark sheet.												
MAC-308	MAC*	Energy, Ecology, Environment & Society	-	20	20	10	-	-	-	-	-	-	-	Grade	
HUM-309	HEC*	Holistic Education Course	-	20	20	10	-	-	-	-	-	-	-	Grade	

MS: Minimum two mid semester tests are to be conducted during Semester, (L-Lecture, T- Tutorial, P-Practical)
 MAC* -Mandatory audit course & HEC*- Holistic education courses classes will be conducted in off hours (Weekends)

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Open Course Offered by AIADS Session: 2023-24 Semester III			
Open Elective-I (OE-305)	A	B	C
	Computer System Organisation	Operating System	Data Structure
Prerequisite	Fundamental knowledge of digital electronics	Computer Programming	Logical thinking and Computer Fundamentals
Remark	Open to All	Not Applicable for - CSE & CSE(BC)	Not Applicable for - CSE and Allied branches, EC
Note: 1.Open Courses launched by respective Programmes are not applicable for students of parental programmes. 2. Subject which is being opted by IT/IOT/Others in OE-305 should not be opted as DE/DC in parent department.			

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		SAMRAT ASHOK TECHNOLOGICAL INSTITUTE VIDISHA (M.P.) (A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV Bhopal)												
		Scheme of Examination (Semester-IV)-AIADS												
		for Batch Admitted in session - 2022-23												
		Bachelor of Technology (B. Tech.) – Artificial Intelligence and Data Science												
Subject Code	Subject Category	Subject Name	Maximum Marks Allotted								Contact Hrs. per week			Total Credits
			Theory				Practical			Total Marks	L	T	P	
			ES	MS	Assignment	Quiz	ES	LW	Quiz					
AI-401	DC	Computer Networks	60	20	10	10	30	10	10	150	3	0	2	4
AI-402	DC	DBMS	60	20	10	10	30	10	10	150	3	0	2	4
AI-403	DC	Foundation of Data Science	60	20	10	10	30	10	10	150	3	0	2	4
AI-404	DC	Software Engineering	60	20	10	10				100	3	1	0	4
OE-405	OE	OE-II	60	20	10	10				100	3	0	0	3
AI-406	DL	Advance Java Programming					60	20	20	100	0	0	4	2
Total			300	100	50	50	150	50	50	750	15	1	10	21
	ILC	Extracurricular Activities	Based on participation in extra curriculum activities, one credit per year to be endorsed in the eight semester mark sheet.											
HUM 408	HEC*	Holistic Education Course	-	20	20	10	-	-	-	-	-	-	-	Grade

MS: Minimum two mid semester tests are to be conducted during Semester, (L-Lecture, T- Tutorial, P-Practical)

HEC*- Holistic education courses classes will be conducted in off hours (Weekends)


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Open Elective-II	Category	Name	Holistic Course's
OE-405	A	Foundation of Data Science	Technical writing Skills
	B	Computer Graphics	Yoga & Meditation
	C	DBMS	

Note: 1.Open Courses launched by respective Programmes are not applicable for students of parental programmes.

2. Subject which is being opted by IT/IOT/Others in OE-405 should not be opted as DE/DC in parent department.

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 SAMRAT ASHOK TECHNOLOGICAL INSTITUTE VIDISHA (M.P.) (A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV Bhopal)															
Scheme of Examination (Semester-V) Bachelor of Technology (B. Tech. –AIADS)															
for Batch Admitted in session - 2022-23 w.e.f July 2024															
Subject Code	Subject Category	Subject Name	Maximum Marks Allotted								Contact Hrs.			Total Credits	
			Theory				Practical				Total Marks	L	T		P
			ES	MS	Assignment	Quiz	ES	LW	Quiz						
AI-501	DC	Fuzzy logic	60	20	10	10	30	10	10	150	3	0	2	4	
AI-502	DC	Data Science Analytics	60	20	10	10	30	10	10	150	3	0	2	4	
AI-503	DC	Cloud Computing	60	20	10	10	30	10	10	150	3	0	2	4	
AI-504	DE	DE-1	60	20	10	10	--	--	--	100	3	0	0	3	
AI-505	OC	OC-1	60	20	10	10	--	--	--	100	3	0	0	3	
AI-506	DLC	Advanced Data Science Lab-I	--	--	--	--	30	10	10	50	0	0	4	2	
AI-507	ILC	Internship-II (60 Hrs) Institute Level (Evaluation)	--	--	--	--	50	--	--	50	-	2	-	2	
	ILC	Extracurricular Activities	It is a one credit per year activity to be endorsed in eight semester mark sheet												
Total			300	100	50	50	170	40	40	750	15	2	10	22	

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List of Courses for Honours Degree (MOOCs)											Credits
List of MOOCs/SWAYAM Courses will be notified before the start of the semester											
List of Courses for Minor Degree (MOOCs)											Credits
List of MOOCs/SWAYAM Courses will be notified before the start of the semester											

	DE -1	OC-1
A	Human Computer Interaction	Fuzzy logic
B	Image processing	Computer Graphics & multimedia
C	Information retrieval	Software Engineering

Students can opt any number of subjects depending on the number of credits he /she wants to earn in a particular semester for Honours/Minor degree. Total 20 credits required for Honors / Minor degree (from V TO VIII semester)

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		SAMRAT ASHOK TECHNOLOGICAL INSTITUTE VIDISHA (M.P.) (A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV Bhopal)													
		Scheme of Examination (Semester-VI) Bachelor of Technology (B. Tech.) – for Batch Admitted in session - 2022-23													
Subject Code	Subject Category	Subject Name	Maximum Marks Allotted								Contact Hrs.			Total Credits	
			Theory				Practical				Total Marks	L	T		P
			ES	MS	Assignment	Quiz	ES	LW	Quiz						
AI-601	DC	Data Mining & Data Warehousing	60	20	10	10	30	10	10	150	3	0	2	4	
AI-602	DC	Machine Learning	60	20	10	10	30	10	10	150	3	0	2	4	
AI-603	DE	DE-2	60	20	10	10				100	3	1	0	4	
AI-604	DE	DE-3	60	20	10	10				100	3	1	0	4	
AI-605	OC	OC-2	60	20	10	10				100	3	0	0	3	
AI-606	DLC	Advanced Data Science Lab-II					30	10	10	50	0	0	2	1	
AI-607		Minor Project					50	50		100			4	2	
	ILC	Extracurricular Activities	It is a one credit per year activity to be endorsed in eight semester mark sheet.												
Total			300	100	50	50	140	80	30	750	15	2	10	22	

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List of Courses for Honours Degree (MOOCs)											Credits
List of MOOCs/SWAYAM Courses will be notified before the start of the semester											
List of Courses for Minor Degree (MOOCs)											Credits
List of MOOCs/SWAYAM Courses will be notified before the start of the semester											

Students can opt any number of subjects depending on the number of credits he /she wants to earn in a particular semester for Honours/Minor degree. Total 20 credits required for Honors / Minor degree (from V TO VIII semester)

Internship-III (120 Hrs) External /Institute Level

	DE -2	DE -3	OC – 2
A	Optimization Techniques	Cryptography & Network Security	Artificial Intelligence
B	Knowledge Representation	Introduction to IOT	Data Science Analytics
C	Computer Vision	Robotics and process automation	Image processing

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		Scheme of Examination (Semester-VII) Bachelor of Technology (B. Tech.) – for Batch Admitted in session - 2022-23													
Subject Code	Subject Category	Subject Name	Maximum Marks Allotted								Contact Hrs.			Total Credits	
			Theory				Practical				Total Marks	L	T		P
			ES	MS	Assignment	Quiz	ES	LW	Quiz						
AI-701	DC	Deep Learning	60	20	10	10	30	10	10	150	3	0	2	04	
AI-702	DE	DE-4	60	20	10	10	--	--		100	3	1	0	04	
AI-703	DE	DE-5	60	20	10	10	--	--		100	3	1	0	04	
AI-704	PROJ	Major Project (Phase-I)	--	--	--		60	20	20	100	0	0	8	04	
AI-705	ILC	Internship-III (Completed in Third Year)	--	--	--		30	10	10	50	0	0	4	02	
	ILC	Extracurricular Activities	It is a one credit per year activity to be endorsed in eight semester marksheet.												
Total			180	60	30	30	120	40	40	500	9	2	14	18	
List of Courses for Honours Degree (MOOCs)													Credits		
List of MOOCs/SWAYAM Courses will be notified before the start of the semester															
List of Courses for Minor Degree (MOOCs)													Credits		
List of MOOCs/SWAYAM Courses will be notified before the start of the semester															

PStudents can opt any number of subjects depending on the number of credits he /she wants to earn in a particular semester for Honours/Minor degree. Total 20 credits required for Honors / Minor degree (from V TO VIII semester)

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	DE -4	DE-5
A	Introduction to Logics	Big Data Analytics
B	Natural Language Processing	Data Handling & Visualization
C	Business Intelligence	Software Testing & Quality Assurance

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		Scheme of Examination (Semester-VIII) Bachelor of Technology (B. Tech.) – for Batch Admitted in session - 2022-23												
Subject Code	Subject Category	Subject Name	Maximum Marks Allotted							Contact Hrs.			Total Credits	
			Theory				Practical			Total Marks	L	T		P
			ES	MS	Assignment	Quiz	ES	LW	Quiz					
AI 801	Major Project / MOOCs	Major Project (Phase-II)					300	200		500	0	0	20	10
	ILC	Extracurricular Activities												4
Total							300	200		500				14
List of Courses for Honors Degree (MOOCs)														Credits
List of MOOCs/SWAYAM Courses will be notified before the start of the semester														
List of Courses for Minor Degree (MOOCs)														Credits
List of MOOCs/SWAYAM Courses will be notified before the start of the semester														

Students can opt any number of subjects depending on the number of credits he /she wants to earn in a particular semester for Honours/Minor degree. Total 20 credits required for Honors / Minor degree (from V TO VIII semester)

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List of Courses for Honours Degree (MOOCs) June 24-25											Credits
Reinforcement Learning											3
Deep Learning for Computer Vision											3
Cyber Security and Privacy											3
Google Cloud Computing Foundations											2
Algorithmic Game Theory											3
Responsible & Safe AI Systems											3
Applied Accelerated Artificial Intelligence											3
Artificial Intelligence : Search Methods For Problem solving											3
List of Courses for Minor Degree (MOOCs) June 24-25											Credits
Software Engineering											3
Introduction to Machine Learning											2
Computer Vision											3
Programming, Data Structures and Algorithms using Python											2
Introduction to Operating Systems											2
Design and Analysis of Algorithms											2
Cloud Computing											3
Deep Learning - IIT Ropar											3



SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

(Engineering College), VIDISHA M.P.

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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 501	Subject Name			Fuzzy Logic					
Maximum Marks Allotted											Contact Hours		Total Credits
Theory				Practical			Total Marks	L	T	P			
ES	MS	Assignment	Quiz	ES	LW	Quiz					3	0	2
60	20	10	10	30	10	10	150			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 learn 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.

UNIT s	Descriptio ns	Hrs.
I	<p>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</p> <p>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</p>	8
II	<p>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.</p>	8
III	<p>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.</p>	8
IV	<p>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.</p>	8
V	<p>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</p>	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=111106048B>.

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	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 1	PO 11	PO 12	PSO-1	PS O2
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							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
Prerequisites:											
<ul style="list-style-type: none"> ● Data Science, ● Machine Learning 											
Course Objective:											
<ol style="list-style-type: none"> 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

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
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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 Credit s
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:											
<ul style="list-style-type: none"> ● Basic Knowledge of algorithms, Discrete Mathematics Computer Networks. 											
Course Objective:											
<ol style="list-style-type: none"> 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	Descriptio ns										H rs.
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
II I	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
I V	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 and 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, Applications, APIs.										8
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

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:

COs	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	PO 7	P O 8	P O 9	P O 1	PO 11	P O 1 2	PS O-1	PS O2
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 on Trailhead.com

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DEPARTMENT OF IT

Semester/Year		Program		Program							
				B.Tech – Artificial Intelligence and Data Science							
Subject Category		DE-1		Subject Code:		AI-504-A		Subject Name			
								Human Computer Interaction			
Maximum Marks Allotted											Total Credits
Theory				Practical			Total Marks	Contact Hours			
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10				100	3	0	0	3
Prerequisites:											
<ul style="list-style-type: none"> ● Basic Knowledge of algorithms, Discrete Mathematics 											
Course Objective:											
<ol style="list-style-type: none"> 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 Interactionl, 3rd Edition, Pearson Education, 2004 (UNIT I, II & III)
 2. Brian Fling, —Mobile Design and Developmentl, First Edition, O'Reilly Media Inc., 2009 (UNIT – IV)
 3. Bill Scott and Theresa Neil, —Designing Web Interfacesl, 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	PO10	PO11	PO12	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									

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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			Total Marks	L	T	P	Total Credits	
ES	MS	Assignment	Quiz	ES	LW	Quiz	100	3	0	0	3	
60	20	10	10									
Prerequisites:												
Basic Knowledge of algorithms, Discrete Mathematics												
Course Objective:												
<ol style="list-style-type: none"> 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	
II I	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	
I V	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 Clifford 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	P O 1	P O 2	P O 3	P O 4	P O 5	P O6	P O7	P O8	P O9	P O1	PO 11	P O1 2	PS O-1	PS O2
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

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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	L	T	P	Total Credits
ES	MS	Assignment	Quiz	ES	LW	Quiz	L	T	P	Total Credits	
60	20	10	10				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
II I	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
I V	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 logic, 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. Fundamentals 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%20DEVELOPMENT%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	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O-1	PS O2
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

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Semester/Year		V/III	Program			B.Tech – Artificial Intelligence and Data Science					
Subject Category	OC -1	Subject Code:	AI 505-A	Subject Name		Fuzzy Logic					
Maximum Marks Allotted											
Theory				Practical			Total Marks	Contact Hours			Total Credits
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 learn 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.

UNIT s	Descriptions	Hrs.
I	<p>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</p> <p>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</p>	8
II	<p>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.</p>	8
III	<p>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.</p>	8
IV	<p>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.</p>	8
V	<p>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</p>	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

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

CO-PO Mapping:

COs	P O1	P O2	PO 3	P O4	PO 5	P O6	P O7	P O8	P O9	P O1	PO 11	PO 12	PSO-1	PS O2
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

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Semester/Year		V/III		Program			B.Tech – Artificial Intelligence and Data Science					
Subject Category	OC-1	Subject Code:		AI 505 - B	Subject Name			Computer Graphics and Multimedia				
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				100	3	0	0	3	
Prerequisites:												
Knowledge of Higher Mathematics , Basic Electronics, Algorithms and Discrete Mathematics,												
Course Objective:												
<ol style="list-style-type: none"> 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-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	PO ¹¹	PO ₂	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

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Semester/Year		V/III		Program			B.Tech – Artificial Intelligence and Data Science					
Subject Category	OC -1	Subject Code:		AI 505 - C	Subject Name			Software Engineering				
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				100	3	0	0	3	
Prerequisites:												
Programming Basics												
Course Objective:												
<p>4. To understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices.</p> <p>5. To understand project management and risk management associated with various types of projects.</p> <p>6. To know the basics of testing and understanding the concept of software quality assurance and software configuration management process.</p>												
UNITs	Descriptions										Hrs.	
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	



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.

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

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DEPARTMENT OF IT

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	L	T	P				
ES	MS	Assignment	Quiz	ES	LW	Quiz						4	2	
				30	10	10	50							

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

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

(Engineering College), VIDISHA M.P.

(An Autonomous Institute Affiliated to RGPV Bhopal)

DEPARTMENT OF IT

Semester/Year		VI/III		Program			B.Tech – Artificial Intelligence and Data Science							
Subject Category	DC	Subject Code:		AI 601	Subject Name			Data Mining and Data Warehousing						
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	30	10	10	3	0	2	4				
Prerequisites:														
<ul style="list-style-type: none"> Basic Knowledge of algorithms, Discrete Mathematics 														
Course Objective:														
<ol style="list-style-type: none"> To provide students with knowledge, advanced skills and understanding of Data Warehousing. Its components, design principles and modelling. Provide students with in-depth concepts in knowledge discovery. Data mining, different data mining algorithms and classification techniques. 														
UNITS	Descriptions									Hrs.				
I	Data Warehousing: Introduction to Data warehousing, needs for developing data Warehouse, Data warehouse systems and its Components, Design of Data Warehouse, Dimension and Measures, Data Marts:-Dependent Data Marts, Independents Data Marts and Distributed Data Marts, Conceptual Modelling of Data Warehouses, Star Schema, Snowflake Schema, Fact Constellations. Multidimensional Data Model and Aggregates.									8				
II	Characteristics of OLAP System, Motivation for using OLAP, Multidimensional View and Data Cube, Data Cube Implementations, Data Cube Operations, Guidelines for OLAP Implementation, Difference between OLAP and OLTP, OLAP Servers: ROLAP, MOLAP, HOLAP Queries.									8				
III	Introduction to Data Mining, Knowledge Discovery, Data Mining Functionalities, Data Mining System categorization and its Issues. Data Processing: Data Cleaning, Data Integration and Transformation. Data Reduction, Data Mining Statistics, Guidelines for Successful Data Mining.									8				
IV	Introduction, Basic, The Task and a Naïve Algorithm, Apriori Algorithms, Improving the efficiency of the Apriori Algorithm, Apriori-Tid, Direct Hasing and Pruning (DHP), Dynamic Itemset Counting (DIC), Mining Frequent Patterns without Candidate Generation (FP-Growth), Performance Evaluation of Algorithms.									8				
V	Introduction, Decision Tree, The Tree Induction Algorithm, Split Algorithms Based on Information Theory, Split Algorithm Based on the Gini Index, Overfitting and Pruning, Decision Trees Rules, Naïve Bayes Method. Cluster Analysis: Introduction, Desired Features of Cluster Analysis, Types of Cluster Analysis Methods: Partitional Methods, Hierarchical Methods, Density- Based Methods, Dealing with Large Databases, Quality and Validity of Cluster Analysis Methods									8				
Total Hours										45				
Course Outcomes:														
CO1: Explain the functionality of the various data warehousing models and components. CO2: Apply data pre- processing techniques on different datasets. CO3: Evaluate the performance of different association rules and classification techniques. CO4: Compare different association rule mining techniques. CO5: Identify different advance Classification and Clustering data mining techniques.														

Text Book**Text Book-**

1. Jawer Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Elsevier Pub.

Reference Books-

1 Arun K. Pujari, “Data Mining Techniques”, University Press.

2. Berson, “Data Warehousing and Data Mining and OLAP”, TMH

List and Links of e-learning resources:

- <https://ocw.mit.edu/>
- www.weka.com

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:

- 1 Installation of WEKA Tool
- 2 Creating new Arff File
- 3 Data Processing Techniques on Data set
- 4 Data cube construction – OLAP operations
- 5 Implementation of Apriori algorithm
- 6 Implementation of FP- Growth algorithm
- 7 Implementation of Decision Tree Induction
- 8 Calculating Information gains measures
- 9 Classification of data using Bayesian approach
- 10 Implementation of K-means algorithms
- 11 Case Study: Create Placement.arff file to identify the students who are eligible for placements using KNN

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

(Engineering College), VIDISHA M.P.

(An Autonomous Institute Affiliated to RGPV Bhopal)

DEPARTMENT OF IT

Semester/Year		VI/III		Program			B.Tech – Artificial Intelligence and Data Science				
Subject Category	DC	Subject Code:		AI 602	Subject Name			Machine Learning			
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	30	10	10	3	0	2	4	
Prerequisites:											
<ul style="list-style-type: none"> • Basic Knowledge of algorithms, Discrete Mathematics 											
Course Objective:											
<ol style="list-style-type: none"> 1. To introduce students to the basic concepts and techniques of Machine Learning. 2. To become familiar with regression methods, classification methods, clustering methods. 3. To become familiar with Dimensionality reduction Techniques. 											
UNITs	Descriptions									Hrs.	
I	Definition of learning systems. Goals and applications of machine learning. designing a learning system: training data, concept representation, function approximation. well posed learning problems, perspective & issues in machine learning ,The concept learning task. Concept learning as search through a hypothesis space. General-to-specific ordering of hypothesis. FIND-S ,candidate elimination algorithm									8	
II	Introduction, Decision tree representation, appropriate problems for decision tree learning, basic decision tree algorithm, hyperspace search in decision tree learning, issues in decision tree learning . Probability theory and Bayes rule. Naive Bayes learning algorithm									10	
III	Parameter smoothing. Generative vs. discriminative training. Logistic regression. Bayes nets and Markov nets for representing dependencies. Introduction, K -nearest neighbour learning, case-based learning, radial basis functions.									12	
IV	Learning from unclassified data. Clustering. Hierarchical Agglomerative Clustering. k-means partitional clustering. Expectation maximization (EM) for soft clustering. Semi-supervised learning with EM using labelled and unlabelled data.									8	
V	Introduction, neural network representation , problems for neural network learning, perceptron's, multilayer network & Back propagation Algorithm. Introduction, genetic operators, genetic programming, models of evolution & learning, parallelizing genetic algorithm.									7	
Total Hours									45		
Course Outcomes:											
<p>CO-1: Gain knowledge about basic concepts of Machine Learning.</p> <p>CO-2: Identify machine learning techniques suitable for a given problem</p> <p>CO-3: Solve the problems using various machine learning techniques</p> <p>CO-4: Apply Dimensionality reduction techniques.</p> <p>CO-5: Design application using machine learning techniques</p>											

Text Book

1. Tom M. Mitchell. "Machine Learning" McGraw-Hill, 2297.

**Reference Books-**

1. P. Langley. "Elements of Machine Learning" Morgan Kaufmann Publishers, Inc. 2296.
2. Ethem Alpaydin "Introduction to machine learning ".Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Universities Press.

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	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:

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate- Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select

appropriate data set for your experiment and draw graphs	
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

(Engineering College), VIDISHA M.P.

(An Autonomous Institute Affiliated to RGPV Bhopal)

DEPARTMENT OF IT

Semester/Year		VI/III		Program			B.Tech – Artificial Intelligence and Data Science							
Subject Category	DE-2	Subject Code:		AI 603 (A)	Subject Name			Optimization Technique						
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				100	3	1	-	4			

Prerequisites:

- Basic Knowledge of algorithms, Discrete Mathematics

Course Objective:

Identify and develop operational research models from the verbal description of the realsystem.

Analyse the results to resolve resource optimization

To practice their skills on many well-known real-life problems.

UNITs	Descriptions	Hrs.
I	Introduction What is optimization, Formulation of LPP, Solution of LPP: Simplex method, Basic Calculus for optimization: Limits and multivariate functions, Derivatives and linear approximations: Single variate functions and multivariate functions	8
II	Machine Learning Strategy ML readiness, Risk mitigation, Experimental mindset, Build/buy/partner, setting up a team, Understanding and communicating change.	8
III	Responsible Machine Learning AI for good and all, Positive feedback loops and negative feedback loops, Metric design and observing behaviours, Secondary effects of optimization, Regulatory concerns.	8
IV	Machine Learning in production and planning Integrating info systems, users break things, time and space complexity in production, when to retain the model? Logging ML model versioning, Knowledge transfer, Reporting performance to stakeholders.	8
V	Care and feeding of your machine learning model MLPL Recap, Post deployment challenges, QUAM monitoring and logging, QUAM Testing, QUAM maintenance, QUAM updating, Separating Datastack from Production, Dashboard Essentials and Metrics monitoring.	8
Total Hours		40

Course Outcomes:



CO1. Demonstrate a familiarity with major optimization algorithms.

CO2. Apply important optimization algorithmic and analyze the results.

CO3. finding out the local and global optimum.

CO4. formulation of design problems as mathematical programming problems. CO5.

design supervised and unsupervised learning approaches for real-life problems.

Text Book

Optimization for Machine Learning, SuvritSra, Sebastian Nowozin and Stephen J. Wright, MITPress, 2011

Reference Books-

Optimization in Machine Learning and Applications, Suresh Chandra Satapathy, Anand J. Kulkarni, Springer, 2019

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:

Recommendation by Board of studies on

Approval by Academic council on

Compiled and designed by

Prof. Ramratan Ahirwal

Subject handled by department

Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

(Engineering College), VIDISHA M.P.

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DEPARTMENT OF IT

Semester/Year		VI/III		Program			B.Tech – Artificial Intelligence and Data Science					
Subject Category	DE-2	Subject Code:		AI 603(B)	Subject Name		Knowledge Representation					
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				100	3	1	0	4	

Prerequisites:

- Basic Knowledge of algorithms, Discrete Mathematics

UNITS	Descriptions	Hrs.
I	The Key Concepts: Knowledge, Representation, and Reasoning, Why Knowledge Representation and Reasoning? Knowledge-Based Systems, why knowledge Representation? Why Reasoning? The Role of Logic, Propositional Logic basics, Soundness & Completeness, Resolution Proof, Semantic Tableaux, Binary Decision Diagrams	8
II	The Language of First-Order Logic: Introduction, The Syntax, The Semantics, Interpretations, Denotation, Satisfaction and Models, Logical Consequence Why We Care, Explicit and Implicit Belief, Knowledge-Based Systems. Expressing Knowledge. Knowledge Engineering, Vocabulary, Basic Facts, Complex Fact, Terminological Fact, Entailments, Abstract Individuals, Other Sorts of Facts.	8
III	Resolution: The Propositional Case, Resolution Derivations, An Entailment Procedure, Handling Variables and Quantifiers, First-Order Resolution, Answer Extraction., Skolemization, Equality, Dealing with Computational Intractability, The First-Order Case, The Herbrand Theorem, The Propositional Case , The Implications , SAT Solvers, Most General Unifiers, Other Refinements	8
IV	Reasoning with Horn Clauses: Horn Clauses, Resolution Derivations with Horn Clauses, SLD Resolution, Goal Trees, Computing SLD Derivations, Backward Chaining, Forward Chaining, The First-Order Case.	8
V	Procedural Control of Reasoning: Facts and Rules , Rule Formation and Search Strategy, Algorithm Design, Specifying Goal Order , Committing to Proof Methods , Controlling Backtracking, Negation as Failure Dynamic Databases, The PLANNER Approach.	8
Total Hours		40

Course Outcomes:

- CO-1: Express knowledge of a domain formally (Understand)
- CO-2: Explain the production systems, frames, inheritance systems and approaches to handle uncertain or incomplete knowledge (Understand).
- CO-3: Examine the principles of reasoning (Analyze)
- CO-4: Describe how knowledge-based systems work (Understand)
- CO-5: Illustrate knowledge-based approaches to problem solving (Apply)
- CO-6: Design & develop a knowledge- based system (Create)

Text Book

Text Book-

1. Language, Proof and Logic, Jon Barwise & John Etchemendy, CSLI Publications (1999); 2. Knowledge representation and Reasoning, Ronald J. Brachman & Hector J. Levesque, Elsevier (2004);

**Reference Books-**

1. The Description Logic Handbook: Theory, implementation, and applications, Franz Baader, Deborah L.
2. McGuinness, Daniele Nardi and Peter F. Patel-Schneider, Cambridge University Press (2010)

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										

Recommendation by Board of studies on

Approval by Academic council on

Compiled and designed by

Prof. Ramratan Ahirwal

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		VI/III		Program			B.Tech – Artificial Intelligence and Data Science						
Subject Category		DE-2		Subject Code:		AI 603(C)	Subject Name			Computer Vision			
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	100	3	1	0	4					

Prerequisites:

- Basic Knowledge of algorithms, Discrete Mathematics

Course Objective:

Identify basic concepts, terminology, theories, models and methods of computer vision.

Describe basic methods of computer vision related to multi-scale representation.

Understanding edge detection of primitives, stereo, motion and object recognition.

Developed the practical skills necessary to build computer vision applications.

To have gained exposure to object and scene recognition.

UNITS	Descriptions	Hrs.
I	Data Warehousing: Introduction to Data warehousing, needs for developing data Warehouse, Data warehouse systems and its Components, Design of Data Warehouse, Dimension and Measures, Data Marts: -Dependent Data Marts, Independents Data Marts and Distributed Data Marts, Conceptual Modelling of Data Warehouses, Star Schema, Snowflake Schema, Fact Constellations. Multidimensional Data Model and Aggregates.	8
II	Characteristics of OLAP System, Motivation for using OLAP, Multidimensional View and Data Cube, Data Cube Implementations, Data Cube Operations, Guidelines for OLAP Implementation, Difference between OLAP and OLTP, OLAP Servers: ROLAP, MOLAP, HOLAP Queries.	8
III	Introduction to Data Mining, Knowledge Discovery, Data Mining Functionalities, Data Mining System categorization and its Issues. Data Processing: Data Cleaning, Data Integration and Transformation. Data Reduction, Data Mining Statistics, Guidelines for Successful Data Mining.	8
IV	Introduction, Basic, The Task and a Naïve Algorithm, Apriori Algorithms, Improving the efficiency of the Apriori Algorithm, Apriori-Tid, Direct Hasing and Pruning (DHP), Dynamic Itemset Counting (DIC), Mining Frequent Patterns without Candidate Generation (FP-Growth), Performance Evaluation of Algorithms.	8
V	Introduction, Decision Tree, The Tree Induction Algorithm, Split Algorithms Based on Information Theory, Split Algorithm Based on the Gini Index, Overfitting and Pruning, Decision Trees Rules, Naïve Bayes Method. Cluster Analysis: Introduction, Desired Features of Cluster Analysis, Types of Cluster Analysis Methods: Partitional Methods, Hierarchical Methods, Density- Based Methods, Dealing with Large Databases, Quality and Validity of Cluster Analysis Methods	8
Total Hours		40

Course Outcomes:

- CO1: Ability to understand the fundamental concepts in computer vision
- CO2: Ability to apply segmentation techniques and descriptors

- CO3: Ability to analyse medical problems using computer vision techniques
- CO4: Ability to evaluate performance of computer vision algorithms in biomedical applications
- CO5: Suggest a design of a computer vision system for a specific problem

Text Book

Text Book-

1. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Elsevier Pub.

Reference Books-

1 Arun K. Pujari, “Data Mining Techniques”, University Press.

2. Berson, “Data Warehousing and Data Mining and OLAP”, TMH

List and Links of e-learning resources:

- <https://ocw.mit.edu/>
- www.weka.com

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:

- 1 Installation of WEKA Tool
- 2 Creating new Arff File
- 3 Data Processing Techniques on Data set
- 4 Data cube construction – OLAP operations
- 5 Implementation of Apriori algorithm
- 6 Implementation of FP- Growth algorithm
- 7 Implementation of Decision Tree Induction
- 8 Calculating Information gains measures
- 9 Classification of data using Bayesian approach
- 10 Implementation of K-means algorithms
- 11 Case Study: Create Placement.arff file to identify the students who are eligible for placements using KNN

Recommendation by Board of studies on

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Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

(Engineering College), VIDISHA M.P.

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DEPARTMENT OF IT

Semester/Year		VI/III		Program			B.Tech – Artificial Intelligence and Data Science				
Subject Category	DE-3	Subject Code:		AI 604(A)	Subject Name			Cryptography and Network Security			
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	1	-	4


Prerequisites:

- Basic Knowledge of algorithms, Discrete Mathematics

Course Objective:

This course will provide students with a practical and theoretical knowledge of cryptography and network security.

UNITs	Description	Hrs.
I	Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security, Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.	8
II	Symmetric key Ciphers: Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4. Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm	8
III	Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA-512), Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme. Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – KeyInfrastructure.	8
IV	Transport-level Security: Web security considerations, Secure Socket Layer and Transport Layer Security,HTTPS, Secure Shell (SSH) Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security.	8
V	E-Mail Security: Pretty Good Privacy, S/MIME IP Security: IP Security overview, IP Security architecture, Authentication Header, encapsulating security payload, Combining security associations, Internet Key Exchange Case Studies on Cryptography and security: Secure Multiparty Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability.	8
Total Hours		40
Course Outcomes:		

- 
- CO1. Understand cryptography and network security concepts and application**
- CO2. Apply security principles to system design**
- CO3. Identify and investigate network security threat**
- CO4. Analyse and design network security protocols**
- CO5. Conduct research in network security**

Text Book

Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6th Edition
 Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition

Reference Books-

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1stEdition.
2. Cryptography and Network Security: Forouzan Mukhopadhyay, Mc Graw Hill, 3rd Edition
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

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										

Recommendation by Board of studies on

Approval by Academic council on

Compiled and designed by

Prof. Ramratan Ahirwal

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		IV/II		Program			B.Tech – AIADS				
Subject Category	DE-3	Subject Code:		AI 604(B)	Subject Name		Introduction to IoT				
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks	L	T	P	
ES	MS	Assignment	Quiz	ES	LW	Quiz		3	1	0	
60	20	10	10	-	-	-	100			4	

Prerequisites:

NA

Course Objective:

- To make students know the IoT ecosystem.
- To provide an understanding of the technologies and the standards relating to the Internet of Things.
- To develop skills on IoT technical planning.

UNITS	Descriptions	Hrs.
I	Introduction & concepts: definition and characteristics of IoT, physical design of IoT, Logical Design of IoT, IoT enabling technologies, IoT levels and development templates, IoT and M2M, IoT design Methodology.	8
II	IoT Networking: Connectivity Technologies, Gateway Prefix Allotment, Impact of Mobility on Addressing, Multihoming, Deviations from Regular Web, IoT identification and Data Protocols (IPv4, IPv6, MQTT, CoAP, XMPP and AMQP)	8
III	Connectivity Technologies: Introduction, IEEE 802.15.4, ZigBee, 6LoWPAN, RFID, HART and Wireless HART, NFC, Bluetooth, Z-Wave, ISA 100.11A.	8
IV	Wireless Sensor Network: Introduction, Components of Sensor Node, Modes of Detection, Challenges in WSN. UAV Network: Introduction, UAV Network (Feature, Challenges and Topology) FANET: Introduction, FANET design consideration.	8
V	Application of IoT: Smart Homes – Introduction, Origin of Smart Homes, Smart Home Technologies. Smart Cities – Characteristics of Smart Cities, Smart City Framework, Challenges in Smart Cities. Connected Vehicles – Introduction, levels of Automation, Vehicle to Everything (V2X) Paradigm, Vehicular Ad-hoc Network (VANETs)	8
Total Hours		40

Course Outcomes:

- CO1:** To understand the Fundamentals of IoT.
CO2: To know about the networking concepts of IoT.
CO3: To know about the different connectivity technologies.
CO4: To know about the WSN and UAV network.
CO5: To know about the various applications of IoT.

Text Book

1. Arshdeep Bagha and Vijay Madiseti, “Internet of Things – A hands-on approach”, Orient Blackswan Private Limited - New Delhi.
2. Dr. Jeeva Jose, Internet of Things, Khanna Publishing House.
3. Nitesh Dhanjani, Abusing the Internet of Things, Shroff Publisher/O’Reilly Publisher.

Reference Books

1. Internet of Things, RMD Sundaram Shriram K Vasudevan, Abhishek S Nagarajan, John Wiley and Sons.
2. Internet of Things, Shriram K Vasudevan, Abhishek S Nagarajan, RMD Sundaram, John Wiley & Sons.
3. Cuno Pfister, “Getting Started with the Internet of Things”, Shroff Publisher/MakerMedia.
4. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications.
5. Massimo Banzi, Michael Shiloh Make: Getting Started with the Arduino, Shroff Publisher/Maker Media Publishers.

List/Links of e-learning resource

- https://onlinecourses.nptel.ac.in/noc19_cs65/preview

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	PSO1	PSO2
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	------	------	------	------	------



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

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

(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)

DEPARTMENT OF IT

Semester/Year		VI/III		Program			B.Tech – Artificial Intelligence and Data Science						
Subject Category	DE-3	Subject Code:		AI 604(C)	Subject Name			Robotics and process automation					
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				100	3	1	-	4		

Prerequisites:

- Basic Knowledge of algorithms, Discrete Mathematics

Course Objective:

Understand the RPA and the ability to differentiate it from other types of automation.

2. Model the sequences and the nesting of activities.

3. Experiment with workflow in a manner to get the optimized output from a Bot

UNITS	Descriptions	Hrs.
I	Automation RPA vs Automation - Processes & Flowcharts - Programming Constructs Types of Bots Workloads automated RPA Advanced Concepts - Standardization of processes - RPA Development methodologies SDLC - Robotic control flow architecture - RPA business case - RPA Team - Process Design Document/Solution Design Document Risks & Challenges with RPA - RPA and emerging ecosystem.	8
II	User Interface - Variables - Managing Variables - Naming Best Practices - Variables Panel The Arguments Panel - Importing New Namespaces- Control Flow - Control Flow Introduction - Control Flow Activities - Data Manipulation - Data Manipulation Introduction - Scalar variables, collections and Tables - Text Manipulation - Data Manipulation - Gathering and Assembling Data	8
III	Basic and Desktop Recording , Web Recording , Input/Output Methods Screen Scraping - Data Scraping - Scraping advanced techniques - Selectors - Defining and Assessing Selectors - Customization - Debugging - Dynamic Selectors - Partial Selectors - RPA Challenge - Image, Text & Advanced Citrix Automation - Introduction to Image & Text Automation - Image based automation - Keyboard based automation - Information Retrieval	8
IV	Monitoring system event triggers - Hotkey trigger - Mouse trigger - System trigger - Monitoring image and element triggers - An example of monitoring email - Example of monitoring a copying event and blocking it - Launching an assistant bot on a keyboard event, EXCEPTION HANDLING: Debugging and Exception Handling - Debugging Tools - Strategies for solving issues - Catching errors	8
V	DEPLOYING AND MAINTAINING THE BOT: Publishing using publish utility - Creation of Server - Using Server to control the bots - Creating a provision Robot from the Server - Connecting a Robot to Server - Deploy the Robot to Server - Publishing and managing updates - Managing packages - Uploading packages - Deleting packages.	8
Total Hours		40

Course Outcomes:

CO 1: Describe RPA, where it can be applied and how it's implemented.

CO 2: Shows the different types of variables, Control Flow and data manipulation techniques.



CO 3: Identify and understand Image, Text and Data Tables Automation.

CO 4: Describe how to handle the User Events and various types of Exceptions and strategies.

CO 5: Understand the Deployment of the Robot and to maintain the connection.

Text Book

Alok Mani Tripathi, “Learning Robotic Process Automation”, Packt Publishing, 2018.

Reference Books-

1. Frank Casale , Rebecca Dilla, Heidi Jaynes , Lauren Livingston, “Introduction to Robotic Process Automation: a Primer”, Institute of Robotic Process Automation,1st Edition 2015.
2. Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant”, Independently Published, 1st Edition 2018.
3. Srikanth Merianda,”Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation”, Consulting Opportunity Holdings LLC, 1st Edition 2018.
4. 4. Lim Mei Ying, “Robotic Process Automation with Blue Prism Quick Start Guide: Create software robots and automate business processes”, Packt Publishing, 1st Edition 2018.

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										

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
(Engineering College), VIDISHA M.P.
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DEPARTMENT OF IT

Semester/Year		III/II	Program			B.Tech – Artificial Intelligence and Data Science							
Subject Category	OC-2	Subject Code:	AI 605 A	Subject Name		Artificial Intelligence							
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				100	3	0	0	3		

Prerequisites:

- Basic Knowledge of algorithms, Discrete Mathematics

Course Objective:

- 1 Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.
- 2 Review of classical problem solving: search and forward and backward chaining.
- 3 Formalize a given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem etc.

UNITs	Descriptions	Hrs.
I	Definitions – Foundation and History of AI, Evolution of AI - Applications of AI, Classification of AI Systems with respect to environment. Artificial Intelligence vs Machine learning, Tic - Tac – Toe problem. Intelligent Agent: Concept of Rationality, nature of environment, structure of agents.	8
II	Heuristic Search Techniques: Generate-and-Test; Hill Climbing; Properties of A* algorithm, Best first Search; Problem Reduction. Constraint Satisfaction problem: Interference in CSPs; Back, tracking search for CSPs; Local Search for CSPs; structure of CSP Problem. Beyond Classical, Search: Local search algorithms and optimization problem, local search in continuous spaces, searching with nondeterministic action and partial observation, online search agent and unknown environments.	8
III	Game playing – Knowledge representation, Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic-Structured representation of knowledge	8
IV	Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Reactive Systems, Other Planning Techniques. Natural Language Processing Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing. Hopfield Network, Learning in Neural Networks, Application of Neural Networks, Recurrent Networks, Distributed Representations, Connectionist AI and Symbolic AI.	8
V	Development Process, knowledge Acquisition. PROLOG Introduction, Syntax and Numeric Function, Basic List Manipulation, Functions, Predicates and Conditional, input, output and Local Variables, iteration and Recursion, Property Lists and Arrays, LISP and other AI Programming Languages.	8
Total Hours		40

Course Outcomes:

CO1: Describe various searching methods and reasoning in AI.
CO2: Uses of Knowledge Representation Techniques.
CO3: Analysis the concepts of reasoning and planning
CO4: Illustrate the concept of NLP and NN
CO5: Apply and evaluate AI Techniques using PROLOG and LISP

Text Book

1. Artificial Intelligence -By Elaine Rich And Kevin Knight (2nd Edition) Tata Mcgraw-Hill Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, “Fundamentals of Computer Algorithms”, Universities Press.

Reference Books-

1. Introduction to Prolog Programming By Carl Townsend.
2. Programming with PROLOG —By Klocksin and Mellish.
3. Artificial Intelligence (Fifth Edition) -By George F Luger, Pearson Education.
4. Artificial Intelligence (Second Edition)-By Stuart Russell and Peter Norvig, Pearson Education.
5. Artificial Intelligence Application Programming, Tim Jones, Wiley India
6. Artificial Intelligence And Expert Systems - By D.W Patterson .

List/Links of e-learning resource

List and Links of e-learning resources:

- <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:

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:

1. Write a program to solve 8 queens problem
2. Solve any problem using depth first search.
3. Solve any problem using best first search.
4. Solve 8-puzzle problem using best first search
5. Solve travelling salesman problem.
6. Write a program to solve the Monkey Banana problem

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		V/III		Program			B.Tech – Artificial Intelligence and Data Science					
Subject Category	OC-2	Subject Code:		AI 605(B)	Subject Name			Data Science Analytics				
Maximum Marks Allotted												
Theory				Practical			Total Marks	Contact Hours			Total Credits	
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P		
60	20	10	10				100	3	0	0	3	

- 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

40

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	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:

Recommendation by Board of studies on

Approval by Academic council on

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	OC-2	Subject Code:		AI 605 C	Subject Name		Image Processing								
Maximum Marks Allotted											Total Marks	Contact Hours			Total Credits
Theory				Practical			L	T	P						
ES	MS	Assignment	Quiz	ES	LW	Quiz									
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 Clifford 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

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**

(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)

DEPARTMENT OF IT

Semester/Year		VI/II I		Program		B.Tech – Artificial Intelligence and Data Science					
Subject Category		DLC		Subject Code:		AI 606		Subject Name		Advanced Data Science Lab II	
Maximum Marks Allotted								Contact Hours			Total Credit s
Theory				Practical			Total Marks	L	T	P	
ES	MS	Assignment	Quiz	ES	LW	Quiz					
				30	10	10	50			2	1

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	Descript ions	Hrs
I	Creating strings, paste() and paste0(), Formatting numbers and string using format(), String manipulation	8
II	Creating lists, manipulating list elements, merging lists, Converting lists to vectors	8
III	ARRAYS IN R: Creating arrays, Accessing array elements, Calculations across array elements	8
IV	R FACTORS: Understanding factors, Modifying factors, Factors in Data frames	8
V	Creating data frame: Operations on data frames, Accessing data frames, Creating data frames from various sources, need for data visualization, Bar plot, Plotting categorical data, Stacked bar plot, Histogram, plot() function and line plot, pie chart / 3D pie chart, Scatter plot, Box plot	8
Total Hours		40

Course Outcomes:

CO1: Explain critical R programming concepts for data preprocessing
 CO2: Analyze data and generate reports based on the data in the R
 CO3: Apply machine learning concepts in R programming

**Text
Book**

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

Reference Books-

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

Experiment

List:

Experiments (R- Intermediate)

Write an R script to handle outliers.

Write an R script to handle invalid values.

Visualize iris dataset using mosaic plot.

Visualize correlation between sepal length and petal length in iris data set using scatter plot.

Experiments(R- Advance)

Linear Regression:

Consider the following mice data: Height: 140,142,150,147,139,152,154,135,148, 147.

Weight: 59, 61, 66, 62, 57, 68, 69, 58, 63, 62. Derive relationship coefficients and summary for the above data.

Consider the above data and predict the weight of a mouse for a given height and plot the results using a graph.

Logistic Regression:

Analyse iris data set using Logistic Regression. Note: create a subset of iris dataset with two species.

Perform Logistic Regression analysis on the above mice data(Sl.No.21) and plot the results.

Decision Tree:

Implement ID3 algorithm in R.

Implement C4.5 algorithm in R.

Time Series:

Write R script to decompose time series data into random, trend and seasonal data.

Write R script to forecast time series data using single exponential smoothing method.

Clustering:

Implement K-means algorithm in R.

Implement CURE algorithm in R.

Write an R script to handle outliers.

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										

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	Prof. 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 Information Technology

Syllabus applicable

Name of the course:	B. Tech in Artificial Intelligence and Data Science
Semester and Year of study	B. Tech 4 th Year 7 th Semester
Subject Category	Engineering Science Course (DC)
Subject Code: AI-701	Subject Name: Deep Learning

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks	L	T	P	
End Sem	Mid-Sem	Quiz	Assign	End Sem	Lab-Work	Quiz					
60	20	10	10	30	10	10	150	3	-	2	4

Prerequisites:

Introduction to machine learning, data science

Course Objective:

This course will introduce the theoretical foundations, algorithms, methodologies, and applications of neural networks and deep learning. It will help to design and develop application-specific deep learning models and also provide the practical knowledge handling and analysing real world applications.

Course Outcomes: After completion of this course students will be able to:

- CO1. Have a good understanding of the fundamental issues and basics of machine learning.
- CO2. Ability to differentiate the concept of machine learning with deep learning techniques.
- CO3. Understand the concept of CNN and transfer learning techniques, to apply it in the classification problems
- CO4. Learned to use RNN for language modelling and time series prediction.
- CO5. Use auto encoder and deep generative models to solve problems with high dimensional data including text, image and speech.

UNITs	Descriptions	Hrs.	CO's
I	Machine Learning Basics: Learning algorithms, Maximum likelihood estimation, Building machine learning algorithm, Neural Networks Multilayer Perceptron, Back-propagation algorithm and its variants Stochastic gradient decent, Curse of Dimensionality.	8	1
II	Introduction to Deep Learning & Architectures Machine Learning Vs. Deep Learning, Representation Learning, Width Vs. Depth of Neural Networks, Activation Functions: RELU, LRELU, ERELU, Unsupervised Training of Neural Networks, Restricted Boltzmann Machines, Auto Encoders.	7	2
III	Convolutional Neural Networks Architectural Overview – Motivation - Layers – Filters – Parameter sharing – Regularization, Popular CNN Architectures: ResNet, AlexNet.	8	3
IV	Transfer Learning Transfer learning Techniques, Variants of CNN: DenseNet, PixelNet. Sequence Modelling – Recurrent and Recursive Nets	8	4

	Recurrent Neural Networks, Bidirectional RNNs – Encoder-decoder sequence to sequence architectures - BPTT for training RNN, Long Short Term Memory Networks.		
V	Auto Encoders: Under complete Autoencoders – Regularized Autoencoders – stochastic Encoders and Decoders – Contractive Encoders Deep Generative Models: Deep Belief networks – Boltzmann Machines – Deep Boltzmann Machine - Generative Adversarial Networks. Recent Trends	9	5
Guest Lectures (if any)			
Total Hours		40	
Suggestive list of experiments:			
<ol style="list-style-type: none"> 1. Classification with Multilayer Perceptron using Scikit-learn (MNIST Dataset) 3 hours 2. Hyper-Parameter Tuning in Multilayer Perceptron 3 hours 3. Deep learning Packages Basics: Tensorflow, Keras, Theano and PyTorch 2 hours 4. Classification of MNIST Dataset using CNN 2 hours 5. Parameter Tuning in CNN 2 hours 6. Sentiment Analysis using CNN 2 hours 7. Face recognition using CNN 2 hours 8. Object detection using Transfer Learning of CNN architectures 2 hours 9. Recommendation system using Deep Learning 2 hours 10. Dimensionality Reduction using Deep learning 2 hours 11. Language Modeling using RNN 2 hours 12. Time Series Prediction using RNN 2 hours 13. Sentiment Analysis using LSTM 2 hours 14. Image generation using GAN 2 hours <p>Total Laboratory Hours 30 hours</p>			
Text Book-			
<ol style="list-style-type: none"> 1. Ian Goodfellow, Yoshua Bengio and Aaron Courville, “ Deep Learning”, MIT Press, 2017. 2. Josh Patterson, Adam Gibson "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017 			
Reference Books-			
<ol style="list-style-type: none"> 1. Umberto Michelucci “Applied Deep Learning. A Case-based Approach to Understanding Deep Neural Networks” Apress, 2018. 2. Kevin P. Murphy "Machine Learning: A Probabilistic Perspective", The MIT Press, 2012. 3. Ethem Alpaydin, "Introduction to Machine Learning”, MIT Press, Prentice Hall of India, Third Edition 2014. 4. Giancarlo Zaccaro, Md. Rezaul Karim, Ahmed Menshaway "Deep Learning with TensorFlow: Explore neural networks with Python", Packt Publisher, 2017. 5. Antonio Gulli, Sujit Pal "Deep Learning with Keras", Packt Publishers, 2017. 6. Francois Chollet "Deep Learning with Python", Manning Publications, 2017. 			
List and Links of e-learning resources:			
Modes of Evaluation and Rubric			
The evaluation modes consist of performance in Two mid-semester Tests, Quiz/ Assignments, term work, end-semester examinations, and end-semester practical examinations.			

COs	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈	PO ₉	PO ₁₀	PO ₁₁	PO ₁₂	PSO ₁	PSO ₂	
CO-1	1	1										3	3	3	2
CO-2	1		1	2								2	1	3	2
CO-3	2	1										2	2	1	2
CO-4	3	2	3	2	1			1	2			3		3	1
CO-5	3	3	2	1				2		2		2	3	1	1

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	Ramratan Ahirwal & Rashi Kumar



SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
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Department of Information Technology

Syllabus applicable

Name of the course:	B. Tech in Artificial Intelligence and Data Science
Semester and Year of study	B. Tech 4 th Year 7 th Semester
Subject Category	Engineering Science Course (DE-4)
Subject Code: AI-702(A)	Subject Name: Introduction to Logics

Maximum Marks Allotted							Contact Hours			Total Credits
Theory				Practical		Total Marks	L	T	P	
End Sem	Mid-Sem	Quiz	Assign	End Sem	Lab-Work					
60	20	10	10			100	3	1	-	4

Prerequisites:

Basic Knowledge of algorithms, Discrete Mathematics

Course Objective:

1

Course Outcomes: After completion of this course students will be able to

CO1.

UNITS	Descriptions	Hrs.	CO's
I	Creating Motivation for the Study of Logic, Sets, Relations and Functions, Operations on Binary Relations, Ordering Relations, Partial Orders and Trees, Infinite Sets: Countability and Uncountability .	8	1
II	Induction Principles Mathematical Induction Mathematical Induction Complete Induction inductive definitions Structural Induction Universe constructor depth of construction , elements rules generation	8	2
III	Propositional Logic Syntax of Propositional Logic The model of truth Semantics of Propositional Logic , boolean algebra Satisfiability, Validity and Contingency contradiction.	8	3
IV	An Axiomatic Theory for Propositional Logic a deductive system pattern substitution rules complete system. Formal theories inference rules Monotonicity Compactness Substitutivity Hilbert-style Proof System Proof tree for theorem Natural Deduction Proof System Derived Operators Derived Inference Consistency, completeness and decidability Compactness Propositional Resolution	10	4
V	Resolution in Propositional Logic: Introduction, procedure Space Complexity, Time Complexity, procedure resolution, cleanup operations Undecidability : Introduction Representability Godel's Incompleteness Theorem Second-Order Logic	8	5

Guest Lectures (if any)

Nil

Total Hours

42

Suggestive list of experiments:

NO Lab

Text Book-

1. Introduction to Logic for Computer Science, S. Arun-Kumar

Reference Books-

1. Logic in Computer Science: Modeling and Reasoning about Systems (2nd edition), Huth and Ryan, Cambridge
2. Logic for Computer Science Steve Reeves and Michael Clarke. Addison-Wesley, 1990. ISBN: 0-201-41643-3
3. Logic for Computer Science. Jean H. Gallier. Harper and Row, New York, 1986.
4. First-Order Logic and Automated Theorem Proving. Melvin Fitting. Springer Verlag, Berlin, 1990.
5. A Mathematical Introduction to Logic. Herbert B. Enderton. Academic Press, New York, 1972.
6. Natural Deduction (A Proof-theoretical study). Dag Prawitz. Almqvist and Wiskell, 1965.

List and Links of e-learning resources:

1. <https://nptel.ac.in/courses/117103063/>
2. <http://www.public.asu.edu/~yzhan442/teaching/CSE259F19-LCS>
3. <http://www.wikihow.com/Email-a-Professor>.

Modes of Evaluation and Rubric

The evaluation modes consist of performance in Two mid-semester Tests, Quiz/ Assignments, term work, end-semester examinations, and end-semester practical examinations.

COs	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈	PO ₉	PO ₁₀	PO ₁₁	PO ₁₂	PSO1	PSO2
CO1	2	1	2										1	1
CO2	2	1	2										1	1
CO3	2	1	2										1	2
CO4	2	2	2										1	2
CO5	1	2	2	1	2								2	1

Recommendation by Board of studies on

Approval by Academic council on

Compiled and designed by

Ramratan Ahirwal & Rashi Kumar



SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

(Engineering College), VIDISHA M.P.

(An Autonomous Institute Affiliated to RGPV Bhopal)

Department of Information Technology

Syllabus applicable

Name of the course:	B. Tech in Artificial Intelligence and Data Science
Semester and Year of study	B. Tech 4th Year 7 th Semester
Subject Category	Professional Elective courses (DE-4)
SubjectCode: AI-702(B)	Subject Name: Natural Language Processing

Maximum Marks Allotted						Contact Hours			Total Credits	
Theory				Practical		Total Marks	L	T		P
End Sem	Mid-Sem	Quiz	Assignment	End Sem	Lab-Work					
60	20	10	10			100	3	1		4

Prerequisites:

Basic Knowledge of algorithms, Discrete Mathematics

Course Objective:

- 1 Natural language processing deals with written text.
- 2 Learn how to process written text from basic of fundamental knowledge.
- 3 Regular expression and probabilistic model with n-grams.
- 4 Recognizing Speech and parsing with grammar.

Course Outcomes: After completion of this course students will be able to

CO1: Understand comprehend the key concepts of NLP and identify the NLP challenges and issues.

CO2: Develop Language Modelling for various text corpora across the different languages

CO3: Illustrate computational methods to understand language phenomena of word sense disambiguation.

CO4: Design and develop applications for text or information extraction/summarization/classification

CO5: Apply different Machine translation techniques for translating a source to target language(s).

UNITS	Descriptions	Hrs.	CO's
I	Introduction to NLP: History of NLP, Advantages of NLP, Disadvantages of NLP, Components of NLP, Applications of NLP, build an NLP pipeline, Phases of NLP, NLP APIs, NLP Libraries.	8	1
II	Unigram Language Model, Bigram, Trigram, N-gram, Advanced smoothing for language modeling, Empirical Comparison of Smoothing Techniques, Applications of Language Modeling, Natural Language Generation, Parts of Speech Tagging, Morphology, Named Entity Recognition	8	2
III	Words and Word Forms: Bag of words, skip-gram, Continuous Bag-Of-Words, Embedding representations for words Lexical Semantics, Word Sense Disambiguation, Knowledge Based and Supervised Word Sense Disambiguation.	8	3
IV	Text Analysis, Summarization and Extraction: Sentiment Mining, Text Classification, Text Summarization, Information Extraction, Named Entity Recognition, Relation Extraction, Question Answering in Multilingual Setting; NLP in Information Retrieval, Cross-Lingual IR	8	4
V	Need of MT, Problems of Machine Translation, MT Approaches, Direct Machine Translations, Rule-Based Machine Translation, Knowledge Based MT System, Statistical Machine Translation (SMT), Parameter learning in SMT (IBM models) using EM, Encoder-decoder architecture, Neural Machine Translation.	8	5
Guest Lectures (if any)		Nil	

Total Hours												40		
Suggestive list of experiments:														
NO LAB														
Text Book-														
1. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition Jurafsky, David, and James H. Martin, PEARSON														
Reference Books-														
1. Foundations of Statistical Natural Language Processing, Manning, Christopher D., and Hinrich Schütze, Cambridge, MA: MIT Press														
1. Natural Language Understanding, James Allen. The Benjamin/Cummings Publishing														
3. Natural Language Processing with Python – Analyzing Text with the Natural Language Toolkit Steven Bird, Ewan Klein, and Edward Loper.														
List and Links of e-learning resources:														
1. https://www.kaggle.com/learn/natural-language-processing														
2. https://www.javatpoint.com/nlp														
3. https://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 examinations, and end-semester practical examinations.														
Cos	PO₁	PO₂	PO₃	PO₄	PO₅	PO₆	PO₇	PO₈	PO₉	PO₁₀	PO₁₁	PO₁₂	PSO1	PSO2
CO-1		2			2							2	1	2
CO-2	2	3		2	1						1	2	3	3
CO-3	2	3	3	2								2	2	2
CO-4	2	2		2								2	3	3
CO-5	2	2	2									2	3	3
Recommendation by Board of studies on														
Approval by Academic council on														
Compiled and designed by										Ramratan Ahirwal & Rashi Kumar				



SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

(Engineering College), VIDISHA M.P.

(An Autonomous Institute Affiliated to RGPV Bhopal)

Department of Information Technology

Syllabus applicable

Semester/Year		7 th /4-year		Program			B.Tech. AIADS				
Subject		Subject Code:		AI-702(C)		Subject Name:		Business Intelligence			
Category		DE-4									
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks	L	T	P	
End Sem	Mid-Sem	Assignment/Quiz		End Sem	Lab-Work	Quiz					
60	20	10	10				100	3	1		4
Prerequisites:											
Basic understanding of database systems and software engineering.											
Course Objective:											
The objective of this course is to understand the basic concepts of business intelligence, probability and statistics. To impart the knowledge of BI tools. To familiarize students with the Data Warehousing. The course will help student to understand the problems of current scenario and design of the business solutions.											
Course Outcomes:											
Upon completion of this course, the student will be able to: CO1: Familiarize the importance of business intelligence for organizations. CO2: Understand and apply basic concepts of Probability. CO3: Understand and analyze baye's theorem and its applications CO4: Develop data warehouse for a domain using Data warehouse tools. Operate data warehouse to meet business objectives. CO5: Understand the concept of designing data warehouse models using appropriate schemas.											
UNITs		Descriptions						Hrs.		CO's	
I		Business Intelligence Introduction - Effective and timely decisions – Data, information and knowledge – Role of mathematical models – Business intelligence architectures: Cycle of a business intelligence analysis – Enabling factors in business intelligence projects – Development of a business intelligence system – Ethics and business intelligence, Types of Data, The measure of Central Tendency, Measure of Spread, Standard Normal Distribution, Skewness, Measures of relationship, Central Limit Theorem.						7		CO1	
II		Basic Probability -- definition of probability, conditional probability, independent events, Bayes' rule, Bernoulli trials, Random variables, discrete random variable, probability mass function, continuous random variable, Probability Density						6		CO2	

	Function, Cumulative Distributive Function, properties of cumulative distribution function, Two dimensional random variables and their distribution functions, Marginal probability function, Independent random variables.		
III	Bayesian Analysis – Bayes Theorem, Applications of Bayes Theorem, Decision Theoretic framework and major concepts of Bayesian Analysis Likelihood, Prior and posterior, Loss function, Bayes Rule, One-parameter Bayesian models. Bayesian Machine Learning- Hierarchical Bayesian Model, Regression with Ridge prior, Classification with Bayesian Logistic Regression	8	CO3
IV	Data Warehousing (DW) - Introduction & Overview; Data Marts, DW architecture - DW components, Implementation options; Meta Data, Information delivery. ETL - Data Extraction, Data Transformation - Conditioning, Scrubbing, Merging, etc., Data Loading, Data Staging, Data Quality.	7	CO4
V	Dimensional Modeling - Facts, dimensions, measures, examples; Schema Design Star and Snowflake, Fact constellation, Slow changing Dimensions. OLAP - OLAP Vs OLTP, Multi-Dimensional Databases (MDD); OLAP MOLAP, HOLAP; ROLAP, Data Warehouse Project Management - Critical issues in planning, physical design process, deployment and ongoing maintenance.	7	CO5
Guest Lectures (if any)		May be arranged as required	
Total Hours		35	
Text Book-			
<ul style="list-style-type: none"> ● P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall. ● D. C. Montgomery and G. C. Runger, Applied Statistics and Probability for Engineers, Wiley ● David Loshin, Business Intelligence - The Savy Manager's Guide Getting Onboard with Emerging IT, Morgan Kaufmann Publishers, 2009. ● Efraim Turban, Ramesh Sharda, Dursun Delen, “Decision Support and Business Intelligence Systems”, 9th Edition, Pearson 2013. 			
Reference Books-			
<ul style="list-style-type: none"> ● Larissa T. Moss, S. Atre, “Business Intelligence Roadmap: The Complete Project Lifecycle of Decision Making”, Addison Wesley, 2003. ● Carlo Vercellis, “Business Intelligence: Data Mining and Optimization for Decision Making”, Wiley Publications, 2009. ● David Loshin Morgan, Kaufman, “Business Intelligence: The Savvy Manager’s Guide”, Second Edition, 2012. ● Cindi Howson, “Successful Business Intelligence: Secrets to Making BI a Killer App”, McGraw-Hill, 2007. 			

- Ralph Kimball , Margy Ross , Warren Thornthwaite, Joy Mundy, Bob Becker, “The Data Warehouse Lifecycle Toolkit”, Wiley Publication Inc.,2007.

Modes of Evaluation and Rubric

The evaluation modes consist of performance in Two mid-semester Tests, Quiz/ Assignments, term work, end-semester examinations, and end-semester practical examinations.

List/Links of e-learning resource

COs	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈	PO ₉	PO ₁₀	PO ₁₁	PO ₁₂	PSO ₁	PSO ₂
CO-1	3	2												3
CO-2	3	3			1									2
CO-3	3	3	1		1								3	3
CO-4	3	3	2	1									1	3
CO-5	3	3											1	2

Recommendation by Board of studies on

Approval by Academic council on

Compiled and designed by

Ramratan Ahirwal & Rashi Kumar

Subject handled by department

IT



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

Department of Information Technology

Syllabus applicable

Name of the course:	B. Tech in Artificial Intelligence and Data Science
Semester and Year of study	B. Tech 4 th Year 7 th Semester
Subject Category	Engineering Science Course DE-5
Subject Code: AI-703(A)	Subject Name: Big Data Analytics

Maximum Marks Allotted							Contact Hours			Total Credits
Theory				Practical		Total Marks	L	T	P	
End Sem	Mid-Sem	ASS	QUIZ	End Sem	Lab-Work					
60	20	10	10				3	1		4

Prerequisites:

Should have knowledge of one Programming Language (Java preferably), Practice of SQL (queries and sub queries), exposure to Linux Environment.

Course Objective:

- Understand the Big Data Platform and its Use cases
- Provide an overview of Apache Hadoop
- Provide HDFS Concepts and Interfacing with HDFS
- Understand Map Reduce Jobs
- Provide hands on Hadoop Eco System
- Apply analytics on Structured, Unstructured Data.
- Exposure to Data Analytics with R.

Course Outcomes: After completion of this course students will be able to:

- CO1: Identify Big Data and its Business Implications.
- CO2: List the components of Hadoop and Hadoop Eco-System
- CO3: Access and Process Data on Distributed File System
- CO4: Manage Job Execution in Hadoop Environment
- CO5: Develop Big Data Solutions using Hadoop Eco System & apply Machine Learning Techniques using R.

UNITS	Descriptions	Hrs.	CO's
I	UNIT I : INTRODUCTION TO BIG DATA AND HADOOP Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Infosphere BigInsights and Big Sheets.	8	1
II	UNIT II : HDFS(Hadoop Distributed File System) The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures.	8	2
III	UNIT III : Map Reduce Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.	8	3
IV	Hadoop Eco System Pig : Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. Hive : Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions.	8	4

	Hbase : HBasics, Concepts, Clients, Example, Hbase Versus RDBMS. Big SQL : Introduction																																																																																												
V	Data Analytics with R Machine Learning : Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with BigR.	8	5																																																																																										
Guest Lectures (if any)																																																																																													
Total Hours 40		40																																																																																											
Suggestive list of experiments:																																																																																													
Text Book- Tom White “Hadoop: The Definitive Guide” Third Edit on, O’reily Media, 2012. • Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.																																																																																													
Reference Books- Michael Berthold, David J. Hand, "Intelligent Data Analysis”, Springer, 2007. • Jay Liebowitz, “Big Data and Business Analytics” Auerbach Publications, CRC press (2013) • Tom Plunkett, Mark Hornick, “Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop”, McGraw-Hill/Osborne Media (2013), Oracle press. • Anand Rajaraman and Jef rey David Ulman, “Mining of Massive Datasets”, Cambridge University Press, 2012. • Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012. • Glen J. Myat, “Making Sense of Data”, John Wiley & Sons, 2007 • Pete Warden, “Big Data Glossary”, O’Reily, 2011. • Michael Mineli, Michele Chambers, Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley Publications, 2013. • ArvindSathi, “BigDataAnalytics: Disruptive Technologies for Changing the Game”, MC Press, 2012 • Paul Zikopoulos ,Dirk DeRoos , Krishnan Parasuraman , Thomas Deutsch , James Giles , David Corigan , "Harness the Power of Big Data The IBM Big Data Platform ", Tata McGraw Hill Publications, 2012.																																																																																													
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COs	PO ₁	PO ₂	PO ₃	PO ₄	PO ₅	PO ₆	PO ₇	PO ₈	PO ₉	PO ₁₀	PO ₁₁	PO ₁₂	PSO ₁	PSO ₂																																																																															
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(Engineering College), VIDISHA M.P.
 (An Autonomous Institute Affiliated to RGPV Bhopal)

Department of Information Technology

Syllabus applicable

Name of the course:	B. Tech in Artificial Intelligence and Data Science
Semester and Year of study	B. Tech 4th Year 7 th Semester
Subject Category	Engineering Science Course (DE-5)
SubjectCode: AI-703(B)	Subject Name: Data Visualization and Handling

Maximum Marks Allotted							Contact Hours			Total Credits
Theory				Practical		Total Marks	L	T	P	
End Sem	Mid-Sem	Quiz	Assi	End Sem	Lab-Work					
60	20	10	10			100	3	1		4

Prerequisites:

Basic Knowledge of algorithms, Discrete Mathematics

Course Objective:

Course Outcomes: After completion of this course students will be able to

- CO1. Describe a flow process for data science problems (Remembering)
- CO2. Classify data science problems into standard typology (Comprehension)
- CO3. Develop R codes for data science solutions (Application)
- CO4. Correlate results to the solution approach followed (Analysis)
- CO5. Assess the solution approach (Evaluation).

UNITs	Descriptions	Hrs.	CO's
I	Introduction to data visualization and why it is important Basic principles of good data visualization design Common types of charts and graphs and when to use them Gathering and cleaning data	8	1
II	Exploratory data analysis and visualization Advanced data visualization techniques and tools, such as interactive charts and maps Creating effective dashboards and visual storytelling with data Data visualization ethics and avoiding common pitfalls.	8	2
III	Introduction to data handling techniques, such as filtering and sorting data, merging, and reshaping data sets, and working with missing data Introduction to programming concepts for data handling, such as loops and functions, and using tools such as Python or R for data analysis and visualization	8	3
IV	Introduction to ELK and the Elastic Stack Installing and setting up ELK Gathering and parsing log data with Logstash Storing and indexing data in Elastic search Visualizing data with Kibana.	8	4
V	Creating and sharing dashboards in Kibana Advanced Kibana features, such as saved searches and visualizations, and the time lion visualization tool Integrating ELK with other tools and platforms Scaling and managing an ELK deployment Tips and best practices for using ELK effectively.	8	5

Guest Lectures (if any)		Nil																																																																																											
Total Hours		40																																																																																											
Suggestive list of experiments:																																																																																													
NO Lab																																																																																													
Text Book-																																																																																													
1. Data Visualization: A Practical Introduction" by Kieran Healy																																																																																													
Reference Books-																																																																																													
1. Mastering Kibana 6.x" by Pranav Shukla and Sharath Kumar M N																																																																																													
2. Elastic Stack 7.x: Up and Running" by Grant S. Sayer and Robert E. Beatty																																																																																													
3. Kibana Essentials" by Pranav Shukla																																																																																													
4. Data Wrangling with Python" by Jacqueline Kazil and David Beazley																																																																																													
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Compiled and designed by		Ramratan Ahirwal & Rashi Kumar																																																																																											



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

Department of Information Technology

Syllabus applicable

Name of the course:	B. Tech in Artificial Intelligence and Data Science
Semester and Year of study	B. Tech 4th Year 7 th Semester
Subject Category	Engineering Science Course (DE-5)
SubjectCode: AI-703(C)	Subject Name: Software Testing & Quality Assurance

Maximum Marks Allotted							Contact Hours			Total Credits
Theory				Practical		Total Marks	L	T	P	
End Sem	Mid-Sem	Quiz	Assi	End Sem	Lab-Work					
60	20	10	10			100	3	1		4

Prerequisites:

Basic Knowledge of software design & development.

Course Objective:

Course Outcomes: After completion of this course students will be able to

- CO1. Understand the fundamental principles of software testing.
- CO2. Learn to create effective test cases & Test plans.
- CO3. Develops skills in test execution & analysis.
- CO4. Understand the role of test tools.
- CO5. Apply industry best practices for software testing.

UNITS	Descriptions	Hrs.	CO's
I	Basics of software testing, Testing objectives, Principles of testing, Requirements, behaviour and correctness, Testing and debugging, Test metrics and measurements, Verification, Validation and Testing, Types of testing, Software Quality and Reliability, Software defect tracking.	8	1
II	White box testing, static testing, static analysis tools, Structural testing: Unit/Code functional testing, Code coverage testing, Code complexity testing, Black Box testing, Requirements based testing, Boundary value analysis, Equivalence partitioning, state/graph based testing, Model based testing and model checking, Differences between white box and Black box testing.	8	2
III	Regression testing, Regression test process, Initial Smoke or Sanity test, Selection of regression tests, Execution Trace, Dynamic Slicing, Test Minimization, Tools for regression testing, Ad hoc Testing: Pair testing, Exploratory testing, Iterative testing, Defect seeding.	8	3
IV	Test Planning, Management, Execution and Reporting, Software Test Automation: Scope of automation, Design & Architecture for automation, Generic requirements for test tool framework, Test tool selection, Testing in Object Oriented Systems.	8	4
V	Quality Assurance process & activity, code reviews & inspections, static analysis & code coverage, test driven development and agile testing, emerging trends in software testing.	8	5

Guest Lectures (if any)	Nil																																																																																											
Total Hours	40																																																																																											
Suggestive list of experiments:																																																																																												
NO Lab																																																																																												
Text Book-																																																																																												
Reference Books-																																																																																												
1. S. Desikan and G. Ramesh, "Software Testing: Principles and Practices", Pearson Education. 2. Aditya P. Mathur, "Fundamentals of Software Testing", Pearson Education. 3. Naik and Tripathy, "Software Testing and Quality Assurance", Wiley 4. K. K. Aggarwal and Yogesh Singh, "Software Engineering", New Age International Publication.																																																																																												
List and Links of e-learning resources:																																																																																												
Modes of Evaluation and Rubric																																																																																												
The evaluation modes consist of performance in Two mid-semester Tests, Quiz/ Assignments, term work, end-semester examinations, and end-semester practical examinations.																																																																																												
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