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-2020-21 & 2021-22

DEPARTMENT OF INFORMATION TECHNOLOGY

Structure of Undergraduate Engineering Program					
S.No.	**Category**	**Subject Category**	**Suggested Breakup of Credits (Total 160)**	**Possible list of subjects**	**Approx. Credits (Total 160)**
1	Humanities and Social Sciences including Management courses	HSMC	12*	English, Environmental Science, Management Concepts and Principles, Organisation behaviors, Project Management, Ethics, Stress Management, Human resource Management, Financial Management, Marketing Management, Project Management, IPR.	10-12
2	Basic Science courses	BSC	25*	Applied Physics, Applied Chemistry, Engineering Mathematics (M-1, M-2, M-3)	20-22
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.	ESC	24*	Basic Electrical Engineering, Engineering Graphics & Design, Engineering materials, Manufacturing Practices, Strength of Materials / Mechanics of Materials. Introduction to Computer Science, Basic of Information Technology. Engineering Electronics, Digital Design, Programming for Problem Solving,	20-24
4	Professional core courses	PCC	48*	Specific to Departments	48-50
5	Professional Elective courses relevant to chosen specialization/branch	PEC	18*	Specific to Departments	18-20
6	Open subjects – Electives from other technical and /or emerging subjects	OEC	18*	Specific to Departments	18-20
7	Project work, seminar and internship in industry or elsewhere	PROJ	15*	Specific to Departments	15-20
8	Mandatory Courses [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge]	MC	[Non-Credit]		
Total Credits			160*		
NPTEL/SWAYAM Courses Certification			20* (Max.)		
Mandatory Induction Program for first year students (Three Weeks duration)				• Physical activity • Creative Arts • Universal Human Values • Literary • Proficiency Modules • Lectures by Eminent People • Visits to local Areas • Familiarization to Dept./Branch & Innovations	

*Minor variation is allowed as per need of the respective disciplines.

DEPARTMENT OF INFORMATION TECHNOLOGY

Samrat Ashok Technological Institute (Engineering. College) VIDISHA (M.P.)
(An Autonomous Institute Affiliated to RGPV, Bhopal)
Scheme of Examination (2020-21 & 2021-22)
Bachelor of Technology (B.Tech.) in Artificial Intelligence and Data Science (AIADS)

Semester-I

S. No.	Subject Code	Category	Subject Name / Title	Maximum Marks Allotted						Contact Hrs.			Total Credits
				Theory Slot			Practical Slot						
				End Sem.	Mid Sem. Exam	Quiz, Assignment	End Sem.	Lab Work & Sessional	Total Marks	L	T	P	
Mandatory Induction Program (First Three weeks)				Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations									
Fourth week onwards				The classes will start									
1	BT-1811	BSC	Engineering Chemistry	70	20	10	30	20	150	3	-	2	4
2	BT-1812	ESC	Basic Electrical & Electronics Engineering	70	20	10	30	20	150	3	-	2	4
3	BT-1813	ESC	Engineering Graphics	70	20	10	30	20	150	3	-	2	4
4	BT-1814	HSMC	Communication Skills	70	20	10	-	-	100	3	-	-	3
5	BT-1815	BSC	Engineering Mathematics-I	70	20	10	-	-	100	3	1	-	4
6	BT-1816	ESC	Manufacturing Practices	-	-	-	60	40	100	-	-	2	1
7		DLC	Internship – I (60 Hrs Duration at the Institute level)	To be completed during first/second semester. Its evaluation/credit to be added in third semester.									
			Total	**350**	**100**	**50**	**150**	**100**	**750**	**15**	**1**	**8**	**20**

MST: Minimum two mid semester tests to be conducted during Semester L: Lecture T: Tutorial P: Practical

DEPARTMENT OF INFORMATION TECHNOLOGY

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Bachelor of Technology (B.Tech.) in Artificial Intelligence and Data Science (AIADS)

Semester-II

S. No.	Subject Code	Category	Subject Name / Title	Maximum Marks Allotted						Contact Hrs.			Total Credits
				Theory Slot			Practical Slot						
				End Sem.	Mid Sem. Exam	Quiz, Assignment	End Sem.	Lab Work & Sessional	Total Marks	L	T	P	
1	BT-1821	BSC	Semiconductor (Engineering Physics)	70	20	10	30	20	150	3	-	2	4
2	BT-1822	ESC	Basic Civil Engineering & Mechanics	70	20	10	30	20	150	3	-	2	4
3	BT-1823	ESC	Basic Mechanical Engineering	70	20	10	30	20	150	3	-	2	4
4	BT-1824	HSMC	Energy, Environment Ecology & Society	70	20	10	-	-	100	3	-	-	3
5	BT-1825	BSC	Probability and Statistics (Engineering Mathematics-II)	70	20	10	-	-	100	3	1	-	4
6	BT-1826	ESC	Programming for Problem Solving (Computer Programming)	-	-	-	60	40	100	-	-	2	1
7		DLC	Swachh Bharat Summer Internship Unnanat Bharat Abhiyaan (100Hrs)/ Rural out reach	To be completed during first/second semester. Its evaluation/credit to be added in third semester.									
			Total	**350**	**100**	**50**	**150**	**100**	**750**	**15**	**1**	**8**	**20**

MST: Minimum two mid semester tests to be conducted during Semester L: Lecture T: Tutorial P: Practical

DEPARTMENT OF INFORMATION TECHNOLOGY

Samrat Ashok Technological Institute (Engineering. College) VIDISHA (M.P.)
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Semester-III

S. No.	Subject Code	Category	Subject Name / Title	Maximum Marks Allotted						Contact Hrs.			Total Credits
				Theory Slot			Practical Slot						
				End Sem.	Mid Sem. Exam	Quiz, Assignment	End Sem.	Term work Lab Work & Sessional	Total Marks	L	T	P	
1	AI-2031	HSMC	Management (Organizational Behavior/Managerial Economics)	70	20	10	-	-	100	3	1	-	4
5	AI -2032	DC	Introduction to Data Science	70	20	10	30	20	150	3	-	2	4
3	AI -2033	DC	Data Structure and Algorithm	70	20	10	30	20	150	3	-	2	4
4	AI -2034	DC	Computer Organization and Architecture	70	20	10	30	20	150	3	-	2	4
2	AI -2035	DC	Discrete Mathematics	70	20	10	-	-	100	3	-	-	3
6	AI -2036	HSMC	Language Lab	-	-	-	30	20	50	-	-	2	1
7	AI -2037	DLC	Evaluation of Internship – I completed at I year level & Seminar (personality development)	-	-	-	50	-	50	-	-	4	2
8		DLC	90 hrs Internship based on using various software's Internship – II	To be completed anytime during Third/Fourth semester. Its evaluation/ credit to be added in fifth semester.									
			Total	**350**	**100**	**50**	**170**	**80**	**750**	**15**	**1**	**12**	**22**
9		MC	Constitution of India (Ethics)	Non Credit	-	-	-	-	-	-	-	-	-
10		SL	MOOCs	-	-	-	-	-	-	-	-	-	-
11		NLC	Participation & Winning in **National level competition**	-	-	-	-	-					
12			NSS/NCC	**Qualifier**									

MST: Minimum two mid semester tests to be conducted during Semester L: Lecture T: Tutorial P: Practical

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Semester-IV

S. No.	Subject Code	Category	Subject Name / Title	Maximum Marks Allotted						Contact Hrs.			Total Credits
				Theory Slot			Practical Slot						
				End Sem.	Mid Sem. Exam	Quiz, Assignment	End Sem.	Term work Lab Work & Sessional	Total Marks	L	T	P	
1	AI-2041	DC	Operating System	70	20	10	-	-	100	3	1	-	4
2	AI -2042	DC	Data Base Management System	70	20	10	30	20	150	3	-	2	4
3	AI -2043	DC	Introduction to Machine Learning	70	20	10	30	20	150	3	-	2	4
4	AI -2044	DC	Analysis and Design of Algorithm	70	20	10	30	20	150	3	-	2	4
5	AI -2045	BSC	Engineering Mathematics-III	70	20	10	-	-	100	3	-	-	3
6	AI -2046	DLC	Python	-	-	-	60	40	100	-	-	2	1
7	AI -2047	DLC	90 hrs Internship based on using various software's - Internship – II	To be completed anytime during Fourth semester. Its evaluation/ credit to be added in fifth semester.						-	-	-	-
			Total	**350**	**100**	**50**	**150**	**100**	**750**	**15**	**1**	**8**	**20**
8		MC	Indian Traditional Knowledge	-	-	-	-	-	-	-	-	-	-
9		SL	MOOCs	-	-	-	-	-	-	-	-	-	-
10		NLC	Participation & Winning in **National level competition**	-	-	-	-	-					

MST: Minimum two mid semester tests to be conducted during Semester L: Lecture T: Tutorial P: Practical

DEPARTMENT OF INFORMATION TECHNOLOGY

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Scheme of Examination (2020-21 & 2021-22)

(Semester - V)

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						
			ES	**MS**	**QA**	**ES**	**LW**	**Total Marks**	**L**	**T**	**P**	
AI -2051	PCC	Computer Network	70	20	10	30	20	150	3		2	4
AI-2052	PCC	Artificial Intelligence	70	20	10	30	20	150	3		2	4
AI-2053	PCC	Cloud Computing	70	20	10	30	20	150	3		2	4
AI-2054	PEC	Department Elective-1	70	20	10			100	3	1		4
AI-2055	OEC	Open Elective-1	70	20	10			100	3			3
AI-2056	DLC	Advanced Data Science Lab				30	20	50			4	2
AI-2057	DLC	Internship				30	20	50			2	1
Total			350	100	50	150	100	750	15	1	12	22

MST: Minimum two mid semester tests to be conducted during Semester

	Departmental Elective Course-1	**Open Elective (the course must be enrolled in inter department)-2**	
PEC-1(A)	Introduction to Logic	IoT Architecture (OE-1(A))	
PEC-1(B)	Image Processing	CGMM(OE-1(B))	
PEC-1(C)	Data Mining and Warehousing	Web Technology (OE-1(C))	

DEPARTMENT OF INFORMATION TECHNOLOGY

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE VIDISHA (M.P.)

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Scheme of Examination (2020-21 & 2021-22)

(Semester - VI)

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						
			ES	**MS**	**QA**	**ES**	**LW**	**Total Marks**	**L**	**T**	**P**	
AI -2061	PCC	Data Handling and Visualization	70	20	10	30	20	150	3		2	4
AI-2062	PCC	Business Intelligence	70	20	10	30	20	150	3		2	4
AI-2063	PCC	Natural Language Processing	70	20	10	30	20	150	3		2	4
AI-2064	PEC	PEC-2	70	20	10			100	3			3
AI-2065	OEC	OE-2	70	20	10			100	3			3
AI-2066	PROJ	Minor Project-1				50	50	100			4	2
Total			**350**	**100**	**50**	**140**	**110**	**750**	**15**		**10**	**20**

MST: Minimum two mid semester tests to be conducted during Semester

PEC (Department Elective-2)		**Open Elective (the course must be enrolled in inter department)-2**	
PEC-2(A)	Robotics Process Automation	Soft Computing OE-2(A)	
PEC-2(B)	Computer Vision	Information Retrieval OE-2(B)	
PEC-2(C)	Data compression	Advanced Web Technology OE-2(C)	

DEPARTMENT OF INFORMATION TECHNOLOGY

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE VIDISHA (M.P.)

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Scheme of Examination (2020-21 & 2021-22)

(Semester - VII)

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						
			ES	**MS**	**QA**	**ES**	**LW**	**Total Marks**	**L**	**T**	**P**	
AI-2071	PCC	Big Data Analytics	70	20	10	30	20	150	3	0	2	4
AI-2072	PCC	Probabilistic Graphical Methods	70	20	10			100	3	1	0	4
AI-2073	PCC	Deep Learning	70	20	10			100	3	1	0	4
AI-2074	PEC	PEC-3	70	20	10			100	3	0	0	3
AI-2075	OEC	OE-3	70	20	10			100	3	0	0	3
AI-2076	PROJ	Major Project Prelim				100	50	150			4	2
AI-2077	DLC	Internship				50		50			4	2
Total			350	100	50	180	70	750	15	2	10	22

MST: Minimum two mid semester tests to be conducted during Semester

List of Elective and Open Courses			
PEC (Department Elective-3)		**Open Elective (the course must be enrolled in inter department)-3**	
PEC-3(A)	Modern Tools for Data Science	Automata and Compiler Design OE-3(A)	
PEC-3(B)	Pattern Recognition	Recommendation System OE-3(B)	
PEC-3(C)	Distributed Systems	Application Development OE-3(C)	

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE VIDISHA (M.P.)

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Scheme of Examination (2020-21 & 2021-22)

(Semester -VIII)

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						
			ES	**MS**	**QA**	**ES**	**LW**	**Total Marks**	**L**	**T**	**P**	
AI-2081	PROJ	Major Project final	-	-	-	400	150	550	-	-	16	8
AI-2082	OEC	MOOCs Courses/ Open Elective -4*	70	20	10	-	-	100	3			3
AI-2083	OEC	MOOCs Courses /Open Elective -5*	70	20	10	-	-	100	3			3
Total			140	40	20	**400**	**150**	**750**	-	**-**	**16**	**14**

MST: Minimum two mid semester tests to be conducted during Semester

Open Elective-4	**Open Elective -5**
A) AI: Constraint Satisfaction	A) Optimization for Machine learning, Theory & Implementation.
B) Artificial Intelligence: Knowledge representation & Reasoning	B) Fuzzy sets, Logic and Systems & Applications

Note*:- Pool of subjects for OE-4&5 is subjected to change as floated by NPTEL/MOOC's/SWAYAM.

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Department Of Information Technology

Programme AIADS

Scheme-2022-23

Structure of Undergraduate Engineering Program					
S.No.	**Category**	**Subject Category**	**Suggested Breakup of Credits (Total 160)**	**Possible list of subjects**	**Approx. Credits (Total 160)**
1	Humanities and Social Sciences including Management courses	HSMC	12*	English, Environmental Science, Management Concepts and Principles, Organisation behaviors, Project Management, Ethics, Stress Management, Human resource Management, Financial Management, Marketing Management, Project Management, IPR.	10-12
2	Basic Science courses	BSC	25*	Applied Physics, Applied Chemistry, Engineering Mathematics (M-1, M-2, M-3)	20-22
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.	ESC	24*	Basic Electrical Engineering, Engineering Graphics & Design, Engineering materials, Manufacturing Practices, Strength of Materials / Mechanics of Materials. Introduction to Computer Science, Basic of Information Technology. Engineering Electronics, Digital Design, Programming for Problem Solving,	20-24
4	Professional core courses	PCC	48*	Specific to Departments	48-50
5	Professional Elective courses relevant to chosen specialization/branch	PEC	18*	Specific to Departments	18-20
6	Open subjects – Electives from other technical and /or emerging subjects	OEC	18*	Specific to Departments	18-20
7	Project work, seminar and internship in industry or elsewhere	PROJ	15*	Specific to Departments	15-20
8	Mandatory Courses [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge]	MC	[Non-Credit]		
Total Credits			160*		
NPTEL/SWAYAM Courses Certification			20* (Max.)		
Mandatory Induction Program for first year students (Three Weeks duration)				• Physical activity • Creative Arts • Universal Human Values • Literary • Proficiency Modules • Lectures by Eminent People • Visits to local Areas • Familiarization to Dept./Branch & Innovations	

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Scheme of Examination (Semester-I)

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				
			ES	MS	Assign ment	Quiz	ES	LW	Quiz		L	T	P	
CHB101	BSC	Applied Chemistry	60	20	10	10	30	10	10	150	3	0	2	4
CSA101	ESC	Introduction to Computer Science Engineering	60	20	10	10	30	10	10	150	3	0	2	4
HUB102	HSMC	Communication and Report Writing	60	20	10	10	30	10	10	150	3	0	2	4
CSA102	ESC	Digital Electronics	60	20	10	10	–	–	–	100	3	0	0	3
MAB101	BSC	Linear Algebra and Calculus	60	20	10	10	–	–	–	100	3	1	0	4
MAC101	MAC*	Universal Human Values and Professional Ethics	–	–		–	60	20	20	100	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	15	1	6	19

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

MAC	Induction Program	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

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE VIDISHA (M.P.)

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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				
			ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
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 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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Scheme of Examination (Semester-III)

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				
			ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
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)

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.

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE VIDISHA (M.P.)
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Scheme of Examination (Semester-IV)

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				
			ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
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)

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.

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE VIDISHA (M.P.)
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Scheme of Examination (Semester-V)

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				
			ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
AI-501	DC	Artificial Intelligence	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	Fuzzy logic	60	20	10	10	30	10	10	150	3	0	2	4
AI-504	DE	DE-1	60	20	10	10	--	--	--	100	3	1	0	4
AI-505	OC	OC-3	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
Total			300	100	50	50	170	40	40	750	15	1	12	23
	ILC	Extracurricular Activities	It is a one credit per year activity to be endorsed in eight semester marks sheet.											

	DE -1	OC-3
A	Cloud Computing	Fuzzy logic
B	Image processing	Computer Graphics & multimedia
C	Information retrieval	Software Engineering

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 OC-3 should not be opted as DE/DC in parent department.

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE VIDISHA (M.P.)
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Scheme of Examination (Semester-VI)

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				
			ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
AI-601	DC	Machine Learning	60	20	10	10	30	10	10	150	3	0	2	4
AI-602	DC	Data Mining & Data Warehousing	60	20	10	10	30	10	10	150	3	0	2	4
AI-603	DE	DE-2	60	20	10	10				100	3	0	0	3
AI-604	DE	DE-3	60	20	10	10				100	3	1	0	4
AI-605	OC	OC-4	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
			300	**100**	**50**	**50**	**140**	**80**	**30**	**750**	**15**	**`1**	**10**	**21**
	ILC	Extracurricular Activities	It is a one credit per year activity endorse in eight semester mark sheet											

MST: Minimum two mid semester tests to be conducted during Semester

	DE -2	DE -3	OC – 4
A	Optimization Techniques	Cryptography & Network Security	Cloud Computing
B	Knowledge Representation	Introduction to IOT	Data Science Analytics
C	Computer Vision	Robotics and process automation	Artificial Intelligence

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 OC-4 should not be opted as DE/DC in parent department.

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE VIDISHA (M.P.)
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Scheme of Examination (Semester-VII)

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				
			ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
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	4	02
AI-705	ILC	Internship-III (Completed in Third Year)	--	--	--		30	10	10	50	0	0	2	02
Total			**180**	**60**	**30**	**30**	**120**	**40**	**40**	**500**	**9**	**2**	**8**	**16**
	ILC	Extracurricular Activities			It is a one credit per year activity endorse in eight semester mark sheet									
MST: Minimum two mid semester tests to be conducted during Semester														

	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

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE VIDISHA (M.P.)
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Scheme of Examination (Semester-VIII)

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				
			ES	MS	Assignment/ Quiz	ES	LW/ Quiz		L	T	P	
AI-801	PROJ	Major Project (Phase-II)				300	200	500	0	0	12	06
AI-802	DE	SWAYAM/NPTEL MOOC's Course *				--	--	--	0	0	0	03
AI-803	DE	SWAYAM/NPTEL MOOC's Course *				--	--	--	0	0	0	03
AI-804	ILC	Extracurricular Activities		It is a one credit per year activity endorsed in eight semester mark sheet								04
Total						**300**	**200**	**500**				**16**

*List of Course suggested by department (Min. of 8 weeks)

DE-6	DE-7
A) AI: Constraint Satisfaction	A) Optimization for Machine learning, Theory & Implementation
B) Artificial Intelligence: Knowledge representation & Reasoning	B) Fuzzy sets, Logic and Systems & Applications

Note: Pool of subjects for DE-6&7 is subjected to change as floated by NPTEL/MOOC's/SWAYAM.

DEPARTMENT OF INFORMATION TECHNOLOGY

Tentative pool of subjects for Honours & Minor Degree

SWAYAM/NPTEL/ MOOC's Course *

Annexure-I

S. No.	Honours Degree(for students of parents department)	Remark
1.	Artificial Intelligence: Knowledge Representation And Reasoning	**8-12 weeks**
2.	AI: Constraint Satisfaction	**8-12 weeks**
3.	Data Analytics with Python	**8-12 weeks**
4.	Optimisation for Machine Learning: Theory and Implementation	**8-12 weeks**
5.	Reinforcement Learning	**8-12 weeks**
6.	Fuzzy Sets, Logic and Systems & Applications	**8-12 weeks**
7.	Computer Vision And Image Processing - Fundamentals And Applications	**8-12 weeks**
8.	Modern Computer Vision	**8-12 weeks**

Note*:-1. Those subjects which are already studied in the core scheme from I to VIII semester cannot be opted.

2. Pool of subjects for Honours & Minor degrees are subjected to change as floated by NPTEL/MOOC's/SWAYAM.

3. 20 credits additionally to be earned between V to VIII sem. Maximum 6 credits per semester from V sem. onwards will be permitted.

4. Students must have to provide certificate of courses opted by **SWAYAM/NPTEL/ MOOC's for Honours Degree.**

DEPARTMENT OF INFORMATION TECHNOLOGY
Tentative pool of subjects for Honours & Minor Degree

SWAYAM/NPTEL/ MOOC's Course *

Annexure-II

S. No.	Minor Degree(for students of other department)	Remark
1.	Fundamental Algorithms: Design And Analysis	**8-12 weeks**
2.	Introduction to Database Systems	**8-12 weeks**
3.	Data Science for Engineers	**8-12 weeks**
4.	Programming, Data Structures And Algorithms Using Python	**8-12 weeks**
5.	Introduction to Machine Learning	**8-12 weeks**
6.	An Introduction to Artificial Intelligence	**8-12 weeks**
7.	Probability for Computer Science	**8-12 weeks**
8.	Data Mining	**8-12 weeks**

Note*:-1. Those subjects which are already studied in the core scheme from I to VIII semester cannot be opted.

2. Note: Pool of subjects for Honours & Minor degrees are subjected to change as floated by NPTEL/MOOC's/SWAYAM.

3. 20 credits additionally to be earned between V to VIII sem. Maximum 6 credits per semester from V sem. onwards will be permitted

4. Students must have to provide certificate of courses opted by **SWAYAM/NPTEL/ MOOC's for Minor Degree.**

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

Semester/Year		III/II		Program			B.Tech – Artificial Intelligence and Data Science				
Subject Category	DC	Subject Code:		AI 302	Subject Name		Analysis and Design of Algorithms				
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	150	3	0	2	4

Prerequisites:

- **Data Structure**

Course Objective:

- Determine different time complexities of a given algorithm
- Demonstrate algorithms using various design techniques.
- Develop algorithms using various design techniques for a given problem.

UNITs	Descriptions	Hrs.
I	Algorithms: Definition and characteristics. Analysis: Space and Time Complexity, Asymptotic Notations, Time Complexity Analysis of algorithms (Linear Search, Insertion Sort etc.)Recursive algorithms and recurrence relations. Solutions of recurrence relations. Divide and conquer technique, analysis, design and comparison of various algorithms based on this technique, example binary search, quick sort, merge sort, Heap Sort, Strassen's matrix multiplication with their complexity analysis.	8
II	Greedy Algorithms: Knapsack problem, Job sequencing with deadlines, optimal merge patterns, Huffman coding, Dynamic Programming: Multistage Graph, all pairs shortest paths, 0-1 Knapsack, Chained matrix multiplication, longest common subsequence, Travelling salesperson problem.	8
III	Graph and Tree Algorithms: Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms- Dijkstra's Algorithms and Complexity Analysis, Transitive closure, Minimum Spanning Tree- Prim's and Kruskal's Algorithm and their complexity analysis, Union Find Data Structure, Topological sorting, Network Flow Algorithm.	8
IV	Branch & Bound technique: Definition and application to solve 0/1 Knapsack Problem, 8-puzzle problem, travelling salesman problem. Back tracking concept and its examples like 8 Queens's problem, Hamiltonian cycle, Graph Coloring problem.	8
V	Tractable and Intractable Problems: Computability of Algorithms- P, NP, NP-complete and NP-hard. Introduction to Approximation Algorithms, NP-complete problems and Reduction techniques. Lower bound theory and its use in solving algebraic problem.	8
Total Hours		40

Course Outcomes:

CO-1: Analyze and justify the running time complexity of algorithms

CO-2: Articulate the effectiveness of divide and conquer methods to solve searching, sorting and other problems.

CO-3: Understand the combinatorial problems and justify the use of Greedy and Dynamic Programming techniques to solve them.

CO-4: Model graph or tree **f**or a given engineering problem, and write the corresponding algorithm to solve it.

CO-5: Able to analyses the NP-complete

Text Book

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

Reference Books-

Gilles Brassard and Paul Bratley, "Fundamentals of Algorithmics", PHI.

List/Links of e-learning resource

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

Modes of Evaluation and Rubric

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

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}	PSO-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.Understand the working of Ubuntu operating system and basic commands for implementing
2. Algorithm in c programming in Ubuntu operating system using gcc compiler.
3. Write a simple c program to add two integer numbers.
4.Implement Algorithm to calculate factorial of given number using iteration method and recursive Method.
5.Implement logic to swap two integer numbers using three different approaches.
6.Implement Algorithm to determine if a given number is divisible by 5 or not without using % Operator.
7.Implement Algorithm to convert binary number to decimal number without using array and Power function.
8.Implement Algorithm to print reverse of string using recursion and without using character Array.
9.Implement Linear Search Algorithm.
10.Implement Binary Search Algorithm (By using Iterative Approach)
11.Implement Binary Search Algorithm (By using Recursive Approach)
12.Implement Insertion Sort Algorithm
13.Implement Quick Sort Algorithm (By using Recursive Approach)
14.Implement Quick Sort Algorithm (By using Non-Recursive Approach).
15.Implement Merge Sort Algorithm.

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of CS & IT

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

Semester/Year	III/II	Program	B.Tech – Artificial Intelligence and Data Science
Subject Category: DC	Subject Code: AI 303	Subject Name	Object Oriented Programming

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	150	3	0	2	4

Prerequisites:

Fundamentals of programming Skills

Course Objective:

- Enable students to understand concepts and principles of object-oriented programming methodologies using JAVA as a vehicle.
- Also learn software development and problem solving using this JAVA technology.

UNITs	Descriptions	Hrs.
I	Introduction: Procedural Paradigms of programming, Object Oriented Paradigm for programming, Procedural vs. Object Oriented Programming, Principles of OOP, Benefits and applications of OOP. OOP Concepts: Data Abstraction, Encapsulation, Inheritance and Polymorphism. Introduction of Java, Features of Java, Byte Code and Java Virtual Machine, Java Development Kit (JDK). Basics of objects and classes in Java, tokens, keywords, identifiers, variables, data types, and operators in java, Type casting, strict fp keyword.	8
II	Control Statements — If, else, nested if, if-else ladders, Switch, while, do-while, for, for-each, break, continue. Command Line Argument, Classes and Objects, Encapsulation, Tightly Encapsulated classes, Nested class, Inner class, and Anonymous inner class. Inbuilt classes: Object, String, String Buffer, Array, Vector. Wrapper classes. Data members, member Function, Data Hiding: Visibility modifiers in java.	8
III	Is-A relationship, Has-A relationship, Inheritance in Java, types of inheritance, Super and sub class, Method Signature. Overloading, Constructor Overloading, Method Overloading, this and static keyword, finalize () method, Casting objects, Instance of operator, Overriding, covariant return type. Super, final keyword, overloading vs. overriding. Static control flow, instance control flow.	8
IV	Abstraction: Abstract class, Interface in Java, differences between classes and interfaces. Defining an interface, implementing interface, applying interfaces, variables in interface, extending interfaces. Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages. Coupling, Cohesion.	8
V	Exception Handling: Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally keywords, Built-in exceptions, creating own exception sub classes. Multithreading: Concepts of Multithreading, differences between process and thread, thread life cycle, creating multiple threads using Thread class, Runnable interface. Synchronization, thread priorities, inter thread communication, daemon threads, deadlocks, thread groups. Introduction of java micro services.	8
Total Hours		40

Course Outcomes:

CO-1 Define classes, objects, members of a class and relationships among them needed for a specific program.

CO-2 Write the java application programs using OOPs principles.
CO-3 Write java application on constructors, overloading.
CO-4 Demonstrate package creating and accessing members of a packages.
CO-5 Understand and develop collection frame work and its application programs.

Text Book

1. Naughton & Schildt, "The Complete Reference Java 2", Tata McGraw Hill
2. E Balaguruswamy, "Programming in Java", TMH Publications

Reference Books-

1. Deitel "Java-How to Program:" Pearson Education, Asia
2. Horstmann & Cornell, "Core Java 2" (Vol I & II), Sun Microsystems
3. Ivan Bayross, "java 2.0", BPB publications
4. Java Programming for the absolute beginners By Russell, PHI Learning
5. Java Programming by Hari Mohan Pandey, Pearson.

List/Links of e-learning resource

- https://archive.nptel.ac.in/courses/106/105/106105153/

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}	PSO1	PSO2
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

Suggestive list of experiments:

1. Write a java program to find the Fibonacci series using recursive and non-recursive functions.
2. Write a java program to multiply two given matrices.
3. Write a java program for Method overloading and Constructor overloading.
4. Write a java program to display the employee details using Scanner class.
5. Write a java program that checks whether a given string is palindrome or not.
6. A. Write a java program to represent Abstract class with example.

B. Write a java program to implement Interface using extends keyword.

7. A. Write a java program to create inner classes.

B. Write a java program to create user defined package.

8. A. Write a java program for creating multiple catch blocks.

B. Write a java program for producer and consumer problem using Threads.

9. Write a Java program that implements a multi-thread application that has three threads.
10. A. Write a java program to display File class properties.

B. Write a java program to represent ArrayList class.

C. Write a Java program loads phone no, name from a text file using hashtable.

11. Write an applet program that displays a simple message.
12. A. Write a Java program computes factorial value using Applet.

B. Write a program for passing parameters using Applet.

13. A. Write a java program for handling Mouse events and Key events.

B. Write a java program for handling Key events.

14. Write a java program that connects to a database using JDBC.
15. A. Write a java program to connect to a database using JDBC and insert values into it.

B. Write a java program to connect to a database using JDBC and delete values from it.

16. Write a java program that works as a simple calculator. Use a Grid Layout to arrange Buttons for digits and for the + - * %operations. Add a text field to display the result

Recommendation by Board of studies on	
Approval by Academic council on	

Compiled and designed by	
Subject handled by department	Department of CS & IT

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

Semester/Year		III/II	Program		B.Tech – Artificial Intelligence and Data Science
Subject Category	DC	Subject Code:	AI-304	Subject Name	Operating System

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	150	3	0	2	4

Prerequisites:

Computer Fundamentals

Course Objective:

To understand operating system architecture and functioning along with in-depth knowledge of internals and working of OS modules like process management, Storage management, file system, security and Protection

UNITs	Descriptions	Hrs.
I	Overview-Introduction to Operating Systems, Evolution of Operating System mainframe, desktop, multiprocessor, Distributed, Network Operating System, and Clustered and Handheld System), Operating System Structure- Operating System Services and System Calls, System Programs. Types of Operating Systems: Batch Processing, Real-Time, Multitasking, and Multiprogramming, time-sharing system and Distributed Operating Systems, Objectives and functions of OS.	8
II	Process Management-Concept, Process Control Blocks (PCB), Process Scheduling. Scheduling Criteria, Scheduling Algorithms, and their Evaluation. Threads Overview and Multithreading .	8
III	Inter Processes Communication and Critical Section Problem and Solution-Semaphores and Monitors, Deadlock Characterization, Methods for Deadlock handling, deadlock prevention, deadlock avoidance, deadlock detection and Recovery from Deadlock	8
IV	Storage Management-Memory Hierarchy, Concepts of memory management, MFT and MVT, logical and physical address space, swapping, contiguous and non-contiguous allocation, Paging and Segmentation Structure and Implementation of Page table, Virtual memory, Cache Memory Organization, Demand paging, Page replacement Algorithms. Thrashing, Demand segmentation.	8
V	File and Disk Management-File concepts, Access methods, Directory Structure, File Sharing and Protection, Free space management, Disk Scheduling, Efficiency, and Performance- A case study on Unix, Linux, and Windows.	8
Total Hours		40

Course Outcomes:

CO1:Explain the inherent mechanism involved in the functioning of an operating system. Differentiate and justify the need for various operating systems.

CO2:Analyse various scheduling techniques with their comparisons.

CO3:Analyse various synchronization techniques with their comparisons to derive the solution for the deadlock situation.

CO4: Describe the memory management system of an operating system. Analyse and compare various management schemes.

CO5: Describe and Analyze File and Disk Management Techniques.

Text Book

1. Peterson, J.L. & Silberschatz, A.: Operating System Concepts, Addison, Wesley-Reading.
2. Brinch, Hansen: Operating System Principles, Prentice Hall of India.

Reference Books-

1. Haberman, A.N.: Introduction to Operating System Design Galgotia Publication, New Delhi.
2. Tanenbaum, A.S.: Operating Systems.
3. Hansen, P.B.: Architecture of Concurrent Programs, PHI.
4. Shaw, A.C.: Logic Design of Operating Systems, PHI.

List/Links of e-learning resource

- https://archive.nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs10/

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}	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

Suggestive list of experiments:

1. Implementation of Basic Linux Commands.
2. Implementation of Process Related System Calls (Fork).
3. Write a program to simulate the following non-preemptive CPU scheduling algorithms to find turnaround time and waiting time. a) FCFS b) SJF
4. Write a program to simulate the following CPU scheduling algorithms to find turnaround time and waiting time. a) Round Robin b) Priority
5. Write a C program to simulate page replacement algorithms) FIFO b) LRU c) OPTIMAL
6. Write a program to simulate Bankers algorithm for the purpose of deadlock avoidance.
7. Write a program to simulate disk scheduling algorithms a) FCFS b) SCAN c) C-SCAN

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of CS & IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

(Engineering College), VIDISHA M.P.

(An Autonomous Institute Affiliated to RGPV Bhopal)

DEPARTMENT OF IT

Semester/Year		III/II	Program		B.Tech – Artificial Intelligence and Data Science
Subject Category	DL	Subject Code:	AI- 306	Subject Name	Internet Programming

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
				30	10	10	50	0	0	4	2

Prerequisites:

Basic knowledge of computers, its components and programming skills

Course Objective:

Understand Static and Dynamic Web Pages.

UNITs	Descriptions	Hrs.
I	WEBSITE BASICS, Web Essentials: Clients, Servers and Communication, The Internet, Basic Internet protocols, World wide web.	7
II	HTTP Request Message, HTTP Response Message, Web Clients,Web Servers, HTML5, Tables, Lists, Image, HTML5 control elements, Semantic elements, Drag and Drop, Audio , Video control	8
III	CSS3, Inline, embedded and external style sheets, Rule cascading, Inheritance, Backgrounds, Border Images, Colors Shadows, Text, Transformations, Transitions, Animations.	7
IV	Java Script: An introduction to JavaScript, JavaScript DOM Model-Date and Objects, function, Regular Expressions.	7
V	Exception Handling-Validation-Built-in objects-Event Handling- DHTML with JavaScript. XML- Elements, attributes, parser, DOM, query.	7
Total Labs (practical's min)		36

Course Outcomes:

CO1: To understand and interpret the basic concepts of the Internet, tools.

CO2: To understand, analyse CSS components and apply them web page design tools like HTML, CSS.

CO3: To know and analyse client side scripting language concepts.

CO4: Design and Develop Internet applications with the help of Java script.

CO5: Understand the concept of exceptional handling

Text Book

1. Achyut Godbole, Atul Kahate & quot ; Web Technologies: TCP/IP, Web/Java Programming, and Cloud Computing", Third Edition, McGraw Hill Education.
2. Deitel, Deitel, Goldberg, & quot; Internet & World Wide Web How to Program & quot;, Third Edition, Pearson Education.

Reference Books-

1. Raj Kamal, "Internet and Web Technologies", Tata McGraw-Hill.

List/Links of e-learning resource

- https://archive.nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs10/

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}	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

Suggestive list of experiments:

1. Design a web page to display your CV.
2. Design a web page using HTML tags to take the input in a form and display it in another page/frame.
3. Design a web page to isolate a part of the text that might be formatted in a different direction from other text outside it
4. Create a Zebra Striping a Table and make an image rounded with CSS3.
5. Create speech bubble shape and Image cross effect with CSS3 transition.
6. Using HTML, CSS create a styled checkbox with animation on state change.
7. Using HTML, CSS create display an image overlay effect on hover.
8. Using HTML, CSS create a list with floating headings for each section.
9. Using HTML, CSS, JavaScript create a typewriter effect animation.
10. Using HTML, CSS create an animated underline effect when the user hovers over the text.
11. Write a JavaScript program to set paragraph background color.
12. Write a JavaScript function to add rows to a table.
13. Write a JavaScript function that accepts a row, column (to identify a particular cell) and a string to update the cell's content.
14. Write a JavaScript program to highlight the bold words of the following paragraph, on mouse over a certain link.
15. Write a JavaScript program to get the window width and height (any time the window is resized).

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	

Subject handled by department	Department of CS & IT

Open Courses launched by respective Programmes are not applicable for students of parental programme.

Open Course Offered by AIADS Session: 2023-24 Semester III			
Open Elective-I OE-I	**OE-305 (A)**	**OE-305 (B)**	**OE-305 (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

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	OE	Subject Code:	OE-305-A	Subject Name	Computer System Organization

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

Prerequisites:

Fundamental knowledge of digital electronics.

Course Objective:

- Understand the organization and architecture of computer systems and electronic computers.
- Study the assembly language program execution, instruction format, and instruction cycle.
- Design a simple computer using hardwired and microprogrammed control methods.
- Study the basic components of computer systems besides computer arithmetic.
- Understand input-output organization, memory organization and management, and pipelining

UNITs	Descriptions	Hrs.
I	Introduction: Function and structure of a computer, Functional components of a computer, Interconnection of components, Performance of a computer, Register Transfer language : Register Transfer, Bus and Memory Transfers, Three-Stare Bus Buffers, Memory Transfer, Arithmetic Microoperations Binary Adder, Binary Adder-Subtractor, Binary incrementor, Arithmetic Circuit, Logic Microoperations, Shift Microoperations, Arithmetic Logic Shift Unit, List of Logic Microoperations, , Shift Micro operations, Arithmetic Logic Shift Unit	7
II	Control unit: Control memory, address sequencing, micro program example, Microinstruction Format, Symbolic Microinstructions, The Fetch Routine, Symbolic Micro program and design of the control unit, Microprogram Sequencer.	7
III	CPU design: Instruction cycle, data representation, memory reference instructions, input-output, and interrupt, addressing modes, data transfer and manipulation, program control. Computer arithmetic: Addition and subtraction, floating point arithmetic operations, decimal arithmetic unit.	7
IV	Memory organization: Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory; Input or output organization: Input or output Interface, asynchronous data transfer, modes of transfer, priority interrupt, direct memory access	7
V	Pipeline: Parallel processing, pipelining-arithmetic pipeline, instruction pipeline; Multiprocessors: Characteristics of multiprocessors, interconnection structures, inter-processor arbitration, inter-processor communication and synchronization.	7
Total Hours		35

Course Outcomes:

CO1: Understand the organization and levels of design in computer architecture.
CO2: Describe Register transfer languages, arithmetic micro-operations, logic micro-operations, shift micro-operations address sequencing, micro program example, and design of control unit
CO3: Understand the Instruction cycle, data representation, memory reference instructions, input-output, and interrupt, addressing modes, data transfer, and manipulation, program control. Addition and subtraction, floating point arithmetic operations, decimal arithmetic unit.
CO4: Knowledge about Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory Input or output Interface, asynchronous data transfer, modes of transfer, Priority interrupt, and direct memory access.
CO5: Explore the Parallel processing, pipelining-arithmetic pipeline, instruction pipeline Characteristics of multiprocessors, interconnection structures, inter-processor arbitration, inter-processor Communication, and synchronization.

Text Book

- M. Morris Mano, "Computer Systems Architecture", Pearson, 3rdEdition,2007.

Reference Books-

- John D. Carpinelli, "Computer Systems Organization and Architecture", Pearson, 1stEdition,2001.
- Patterson, Hennessy,"Computer Organization and Design: TheHardware/Software Interface", Morgan Kaufmann, 5 thEdition,2013

List/Links of e-learning resource

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}	PSO1	PSO2
CO-1	1	1	2										1	2
CO-2	2	2	2										1	2
CO-3	2	1	2										1	2
CO-4	2	1	2											2
CO-5	2	2	1										1	2

Suggestive list of experiments:

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of CS & IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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Semester/Year		III/II	Program		B.Tech – Artificial Intelligence and Data Science
Subject Category	OE	Subject Code:	OE-305 B	Subject Name	Operating System

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

Prerequisites:

Computer Fundamentals

Course Objective:

To understand operating system architecture and functioning along with in-depth knowledge of internals and working of OS modules like process management, Storage management, file system, security and Protection

UNITs	Descriptions	Hrs.
I	Overview-Introduction to Operating Systems, Evolution of Operating System mainframe, desktop, multiprocessor, Distributed, Network Operating System, and Clustered and Handheld System), Operating System Structure- Operating System Services and System Calls, System Programs. Types of Operating Systems: Batch Processing, Real-Time, Multitasking, and Multiprogramming, time-sharing system and Distributed Operating Systems, Objectives and functions of OS	7
II	Process Management-Concept, Process Control Blocks (PCB), Process Scheduling. Scheduling Criteria, Scheduling Algorithms, and their Evaluation. Threads Overview and Multithreading .	7
III	Inter Processes Communication and Critical Section Problem and Solution-Semaphores and Monitors, Deadlock Characterization, Methods for Deadlock handling, deadlock prevention, deadlock avoidance, deadlock detection and Recovery from Deadlock	7
IV	Storage Management-Memory Hierarchy, Concepts of memory management, MFT and MVT, logical and physical address space, swapping, contiguous and non-contiguous allocation, Paging and Segmentation Structure and Implementation of Page table, Virtual memory, Cache Memory Organization, Demand paging, Page replacement Algorithms. Thrashing, Demand segmentation.	7
V	File and Disk Management-File concepts, Access methods, Directory Structure, File Sharing and Protection, Free space management, Disk Scheduling, Efficiency, and Performance- A case study on Unix, Linux, and Windows.	7
Total Hours		35

Course Outcomes:

CO1:Explain the inherent mechanism involved in the functioning of an operating system. Differentiate and justify the need for various operating systems.

CO2:Analyse various scheduling techniques with their comparisons.

CO3:Analyse various synchronization techniques with their comparisons to derive the solution for the deadlock situation.

CO4: Describe the memory management system of an operating system. Analyse and compare various management schemes.

CO5: Describe and Analyze File and Disk Management Techniques.

Text Book

3. Peterson, J.L. & Silberschatz, A.: Operating System Concepts, Addison, Wesley-Reading.
4. Brinch, Hansen: Operating System Principles, Prentice Hall of India.

Reference Books-

5. Haberman, A.N.: Introduction to Operating System Design Galgotia Publication, New Delhi.
6. Tanenbaum, A.S.: Operating Systems.
7. Hansen, P.B.: Architecture of Concurrent Programs, PHI.
8. Shaw, A.C.: Logic Design of Operating Systems, PHI.

List/Links of e-learning resource

- https://archive.nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs10/

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}	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

Suggestive list of experiments:

Recommendation by Board of studies on	
Approval by Academic council on	
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Subject handled by department	Department of CS & IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

Semester/Year		III/II	Program		B.Tech – Artificial Intelligence and Data Science
Subject Category	OE	Subject Code:	OE-305 C	Subject Name	Data Structure

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

Prerequisites:

Logical thinking and Computer Fundamentals

Course Objective:

- Introduce the fundamentals of data structures
- Utilization of the concepts are useful in problem solving.

UNITs	Descriptions	Hrs.
I	Problem solving concepts: top-down, bottom-up design, Concept of data type, variable, constant and pointers. Dynamic memory allocation. Algorithm: Definition and complexity Analysis. Introduction to data structure: Linear, Nonlinear, Primitive and Non primitive. Arrays-Concepts of Arrays, Single dimensional array, two-dimensional array-Representation and Address Calculation, Operations on arrays with algorithms (traversing, searching, inserting, deleting).	7
II	List-Singly linked lists: Representation in memory, Operations on singly linked list with algorithms (traversing, searching, insertion, deletion) Doubly linked list-Operations with algorithms and analysis. Circular linked lists- Operations with algorithms. Representation & manipulations of polynomials / sets using linked lists.	7
III	Stack- Introduction to Stack and its operations, Implementation of stack using array and linked list with comparison. Application of stacks (Polish Notations, converting infix to postfix notation, evaluating postfix notation, Parenthesis balancing, Recursion).Queue- Introduction to Queue and its operations. Implementation of queue using array and linked list. De- queue, circular queue, priority queue. Applications of queue.	7
IV	Tree-Definition and terminology, concept of binary tree and representation, Traversing binary tree (pre order, post order, in order) Operation with algorithm -insertion and deletion. Binary Search Trees and its Applications. Graph- Definition and terminology, Types of graphs, Representation of graph. Traversing of graph-Breadth First Traversing and Depth First Traversing.	7
V	Searching- Search methods- Linear search, Binary search and Hashing (collision, chaining and probing) with their algorithms. Sorting- Sorting Methods-Bubble sort, Selection sort, Insertion sort, Quick sort, Merge sort.	7
Total Hours		35

Course Outcomes:

CO-1 Understand-Problem solving using of data structure and various searching and sorting methods.
CO-2 Apply-Apply different concepts of data structures to solve different computing problems.
CO-3 Analyze-Analyze the access pattern of various data structure and understand their applicability.
CO-4 Evaluate-Evaluate and Compare the performance of different data structures on real world problems.
CO-5 Discuss-Graph and Tree structure with their operations and applicability

Text Book

- Data Structure-Horwitz and Sartaj Sahni

Reference Books-

- Data Structure-Schaum's Series-Mc Graw Hill Publication
- Data Structure through C, Yashwant Kanekar, BPB Publication.

List/Links of e-learning resource

- https://archive.nptel.ac.in/courses/106/106/106106127/

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}	PSO1	PSO2
CO-1	2	2	1										1	2
CO-2	2	2	2	1									1	2
CO-3	2	2	2	1									1	2
CO-4	2	2	2	1									1	2
CO-5	2	2	1										1	2

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of CS & IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

Semester/Year		**IV/II**	**Program**		**B.Tech – Artificial Intelligence and Data Science**
Subject Category	**DC**	**Subject Code:**	**AI 401**	**Subject Name**	**Computer Network**

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**	**150**	**3**	**0**	**2**	**4**

Prerequisites:

Student having fundamental knowledge of analog and digital communication.

Course Objective:

- Have fundamental knowledge of the various aspects of computer networking and enables students to appreciate recent developments in the area.
- Be familiar with various types of computer networks.
- Understand the concepts of Network Layer ,Transport Layer, Application Layer

UNITs	**Descriptions**	**Hrs.**
I	Computer Network: Definitions, goals, components, structure, Architecture, Classifications & types, Growth, Complexity and applications etc. Layered Architecture: Protocol hierarchy, Connection Oriented & Connectionless Services, Service primitive Design issues & its functionality. ISO-OSI Reference Model: Principle, Model, Descriptions of various layers and its comparison with TCP/IP. Network standardization	8
II	Transmission Media, Sources of transmission impairment. Network Topology: Mesh, Bus, Star, Ring, Tree, etc. Standards Connecting Devices: Active and Passive Hubs, Repeaters, Bridges, Two- & Three-layer switches & Gateway.	8
III	Data Link Layer: Need, Services Provided, Framing & its methods, Flow Control, Error control. DLL Protocol: Elementary & Sliding Window. Piggybacking & Pipelining. MAC Sub layer: Static & Dynamic channel allocation, Media access control for LAN & WAN. Collision free & limited contention protocol ALOHA : pure, slotted CSMA, CSMA/CD,CSMA/CA, IEEE 802 standards for LAN & MAN & their comparison.	8
IV	Network Layer: Need, Services Provided, Design issues, Routing algorithms: Least Cost Routing algorithm, Dijkstra's algorithm, Bellman-ford algorithm, Hierarchical Routing, Broadcast Routing, Multicast Routing, Routing Strategies, Congestion Control Algorithms: General Principles of Congestion control, Prevention Policies, Congestion Control in Virtual-Circuit Subnets, Congestion Control in Datagram subnets. Comparison of IPv4 & IPv6, Mobile IP.	8
V	Processes to Processes Delivery: Transmission Control Protocol (TCP) – User Datagram Protocol, Data Traffic, Congestion Control and Quality of Service, Techniques to improve QOS, Integrated Services, and Differentiated Services, DNS,SMTP, FTP, HTTP, WWW, Virtual Terminal Protocol, VoIP: Basic IP Telephone System.	8
Total Hours		40

Course Outcomes:

CO1: Develop a fundamental understanding of network design principles and structure of computer network.
CO2: Explain the importance of data communications, how communication works in data networks and the internet, recognize the different internetworking devices and their functions.
CO3: Explain the role of protocols in networking, Analyze the role and services and features of the various layers of data networks.
CO4: Analyze the features and operations of various routing protocols such as Bellman-ford algorithm, Hierarchical Routing, Broadcast Routing, Multicast Routing.
CO5: Describe and examine working of Transport Layer and Application Layer protocol.

Text Book

1. Tanenbaum A. S, "Computer Networks", Pearson Education , 4th Edition
2. William Stallings, "Data and Computer Communications", PHI 6th Edition .

Reference Books-

1. Douglas E. Comer ,"Computer Network & Internet", Pearson Education, 6th Edition.
2. Behraj A Forouzan,"Data Communication & Networking", McGraw-Hill,4th edition.
3. Natalia Olifar & Victor Olifer,"Computer Networks", Willey Pub.
4. Prakash C. Gupta, "Data Communications and Computer Networks", PHI,2end edition.
5. Gallo,"Computer Communication & Networking Technologies", Cengage Learning.1st edition.

List/Links of e-learning resource

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}	PSO1	PSO2
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	

Suggestive list of experiments:

1. Study of different types of Network cables and practically implement the cross-wired cable and straight through cable using clamping tool.
2. Study of Network Devices in detail.
3. Demonstrate single parity bit for error detection.
4. To understand error detection and correction technique Implement hamming code.
5. To understand error detection technique, Implement CRC.
6. To understand working of framing method Implement bit stuffing with start and end flag.
7. To understand farming methods, implement character count farming method.
8. To study and understand network IP.
9. Connect the computer in local Area Network.

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

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

Semester/Year		**IV/II**		**Program**		**B.Tech – Artificial Intelligence and Data Science**
Subject Category	**DC**	**Subject Code:**	**AI 402**	**Subject Name**		**Database Management System**

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**	**150**	**3**	**0**	**2**	**4**

Prerequisites:

Basic Knowledge of Mathematics and Programming

Course Objective:

- To understand the different issues involved in the design and implementation of a database system.
- To represent a database system using ER diagrams and to learn normalization techniques
- To learn the fundamentals of data models, relational algebra, and SQL.
- To understand the basic issues of transaction processing and concurrency control.
- To become familiar with database storage structures and access techniques

UNITs	**Descriptions**	**Hrs.**
I	Introduction: Purpose of Database System –- Views of data – data models, database management system, three-schema architecture of DBMS, components of DBMS. E/R Model - Conceptual data modeling - motivation, entities, entity types, attributes relationships, relationship types, E/R diagram notation, examples.	6
II	Relational Model: Relational Data Model - Concept of relations, schema-instance distinction, keys, referential integrity and foreign keys, relational algebra operators, SQL - Introduction, data definition in SQL, table, key and foreign key definitions, update behaviors. Querying in SQL, notion of aggregation, aggregation functions group by and having clauses.	8
III	Database Design: Dependencies and Normal forms, dependency theory - functional dependencies, Armstrong's axioms for FD's, closure of a set of FD's, minimal covers, definitions of 1NF, 2NF, 3NF and BCNF, decompositions and desirable properties of them, algorithms for 3NF and BCNF normalization, 4NF, and 5NF.	9
IV	Transactions: Transaction processing and Error recovery - concepts of transaction processing, ACID properties, concurrency control, locking based protocols for CC, error recovery and logging, undo, redo, undo-redo logging and recovery methods.	9
V	Implementation Techniques: Data Storage and Indexes - file organizations, primary, secondary index structures, various index structures - hash-based, dynamic hashing techniques, multi-level indexes, B+ trees.	8
Total Hours		40

Course Outcomes:

CO-1: Understand the basic concepts, principles and applications of database systems.

CO-2: Discuss the components of DBMS, data models, Relational models.

CO-3: Use knowledge to find the functional dependencies and differentiate between different normal forms.

CO-4: Execute transaction concepts and concurrency protocols

CO-5: Articulate the basic concept of storage and access techniques.

Text Book

1. Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems , Pearson Education
2. Silberschatz, Korth, "Data base System Concepts", 7th ed., McGraw hill.

Reference Books-

1. C. J. Date, "An Introduction to Database Systems", 8th ed., Pearson.
2. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems McGraw Hill.
3. Peter Rob and Carlos Coronel, Database System- Design, Implementation and Management ,Cengage Learning.

List/Links of e-learning resource

- https://nptel.ac.in/courses/106/104/106104135/
- https://nptel.ac.in/courses/106/106/106106220

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}	PSO1	PSO2
CO-1	1	1	2										1	2
CO-2	3	2	2										1	2
CO-3	2	1	2		2								1	2
CO-4	2	1	2											2
CO-5	2	2	2											1

Suggestive list of experiments:

1. Design a Database and create required tables. For e.g. Bank, College Database
2. Apply the constraints like Primary Key , Foreign key, NOT NULL to the tables
3. Write a sql statement for implementing ALTER,UPDATE and DELETE
4. Write the queries to implement the joins
5. Write the query for implementing the aggregate functions
6. Write the query to implement the concept of Integrity constraints
7. Write the query to create the views
8. Perform the queries with group by and having clauses
9. Perform the following operation for demonstrating the insertion , updation and deletion using the referential integrity constraints
10. Write the query for creating the users and their role

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

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

Semester/Year		IV/II		Program		B.Tech – Artificial Intelligence and Data Science				
Subject Category	DC	Subject Code:		AI-403	Subject Name	Foundation of Data Science				
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	150	3	0	2	4

Prerequisites:

Mathematics

Course Objective:

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

UNITs	Descriptions	Hrs.
I	Data Science-What is Data Science, Need for Data Science, Difference between Data Science & Business Intelligence, Data Science Components, Tools for Data Science, Data Science Life cycle, Applications of Data Science, Data Science Ethics. Representation of Data- Types of data, primary, secondary, quantitative and qualitative data. Types of Measurements, nominal, ordinal, discrete and continuous data.	8
II	Presentation of data by tables, construction of frequency distributions for discrete and continuous data. Graphical representation of a frequency distribution by histogram and frequency polygon, cumulative frequency distributions. Data Pre-processing- Knowing Data, Data Cleaning, Data Integration, Data Selection, Data Transformation	8
III	Descriptive Statistics-Arithmetic mean, Median, Mode, Geometric mean, Harmonic mean. Partition values: Quartiles, Deciles and percentiles. Measures of dispersion: Mean deviation, Quartile deviation, Standard deviation, Coefficient of variation. Moments: measures of skewness, Kurtosis	8
IV	Correlation-Scatter plot, Karl Pearson coefficient of correlation, Spearman's rank correlation coefficient, multiple and partial correlations. Regression: Concept of errors, Principles of Least Square, Simple linear regression and its properties. Types of Regressions.	8
V	Basics of Big Data, Problem handling large data, general techniques for handling large data, Basic concept of Machine Learning, training model, validating model, supervised & unsupervised learning.	8
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 data science, including their real-world applications and the toolkit used by data scientists.
CO3: To implement data collection and management scripts using Mongo DB.
CO4: Examine the techniques of Data Visualization.
CO5: Identification of various applications of Data Science.

Text Books

1. "Introducing Data Science" by Davy Cielen, Arno D. B. Meysman, Mohamed Ali, 1st Edition, Manning Publications Co.
2. "An Introduction to Probability and Statistics" by Rohatgi V.K and Saleh E, 3rd Edition, John Wiley & Sons Inc., New Jersey,
3. "Data Mining Concept & Techniques" by Han & Kember,3rd Edition, The Morgan Kaufmann,

Reference Books

1. Joel Grus, Data Science from Scratch, Shroff Publisher/O'Reilly Publisher Media
2. Annalyn Ng, Kenneth Soo, Num sense Data Science for the Layman, Shroff Publisher Publisher
3. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk from The Frontline. O'Reilly Publisher.

List/Links of e-learning resource

- https://nptel.ac.in/courses/106106179

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}	PSO1	PSO2
CO-1	1	3		2									**1**	**2**
CO-2	2	2											**2**	**2**
CO-3	2	1	3										**1**	**2**
CO-4	1	2											3	1
CO-5	3	3		2									2	3

Suggestive list of experiments:

1. Working with various types of data
2. Experiment on measurement of data
3. Experiments on presentation of Data
4. Develop program for Frequency distributions
5. Develop program for Variability
6. Develop program for Averages
7. Develop program for Normal Curves
8. Develop program for Correlation and scatter plots
9. Develop program for Correlation coefficient
10. Develop program for Simple Linear Regression

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

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

Semester/Year		**IV/II**		**Program**		**B.Tech – Artificial Intelligence and Data Science**
Subject Category	**DC**	**Subject Code:**	**AI 404**	**Subject Name**		**Software Engineering**

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**	**0**	**4**

Prerequisites:

Fundamental knowledge of system, analysis and design

Course Objective:

- To introduce students to the basic concepts, testing techniques and applications of Software Engineering.
- To provide a brief, hands-on overview of software development life cycle.
- Develop and write a software project proposal.
- Develop and write a Software Requirements Specification.
- To understand and apply the various phases of software development like information gathering, feasibility, Process model, analysis, design, Estimations, quality, risk, maintenance, reengineering.

UNITs	**Descriptions**	**Hrs.**
I	Introduction to Software and Software Engineering The Evolving Role of Software, Software: Software Myths, Software Engineering: A Layered Technology, Software Process Models, The Linear Sequential Model, The Prototyping Model, The RAD Model, Incremental Model, Spiral, Evolutionary Process Models, Agile Process Model, Component-Based Development, the capability maturity model integration (CMMI) , ISO 9000 Models.	8
II	Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document. Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management. System models: Context models, behavioral models, data models, object models, structured methods.	6
III	Software Project Planning, Design Methodologies and Software Metrics, Software Project Planning: Project planning objectives, Decomposition Techniques, Empirical estimation models, Software Project Estimation Models, CPM/PERT. Design concept: Design Principles, Abstractions, refinement modularity, effective modular design, Cohesion & Coupling, Design notation, and specification, structure design methodologies, & design methods. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.	9
IV	Software Testing, Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.	9
V	Software Maintenance and Software Reengineering, Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Adaptive,Corrective and Perfective Maintenance, Cost of Maintenance, Software Reengineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools, Risk management: Reactive vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM plan.	8
Total Hours		40

Course Outcomes:

CO-1: Interpret and justify different software development life cycle models.
CO-2: Understand the requirement analysis and identify state & behavior of real world software projects.
CO-3: Use various design methodologies to derive solutions for software project.
CO-4: Evaluate and quantify the quality of software though evaluation metrics.
CO-5: Identify and analyse the risk in development. CO-5: Evaluate different testing methods for software project management.

Text Book

1. Roger S. Pressman, "Soflware Engineering — A Practitioner's Approach", Seventh Edition, McGraw-Hill International Edition,2010.

2. Rajib Mall, “Fundamentals of Software Engineering”, Third Edition, PHI Learning Private Limited,2009.
3. Srinivasan Desikan and Gopalaswamy : Software Testing, Principle.

Reference Books

1. Elis Awad, "System Analysis & Design", Galgotia publications.
2. Pankaj Jalote “Software Engg” Narosa Publications.
3. Ian Sommerville: Software Engineering 6/e (Addison-Wesley).
4. Richard Fairley: Software Engineering Concepts (TMH).
5. Hans Vans Vilet, “Software Engineering Principles and Practice”, Wiley.

List/Links of e-learning resource

https://onlinecourses.nptel.ac.in/noc23_cs122/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	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	3	3	1	1								2	3	1
CO-2	3	2	3	2								3	2	
CO-3	3	2	1	3	2							2	2	2
CO-4	2	3	2	2			3						2	2
CO-5	2	2	1									3	1	2

Suggestive list of design methodology tools:

1. Develop requirements specification for a given problem (The requirements specification should include both functional and non-functional requirements). For a set of about 10 sample problems .
2. Develop DFD Model (Level 0, Level 1 DFD and data dictionary) of the sample problem.
3. Develop UML Use case model for a sample problem .
4. Develop Sequence Diagrams.
5. Develop Class diagrams.
6. Use testing tool such as junit
7. To compute cyclometic complexity for any flow graph.
8. Using configuration management tool-libra.
9. Use CPM/PERT for scheduling the assigned project.
10. Use Gantt Charts to track progress of the assigned project.

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 IT

Semester/Year		**III/II**	**Program**		**B.Tech – Artificial Intelligence and Data Science**
Subject Category	**DL**	**Subject Code:**	**AI 406**	**Subject Name**	**Advance JAVA Programming**

Maximum Marks Allotted								**Contact Hours**			**Total Credits**
Theory				**Practical**			**Total Marks**				
ES	**MS**	**Assignment**	**Quiz**	**ES**	**LW**	**Quiz**		**L**	**T**	**P**	
--	--	--	--	**60**	**20**	**20**	**100**	**0**	**0**	**4**	**2**

Prerequisites:

Concepts of OOPS and Core JAVA.

Course Objective:

- To introduce and understand students to programming concepts and techniques using the Java language and programming environment, class, objects , also learn about lifetime, scope and the initialization mechanism of variables and improve the general problem solving abilities in programming. Be able to use the Java SDK environment to create, debug and run simple Java program

UNITs	**Descriptions**	**Hrs.**
I	Basic Java Features - C++ Vs JAVA, JAVA virtual machine, Exception Handling, File and Streams, Visibility, Constructors, Operator and Methods Overloading, Static Members, Inheritance: Polymorphism, Abstract methods and Classes.	7
II	Java Collective Frame Work - Generics: Introduction, Overloading Generic Methods, Generic Classes, Collections: Interface Collection and Class Collections, Lists, Array List and Iterator, Linked List, Vector. Collections Algorithms: sort, shuffle, reverse, fill, copy, max and min ,binary Search, Stack Class of Package java. Util, Class Priority Queue and Interface Queue, Maps, Properties Class, Unmodifiable Collections.	8
III	Advance Java Features - Multithreading: Multithreading with GUI, Monitors and Monitor Locks. Networking: Manipulating URLs, Reading a file on a Web Server, Socket programming, Security and the Network, RMI, Networking, Accessing Databases with JDBC.	7
IV	Advance Java Technologies - Servlet: Overview and Architecture, Handling HTTP & HTTPS, get Requests, JDBC, Using JDBC from a Servlet, Java Server Pages (JSP): First JSP Example, JSP elements, JSP tag library, Session tracking, , Java Cryptographic Architecture (JCA).	7
V	Advance Web/Internet Programming (Overview): Struts- Basics of MVC, architecture, action class, interceptors, tag library, validations, Hibernate-basics, architecture, CRUD, Spring- framework introduction.	7
Total Hours		36

Course Outcomes:

CO1: Use the syntax and semantics of java programming language and basic concepts of

OOP.

CO2: Write basic Java applications and use arrays.

CO3: Develop reusable programs using the concepts of RMI and JDBC.

CO4: Apply the concepts of Servlet and JSP using advanced tools.

CO5: Design event driven GUI and web related applications which mimic the real word scenarios.

Text Book & Reference Books-

1. E. Balaguruswamy, "Programming In Java"; TMH Publications
2. The Complete Reference: Herbert Schildt, TMH
3. Deitel & Deitel," JAVA, How to Program"; PHI, Pearson
4. Cay Horstmann, Big JAVA, Wiley India
5. Merlin Hughes, et al; Java Network Programming , Manning Publications/Prentice Hall
6.

List/Links of e-learning resource

Modes of Evaluation and Rubric

The evaluation modes consist of performance in Internal assessment/Lab assignments, Quiz, 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	PSO 2
CO-1	2	1	2										1	1
CO-2	2	1	2										1	1
CO-3	2	1	2										1	2
CO-4	2	2	2										1	2
CO-5	2	2	2										1	2

Suggestive list of experiments:

1. Installation of JDK.
2. Write a program to show Scope of Variables
3. Write a program to show Concept of CLASS in JAVA
4. Write a program to show Type Casting in JAVA
5. Write a program to show How Exception Handling is in JAVA
6. Write a Program to show Inheritance
7. Write a program to show Polymorphism
8. Write a program to show Access Specifiers (Public, Private, Protected) in JAVA
9. Write a program to show use and Advantages of CONSTRUCTOR

10. Write a program to show Interfacing between two classes
11. Write a program to Add a Class to a Package
12. Write a program to show Life Cycle of a Thread
13. Write a program to demonstrate AWT.
14. Write a program to Hide a Class
15. Write a Program to show Data Base Connectivity Using JAVA
16. Write a Program to show “HELLO JAVA ” in Explorer using Applet
17. Write a Program to show Connectivity using JDBC
18. Write a program to demonstrate multithreading using Java.
19. Write a program to demonstrate applet life cycle.
20. Write a program to demonstrate concept of servlet.

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

Open Courses launched by respective Programmes are not applicable for students of parental programme.

Open Course Offered by AIADS Session: 2023-24 Semester IV			
Open Elective-II (OE-405)	**A**	**B**	**C**
	Foundation of Data Science	Computer Graphics	Foundation of Blockchain Technology
Prerequisite	Mathematics	Mathematics and Programming Skills	Mathematics
Remark	Open to all	Open to all	Not applicable for - BC

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

Semester/Year		IV/II		Program		B.Tech – Artificial Intelligence and Data Science				
Subject Category	OE	Subject Code:		OE-405 (A)	Subject Name: OE-II	Foundation of Data Science				

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

Prerequisites:

Mathematics

Course Objective:

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

UNITs	Descriptions	Hrs.
I	Data Science-What is Data Science, Need for Data Science, Difference between Data Science & Business Intelligence, Data Science Components, Tools for Data Science, Data Science Life cycle, Applications of Data Science, Data Science Ethics. Representation of Data- Types of data, primary, secondary, quantitative and qualitative data. Types of Measurements, nominal, ordinal, discrete and continuous data.	7
II	Presentation of data by tables, construction of frequency distributions for discrete and continuous data. Graphical representation of a frequency distribution by histogram and frequency polygon, cumulative frequency distributions. Data Pre-processing- Knowing Data, Data Cleaning, Data Integration, Data Selection, Data Transformation	7
III	Descriptive Statistics-Arithmetic mean, Median, Mode, Geometric mean, Harmonic mean. Partition values: Quartiles, Deciles and percentiles. Measures of dispersion: Mean deviation, Quartile deviation, Standard deviation, Coefficient of variation. Moments: measures of skewness, Kurtosis	7
IV	Correlation-Scatter plot, Karl Pearson coefficient of correlation, Spearman's rank correlation coefficient, multiple and partial correlations. Regression: Concept of errors, Principles of Least Square, Simple linear regression and its properties. Types of Regressions.	7
V	Basics of Big Data, Problem handling large data, general techniques for handling large data, Basic concept of Machine Learning , Training model, validating model, supervised & unsupervised learning.	7
Total Hours		35

Course Outcomes:

CO1: To explain how data is collected, managed and stored for data science.
CO2: To understand the key concepts in data science, including their real-world applications and the toolkit used by data scientists.
CO3: To implement data collection and management scripts using Mongo DB.
CO4: Examine the techniques of Data Visualization.
CO5: Identification of various applications of Data Science.

Text Books

1. “Introducing Data Science” by Davy Cielen, Arno D. B. Meysman, Mohamed Ali, 1st Edition, Manning Publications Co.
2. “An Introduction to Probability and Statistics” by Rohatgi V.K and Saleh E, 3rd Edition, John Wiley & Sons Inc., New Jersey,
3. “Data Mining Concept & Techniques” by Han & Kember,3rd Edition, The Morgan Kaufmann,

Reference Books

1. Joel Grus, Data Science from Scratch, Shroff Publisher/O’Reilly Publisher Media
2. Annalyn Ng, Kenneth Soo, Numsense Data Science for the Layman, Shroff Publisher Publisher
3. Cathy O’Neil and Rachel Schutt. Doing Data Science, Straight Talk from The Frontline. O’Reilly Publisher.

List/Links of e-learning resource

- https://nptel.ac.in/courses/106106179

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}	PSO1	PSO2
CO-1	1	3		2									**1**	**2**
CO-2	2	2											**2**	**2**
CO-3	2	1	3										**1**	**2**
CO-4	1	2											3	1
CO-5	3	3		2									2	3

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

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DEPARTMENT OF IT

Semester/Year	IV/II	Program	B.Tech – Artificial Intelligence and Data Science

Subject Category	OE	Subject Code:	OE-405 (B)	Subject Name: OE-II	Computer Graphics

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

Prerequisites:

Mathematics and Programming Skills

Course Objective:

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

UNITs	Descriptions	Hrs.
I	Basic of Computer Graphics, Applications of computer graphics, Display devices, Cathode Ray Tube, quality of phosphors, CRTs for color display, beam penetration CRT, The Shadow - Mask CRT, Direct View Storage Tube, LED and LCD. Graphics input devices, Graphics software and standards.	7
II	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, Line drawing- various algorithms and their comparison, circle generation - Bresenham's midpoint circle drawing algorithm.	7
III	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.	7
IV	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	7
V	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.	7
Total Hours		35

Course Outcomes:

CO1: To understand the Graphics systems, its applications, hardware& software requirement.
CO2: To apply scan conversion algorithms of various graphics output primitives.
CO3: To understand the basic principles of homogeneous coordinate systems, 2-dimensional & 3-dimensional computer graphics systems.
CO4: To create geometrical transformation on 2-dimensional & 3-dimensional objects.
CO5: To apply window into viewport, clipping algorithms of graphics objects against a window.

Text Books

1. "Computer Graphics C Version, Donald Hearn & M. Pauline Baker , Pearson Education, New Delhi,
2. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics- Principles and practice, Second Edition in C, Pearson Education.

Reference Books

1. OpenGL ES 3.0 Programming Guide 2nd Edition (English, Paperback, Budi RijantoPurnomo, Dan Ginsburg), PEARSON.
2. Rogers, "Procedural elements of Computer Graphics", Tata McGraw Hill.
3. Parekh, "Principles if multimedia", Tata McGraw Hill

List/Links of e-learning resource

- https://archive.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_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	1	3		2									1	2

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

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

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

Semester/Year		IV/II	Program		B.Tech – Artificial Intelligence and Data Science
Subject Category	OE	Subject Code:	OE-405 (C)	Subject Name	Database Management System

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

Prerequisites:

Basic Knowledge of Mathematics and Programming

Course Objective:

- To understand the different issues involved in the design and implementation of a database system.
- To represent a database system using ER diagrams and to learn normalization techniques
- To learn the fundamentals of data models, relational algebra, and SQL.
- To understand the basic issues of transaction processing and concurrency control.
- To become familiar with database storage structures and access techniques

UNITs	Descriptions	Hrs.
I	Introduction: Purpose of Database System –– Views of data – data models, database management system, three-schema architecture of DBMS, components of DBMS. E/R Model - Conceptual data modeling - motivation, entities, entity types, attributes relationships, relationship types, E/R diagram notation, examples.	6
II	Relational Model: Relational Data Model - Concept of relations, schema-instance distinction, keys, referential integrity and foreign keys, relational algebra operators, SQL - Introduction, data definition in SQL, table, key and foreign key definitions, update behaviors. Querying in SQL, notion of aggregation, aggregation functions group by and having clauses.	8
III	Database Design: Dependencies and Normal forms, dependency theory - functional dependencies, Armstrong's axioms for FD's, closure of a set of FD's, minimal covers, definitions of 1NF, 2NF, 3NF and BCNF, decompositions and desirable properties of them, algorithms for 3NF and BCNF normalization, 4NF, and 5NF.	9
IV	Transactions: Transaction processing and Error recovery - concepts of transaction processing, ACID properties, concurrency control, locking based protocols for CC, error recovery and logging, undo, redo, undo-redo logging and recovery methods.	9
V	Implementation Techniques: Data Storage and Indexes - file organizations, primary, secondary index structures, various index structures - hash-based, dynamic hashing techniques, multi-level indexes, B+ trees.	8
Total Hours		40

Course Outcomes:

CO-1: Understand the basic concepts, principles and applications of database systems.

CO-2: Discuss the components of DBMS, data models, Relational models.

CO-3: Use knowledge to find the functional dependencies and differentiate between different normal forms.

CO-4: Execute transaction concepts and concurrency protocols

CO-5: Articulate the basic concept of storage and access techniques.

Text Book

3. Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems , Pearson Education
4. Silberschatz, Korth, "Data base System Concepts", 7th ed., McGraw hill.

Reference Books-

4. C. J. Date, "An Introduction to Database Systems", 8th ed., Pearson.
5. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems McGraw Hill.
6. Peter Rob and Carlos Coronel, Database System- Design, Implementation and Management ,Cengage Learning.

List/Links of e-learning resource

- https://nptel.ac.in/courses/106/104/106104135/
- https://nptel.ac.in/courses/106/106/106106220

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}	PSO1	PSO2
CO-1	1	1	2										1	2

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

Suggestive list of experiments:

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

DETAILS OF HOLISTIC EDUCATION COURSES

Name of Faculty Mentor	**Ms. Rashi Kumar (Asst. Prof)**
Holistic Education Course Title	**Technical Writing Skills**
Objectives of Course	1. To build up the calibre to convey complex technical information in a simpler manner. 2. To be able explain a topic in detail while being accessible to a general audience.
Content	Language support and writing tools- Grammarly-cloud based writing assistant, Turnitin - Plagiarism checking tool, Introduction to Typesetting in Latex; Writing a technical report in Latex- outline & Contents, Mathematical style- Mathematics in Science and Technology, writing manuscript in Latex- working with figures, tables, Making presentation in Latex, Beamer, Online tools- CV, Sharelatex, OverLeaf,
Contact hrs	30 hrs
Outcomes of Course	Upon completion of the course, the students will be able to: • To Identify the Common Errors in Writing technical documents. • To Achieve better technical writing and Presentation skills for employment. • To learn about Tools and Techniques for Information representation by making informative tables, figures etc.

Name of Faculty Mentor	**Ms. Sheena Kumar (Asst. Prof)**
Holistic Education Course Title	: **Yoga and Meditation**
Objectives of Course	Take care of their own physical, mental, emotional, social and spiritual health.
Content	**Introduction to Yoga and yogic practices**: Yoga: Definition, aim, objectives and misconceptions, its origin, history and development, perform warming up exercise. Loosening practices, Sukshma vyayama, Surya namaskar, shav asanas for relaxation. **Asanas:** Sarvangasna,Halasana, Kandharasana(setubandhasana) , Bhujangasana etc. **Breathing Exercises**: anuloma viloma ,nadi shodhana, brrahmri, Kapal bhati, Bhastrika. **Practicing Meditation:,** Rajyoga meditation, breathing meditation, om dhyana, mantra enchanting, introspection , SWOT analysis.
Contact hrs	30 hrs
Outcomes of Course	Upon completion of the course, the students will be able to: CO1. Understanding and knowledge of yoga and meditation. CO2: Able to perform asanas, breathing exercises, surya namaskar etc. CO3: Able to improve their focus and mindfulness.

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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	Artificial Intelligence				
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	150	3	0	2	4

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	PO1	PO_{11}	PO_{12}	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	DC	Subject Code:		AI 502	Subject Name		Data Science Analytics				
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	150	3	0	2	4

Prerequisites:

- Data Science,
- Machine Learning

Course Objective:

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

UNITs	Descriptions	Hrs.
I	**Statistical Analysis System(SAS)**: Collection of Data, Sample Measurement and Scaling Techniques, Statistical Derivatives and Measures of Central Tendency, Measures of Variation and Skewness, Correlation and Simple Regression, Time Series Analysis, Index Numbers, Probability and Probability Rules Probability Distributions, Tests of Hypothesis–I, Tests of Hypothesis – II, Chi-Square Test	8
II	**Apache Spark**: Introduction, Features, Spark built on Hadoop,Components of Spark: Apache Spark Core, Spark SQL, Spark Streaming, MLlib (Machine Learning Library), GraphX **BigML: Web Interface, Command Line Interface, API, Creating a deep learning model with BigML**	8
III	**Data-Driven Documents (D3.js)**: Introduction, Web Standards: HyperText Markup Language (HTML), Document Object Model (DOM), Cascading Style Sheets (CSS), Scalable Vector Graphics (SVG), JavaScript. **MatLab**: Matlab Environment Setup, Syntax, Variables, Commands, M-files, Datatypes and Operators.	8
IV	**Natural Language Toolkit (NLTK)**:Tokenizing Text, Training Tokenizer & Filtering Stopwords, Looking up words in Wordnet Stemming & Lemmatization, Natural Language Toolkit - Word Replacement, Synonym & Antonym Replacement. **TensorFlow**: Convolutional Neural Networks, TensorBoard Visualization, TensorFlow - Word Embedding, TensorFlow - Linear Regression	8
V	**Tableau**: Design Flow, File Types, Data Types, Data Terminology, Data source, worksheet and calculations. **Scikit-learn**: Introduction, Modelling Process, Data Representation, Estimator	8

	API, Conventions, Linear Modeling	
Total Hours		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	PO1	PO_{11}	PO_{12}	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. Test of Significance : Application of t test for single mean, t-test for independent samples, paired t test, F-test, Chi-square test

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

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

4. Install Apache Hadoop

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

6. Coding a Chart, the D3.js way

7. Lexical analysis: Word and text tokenizer;

8. Naive Bayes / Decision tree classifier with NLTK.

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

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

Recommendation by Board of studies on	
Approval by Academic council on	

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

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

Semester/Year		V/III		Program		B.Tech – Artificial Intelligence and Data Science				
Subject Category	DC	Subject Code:		AI 503	Subject Name	Fuzzy Logic				
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	150	3	0	2	4

Prerequisites:

Basic Knowledge of Electronic Devices, Electronic Circuits

Course Objective:

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

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

Course Outcomes:

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

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

CO3. design fuzzy rule-based system.

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

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

Text Book

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

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

Reference Books-

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

List/Links of e-learning resource

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

Modes of Evaluation and Rubric

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

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}	PSO-1	PSO2
CO-1	3	3	2	3	1							2	3	
CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-4		2	3	3										
CO-5		3	2	3										

Suggestive list of experiments:

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

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

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

Semester/Year	V/III	Program	B.Tech – Artificial Intelligence and Data Science

Subject Category	DE	Subject Code:	AI 504-A	Subject Name	Cloud Computing

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	0	4

Prerequisites:

- Basic Knowledge of algorithms, Discrete Mathematics Computer Networks.

Course Objective:

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

UNITs	Descriptions	Hrs.
I	Introduction Cloud, Types – NIST model, Cloud Cube model, Deployment models Service models ,Reference model, Characteristics, Benefits and advantages ,Cloud Architecture Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications, Connecting to Cloud by Clients Services and Applications, Types.	8
II	Abstraction and Virtualization (access, application, CPU, storage), Mobility patterns (P2V, V2V, V2P, P2P, D2C, C2C, C2D, D2D) ,Load Balancing, Network resources, Application Delivery Controller and Application Delivery Network, Google Cloud. Hypervisors: Virtual machine technology and types, VMware vSphere Machine Imaging Distinction between SaaS and PaaS.	8
III	Application frameworks Google Web Services ,Google Applications Portfolio – Indexed search, Dark Web, Aggregation and disintermediation, Productivity applications and service, Adwords, Google Analytics, Google Translate, Google Toolkit, features of Google App Engine service, Amazon Web Service components and services: Amazon Elastic Cloud, Amazon Simple Storage system, Amazon Elastic Block Store.	8
IV	Windows Azure platform: Microsoft's approach, architecture, and main elements, AppFabric, Content Delivery Network, SQL Azure, and Windows Live services, Types of services, Consulting, Configuration, Customization and Support Cloud Management. network management systems ,vendors, Monitoring cloud computing deployment stack , Lifecycle management cloud services .	8
V	Cloud security concerns, service boundary Security of data, Brokered cloud storage access, Storage location 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}	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	Ramratan Ahirwal & Rashi Kumar
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

Semester/Year		V/III		Program		B.Tech – Artificial Intelligence and Data Science				
Subject Category	DE	Subject Code:		AI 504 - B	Subject Name	Image Processing				
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	0	4

Prerequisites:

Basic Knowledge of algorithms, Discrete Mathematics

Course Objective:

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

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

Course Outcomes:

CO-1: Ability to apply principles and techniques of digital image processing in applications related to design and analysis of digital imaging systems.
CO-2: Ability to analyze and implement image processing algorithms to real problems.
CO-3: Gaining of hands-on experience in using software tools for processing digital images.
CO-4: Interpret image segmentation and representation techniques.
CO-5: Apply Mathematical Morphology using Polynomial approximation.

Text Book

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

Reference Books-

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

List/Links of e-learning resource

1. www.nptel.co.in

Modes of Evaluation and Rubric

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

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}	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.
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DEPARTMENT OF IT

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

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10				100	3	1	0	4

Prerequisites:

Basic Knowledge of algorithms.

Course Objective:

1. To facilitate students to understand android SDK
2. To help students to gain a basic understanding of Android application development
3. To inculcate working knowledge of Android Studio development tool

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

Course Outcomes:

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

CO-2: Apply machine learning techniques to text classification and clustering which is used for efficient Information Retrieval.

CO-3: Analyze the Web content structure.

CO-4: Design an efficient search engine.

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

Text Book

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

Reference Books-

1. Neural Networks: A Comprehensive Foundation (2nd Edition), Simon Haykin, Prentice Hall.
2. Elements of artificial neural networks by Kishan Mehrotra, Chilukuri K. Mohan and Sanjay Ranka.
3. Neural networks and fuzzy systems by Bart Kosko, Prentice Hall of India.
4. S. Fundam tats of artificial neural networks by Mohammad H. I-lassoun, Prentice Hall of India.

List/Links of e-learning resource

1.https://mrcet.com/pdf/Lab%20Manuals/MOBILE%20APPLICATION%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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}	PSO-1	PSO2
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CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-4		2	3	3										
CO-5		3	2	3										

Suggestive list of experiments:

NO LAB

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

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	Subject Code:		AI 505-A	Subject Name	Fuzzy Logic				
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10				100	3	0	0	3

Prerequisites:

Basic Knowledge of Electronic Devices, Electronic Circuits

Course Objective:

6. To develop the fundamental concepts such as fuzzy sets, operations and fuzzy relations.
7. To lean about the fuzzification of scalar variables and the defuzzification of membership functions.
8. To learn three different inference methods to design fuzzy rule based system.
9. To develop fuzzy decision making by introducing some concepts and also Bayesian decision methods
10. To learn different fuzzy classification methods.

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

Course Outcomes:

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

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

CO3. design fuzzy rule-based system.

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

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

Text Book

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

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

Reference Books-

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

List/Links of e-learning resource

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

Modes of Evaluation and Rubric

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

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}	PSO-1	PSO2
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CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-4		2	3	3										
CO-5		3	2	3										

Suggestive list of experiments:

NO LAB

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

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	OC	Subject Code:		AI 505 - B	Subject Name	Computer Graphics and Multimedia				
Maximum Marks Allotted								Contact Hours		Total Credits
Theory				Practical			Total Marks			
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P
60	20	10	10				100	3	0	0	3

Prerequisites:

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

Course Objective:

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

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

Course Outcomes:

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

CO-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_{12}	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		V/III		Program		B.Tech – Artificial Intelligence and Data Science
Subject Category	OC	Subject Code:	AI 505 - C	Subject Name		Software Engineering

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

Prerequisites:

Programming Basics

Course Objective:

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

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

Course Outcomes:

CO1. explain the various fundamental concepts of software engineering.

CO2. develop the concepts related to software design & analysis.
CO3. compare the techniques for software project management & estimation.
CO4. choose the appropriate model for a real life software project.
CO5. design the software using modern tools and technologies

Text Book

1. Software Engineering for Absolute Beginners, by Nico Loubser

Reference Books-

7. Clean Code by Uncle Bob Martin
8. Design Patterns, by Erich Gamma.

List/Links of e-learning resource

1.www.nptel.ac.in

Modes of Evaluation and Rubric

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

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}	PSO-1	PSO2
CO-1	3	3	2	3	1							2	3	
CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-4		2	3	3										
CO-5		3	2	3										

Suggestive list of experiments:

NO LAB

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

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

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

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

Prerequisites:

- Basic Knowledge of algorithms, Discrete Mathematics

Course Objective:

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

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

Course Outcomes:

CO1: Demonstrate how to install and configure RStudio

CO2: Explain critical R programming concepts

CO3: Explain the use of data structure and loop functions

CO4: Analyze data and generate reports based on the data

CO5: Apply OOP concepts in R programming

Text Book

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

Reference Books-

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

Experiment List:

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

Modes of Evaluation and Rubric

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

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}	PSO-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
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DEPARTMENT OF IT

Semester/Year		VI/III		Program			B.Tech – Artificial Intelligence and Data Science				
Subject Category	DC	Subject Code:		AI 601	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	150	3	0	2	4

Prerequisites:

- Basic Knowledge of algorithms, Discrete Mathematics

Course Objective:

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:

CO-1: Gain knowledge about basic concepts of Machine Learning.
CO-2: Identify machine learning techniques suitable for a given problem
CO-3: Solve the problems using various machine learning techniques
CO-4: Apply Dimensionality reduction techniques.
CO-5: Design application using machine learning techniques

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

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CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}	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
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DEPARTMENT OF IT

Semester/Year		VI/III		Program			B.Tech – Artificial Intelligence and Data Science				
Subject Category	DC	Subject Code:		AI 602	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	150	3	0	2	4

Prerequisites:

- Basic Knowledge of algorithms, Discrete Mathematics

Course Objective:

1. To provide students with knowledge, advanced skills and understanding of Data Warehousing.
2. Its components, design principles and modelling.
3. Provide students with in-depth concepts in knowledge discovery.
4. 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. 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	PO1	PO_{11}	PO_{12}	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
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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 (A)	Subject Name	Optimization Technique				
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10				100	3	0	-	3

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	PO1	PO_{11}	PO_{12}	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			
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10				100	3	0	0	3

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.

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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
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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(C)	Subject Name	Computer Vision

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

Prerequisites:

- Basic Knowledge of algorithms, 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	PO1	PO_{11}	PO_{12}	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
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(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	Descriptions	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	PO1	PO_{11}	PO_{12}	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				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	-	-	-	100	3	1	0	4

Prerequisites:

NA

Course Objective:

- To make students know the IoT ecosystem.
- To provide an understanding of the technologies and the standards relating to theInternet 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 Madisetti, "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", 1 st 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	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	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.
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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(C)	Subject Name		Robotics and process automation

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:

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

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CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}	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
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DEPARTMENT OF IT

Semester/Year		V/III		Program		B.Tech – Artificial Intelligence and Data Science
Subject Category	OC-4	Subject Code:	AI 605-A	Subject Name		Cloud Computing

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

Prerequisites:

- Basic Knowledge of algorithms, Discrete Mathematics Computer Networks.

Course Objective:

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

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

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CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}	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	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		V/III		Program		B.Tech – Artificial Intelligence and Data Science				
Subject Category	OC-4	Subject Code:		AI 605(B)	Subject Name	Data Science Analytics				
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10				100	3	0	0	3

Prerequisites:

- 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 thetoolkit 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/

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

Suggestive list of experiments:

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-4	Subject Code:	AI 605(C)	Subject Name		Artificial Intelligence

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

Prerequisites:

- Basic Knowledge of algorithms, 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.

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

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

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

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
	----	----	-----	30	10	10	50	------	-------	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	Descriptions	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 acrossarray 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, Creatingdata 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 preprocessingCO2: 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

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	PO1	PO_{11}	PO_{12}	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 to July 2022 admitted

Name of the course:	B. Tech in **Artificial Intelligence and Data Science**
Semester and Year of study	B. Tech 4th Year 7thSemester
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**				
End Sem	Mid-Sem	Quiz	Assign	End Sem	Lab-Work	Quiz		L	T	P	
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 architechures - BPTT for training RNN, Long Short Term Memory Networks.		
V	**Auto Encoders:** Under complete Autoencoders – Regulraized Autoencoders – stochastic Encoders and Decoders – Contractive Encoders **Deep Generative Models:** Deep Belief networks – Boltzmann Machines – Deep Boltzmann Machine - Generative Adversial Networks. RecentTrends	9	5
Guest Lectures (if any)			
Total Hours		40	

Suggestive list of experiments:

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

Total Laboratory Hours 30 hours

Text Book-

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-

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 Zaccone, Md. Rezaul Karim, Ahmed Menshawy "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_1	PO_{11}	PO_{12}	PSO1	PSO2
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.

(An Autonomous Institute Affiliated to RGPV Bhopal)

Department of Information Technology

Syllabus applicable to July 2022 admitted

Name of the course:	B. Tech in **Artificial Intelligence and Data Science**
Semester and Year of study	B. Tech 4rd Year 7thSemester
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**				
End Sem	Mid-Sem	Quiz	Assign	End Sem	Lab-Work		L	T	P	
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_1	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 to July 2022 admitted onwards

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

Maximum Marks Allotted							Contact Hours			Total Credits
Theory				Practical		**Total Marks**				
End Sem	Mid-Sem	Quiz	Assign	End Sem	Lab-Work		L	T	P	
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 ToolkitSteven 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	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	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 to July 2022 admitted

Semester/Year		7th /4-year		Program		B.Tech. AIADS					
Subject Category	DE-4	Subject Code:		AI-702(C)	Subject Name:	Business Intelligence					
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Assignment/Quiz		End Sem	Lab-Work	Quiz		L	T	P	
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-

- 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-

- 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_1**	**PO_{11}**	**PO_{12}**	**PSO1**	**PSO2**
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 to July 2022 admitted

Name of the course:	B. Tech in **Artificial Intelligence and Data Science**
Semester and Year of study	B. Tech 4th Year 7thSemester
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**				
End Sem	Mid-Sem	ASS	QUIZ	End Sem	Lab-Work		L	T	P	
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 Hodoop 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.

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_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	1	1	2										1	2
CO-2	3	2	2										1	2
CO-3	2	1	2		2								1	2
CO-4	2	1	2											2
CO-5	2	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 to July 2022 admitted onwards

Name of the course:	B. Tech in **Artificial Intelligence and Data Science**
Semester and Year of study	B. Tech 4th Year 7thSemester
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**				
End Sem	Mid-Sem	Quiz	Assi	End Sem	Lab-Work		L	T	P	
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

List and Links of e-learning resources:

1.

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_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	**1**	**1**	**2**										**1**	**2**
CO-2	**3**	**2**	**2**										**1**	**2**
CO-3	**2**	**1**	**2**		**2**								**1**	**2**
CO-4	**2**	**1**	**2**											**2**
CO-5	**2**	**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 to July 2022 admitted onwards

Name of the course:	B. Tech in **Artificial Intelligence and Data Science**
Semester and Year of study	B. Tech 4th Year 7thSemester
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**				
End Sem	Mid-Sem	Quiz	Assi	End Sem	Lab-Work		L	T	P	
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.

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}	PSO1	PSO2
CO-1	1	1	2		2							2	1	2
CO-2	3	2	2										1	2
CO-3	2	1	2		2								1	2
CO-4	2	1	2											2
CO-5	2	2	2								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 VIDISHA (M.P.)
(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV Bhopal)

Department Of Information Technology

Programme AIADS

Scheme-2023-24

Structure of Undergraduate Engineering Program					
S.No.	**Category**	**Subject Category**	**Suggested Breakup of Credits (Total 160)**	**Possible list of subjects**	**Approx. Credits (Total 160)**
1	Humanities and Social Sciences including Management courses	HSMC	12*	English, Environmental Science, Management Concepts and Principles, Organisation behaviors, Project Management, Ethics, Stress Management, Human resource Management, Financial Management, Marketing Management, Project Management, IPR.	10-12
2	Basic Science courses	BSC	25*	Applied Physics, Applied Chemistry, Engineering Mathematics (M-1, M-2, M-3)	20-22
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.	ESC	24*	Basic Electrical Engineering, Engineering Graphics & Design, Engineering materials, Manufacturing Practices, Strength of Materials / Mechanics of Materials. Introduction to Computer Science, Basic of Information Technology. Engineering Electronics, Digital Design, Programming for Problem Solving,	20-24
4	Professional core courses	PCC	48*	Specific to Departments	48-50
5	Professional Elective courses relevant to chosen specialization/branch	PEC	18*	Specific to Departments	18-20
6	Open subjects – Electives from other technical and /or emerging subjects	OEC	18*	Specific to Departments	18-20
7	Project work, seminar and internship in industry or elsewhere	PROJ	15*	Specific to Departments	15-20
8	Mandatory Courses [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge]	MC	[Non-Credit]		
Total Credits			160*		
NPTEL/SWAYAM Courses Certification			20* (Max.)		
Mandatory Induction Program for first year students (Three Weeks duration)				• Physical activity • Creative Arts • Universal Human Values • Literary • Proficiency Modules • Lectures by Eminent People • Visits to local Areas • Familiarization to Dept./Branch & Innovations	

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE VIDISHA (M.P.)

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Scheme of Examination (Semester-I)

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				
			ES	MS	Assign ment	Quiz	ES	LW	Quiz		L	T	P	
CHB101	BSC	Applied Chemistry	60	20	10	10	30	10	10	150	3	0	2	4
CSA101	ESC	Introduction to Computer Science Engineering	60	20	10	10	30	10	10	150	3	0	2	4
HUB102	HSMC	Communication and Report Writing	60	20	10	10	30	10	10	150	3	0	2	4
CSA102	ESC	Digital Electronics	60	20	10	10	–	–	–	100	3	0	0	3
MAB101	BSC	Linear Algebra and Calculus	60	20	10	10	–	–	–	100	3	1	0	4
MAC101	MAC*	Universal Human Values and Professional Ethics	–	–		–	60	20	20	100	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	15	1	6	19

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

MAC	Induction Program	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

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE VIDISHA (M.P.)
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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				
			ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
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 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

		Scheme of Examination (Semester-III)												
		for Batch Admitted in session - **2023-24**												
		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				
			ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
MAB-301	BSC	Discrete Mathematics	60	20	10	10	--	--	--	100	3	1	0	4
AI-302	DC	Artificial Intelligence	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)														

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 & SE(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 in OE-305 should not be opted as DE/DC in parent department.

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE VIDISHA (M.P.)
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		Scheme of Examination (Semester-IV)												
		for Batch Admitted in session - 2023-24												
		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**				
			ES	**MS**	**Assignment**	**Quiz**	**ES**	**LW**	**Quiz**		**L**	**T**	**P**	
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)														

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 in OE-405 should not be opted as DE/DC in parent department.

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

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE VIDISHA (M.P.)
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Scheme of Examination (Semester-V)

for Batch Admitted in session - 2023-24

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				
			ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
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	1	0	4
AI-505	OC	OC-3	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
Total			300	100	50	50	170	40	40	750	15	1	12	23
	ILC	Extracurricular Activities	It is a one credit per year activity to be endorsed in eight semester marks sheet.											

	DE -1	OC-3
A	Human Computer Interaction	Fuzzy logic
B	Image processing	Computer Graphics & multimedia
C	Information retrieval	Software Engineering

2. Subject which is being opted in OC-3 should not be opted as DE/DC in parent department.

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE VIDISHA (M.P.)
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Scheme of Examination (Semester-VI)

for Batch Admitted in session - 2023-24

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				
			ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
AI-601	DC	Machine Learning	60	20	10	10	30	10	10	150	3	0	2	4
AI-602	DC	Data Mining & Data Warehousing	60	20	10	10	30	10	10	150	3	0	2	4
AI-603	DE	DE-2	60	20	10	10				100	3	0	0	3
AI-604	DE	DE-3	60	20	10	10				100	3	1	0	4
AI-605	OC	OC-4	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
			300	**100**	**50**	**50**	**140**	**80**	**30**	**750**	**15**	**`1**	**10**	**21**
	ILC	Extracurricular Activities	It is a one credit per year activity endorse in eight semester mark sheet											
MST: Minimum two mid semester tests to be conducted during Semester														

	DE -2	DE -3	OC – 4
A	Optimization Techniques	Cryptography & Network Security	Cloud computing
B	Knowledge Representation	Introduction to IOT	Data Science Analytics
C	Computer Vision	Robotics and process automation	Image processing

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

2. Subject which is being opted in OC-4 should not be opted as DE/DC in parent department.

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE VIDISHA (M.P.)
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Scheme of Examination (Semester-VII)

		for Batch Admitted in session - 2023-24												
		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**				
			ES	**MS**	**Assignment**	**Quiz**	**ES**	**LW**	**Quiz**		**L**	**T**	**P**	
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	4	02
AI-705	ILC	Internship-III (Completed in Third Year)	--	--	--		30	10	10	50	0	0	2	02
Total			**180**	**60**	**30**	**30**	**120**	**40**	**40**	**500**	**9**	**2**	**8**	**16**
	ILC	Extracurricular Activities			It is a one credit per year activity endorse in eight semester mark sheet									
MST: Minimum two mid semester tests to be conducted during Semester														

	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

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE VIDISHA (M.P.)
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Scheme of Examination (Semester-VIII)

for Batch Admitted in session - 2023-24

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				
			ES	MS	Assignment/ Quiz	ES	LW/ Quiz		L	T	P	
AI-801	PROJ	Major Project (Phase-II)				300	200	500	0	0	12	06
AI-802	DE	SWAYAM/NPTEL MOOC's Course *				--	--	--	0	0	0	03
AI-803	DE	SWAYAM/NPTEL MOOC's Course *				--	--	--	0	0	0	03
AI-804	ILC	Extracurricular Activities		It is a one credit per year activity endorsed in eight semester mark sheet								04
Total						**300**	**200**	**500**				**16**

*List of Course suggested by department (Min. of 8 weeks)

DE-6	DE-7
A) AI: Constraint Satisfaction	A) Optimization for Machine learning, Theory & Implementation
B) Artificial Intelligence: Knowledge representation & Reasoning	B) Fuzzy sets, Logic and Systems & Applications

Note: Pool of subjects for DE-6&7 is subjected to change as floated by NPTEL/MOOC's/SWAYAM.

Tentative pool of subjects for Honours & Minor Degree

SWAYAM/NPTEL/ MOOC's Course *

Annexure-I

S. No.	Honours Degree(for students of parents department)	Remark
1.	Artificial Intelligence: Knowledge Representation And Reasoning	**8-12 weeks**
2.	AI: Constraint Satisfaction	**8-12 weeks**
3.	Data Analytics with Python	**8-12 weeks**
4.	Optimisation for Machine Learning: Theory and Implementation	**8-12 weeks**
5.	Reinforcement Learning	**8-12 weeks**
6.	Fuzzy Sets, Logic and Systems & Applications	**8-12 weeks**
7.	Computer Vision And Image Processing - Fundamentals And Applications	**8-12 weeks**
8.	Modern Computer Vision	**8-12 weeks**

Note*:-1. Those subjects which are already studied in the core scheme from I to VIII semester cannot be opted.

2. Pool of subjects for Honours & Minor degrees are subjected to change as floated by NPTEL/MOOC's/SWAYAM.

3. 20 credits additionally to be earned between V to VIII sem. Maximum 6 credits per semester from V sem. onwards will be permitted.

4. Students must have to provide certificate of courses opted by **SWAYAM/NPTEL/ MOOC's for Honours Degree.**

Tentative pool of subjects for Honours & Minor Degree

SWAYAM/NPTEL/ MOOC's Course *

Annexure-II

S. No.	Minor Degree(for students of other department)	Remark
1.	Fundamental Algorithms: Design And Analysis	**8-12 weeks**
2.	Introduction to Database Systems	**8-12 weeks**
3.	Data Science for Engineers	**8-12 weeks**
4.	Programming, Data Structures And Algorithms Using Python	**8-12 weeks**
5.	Introduction to Machine Learning	**8-12 weeks**
6.	An Introduction to Artificial Intelligence	**8-12 weeks**
7.	Probability for Computer Science	**8-12 weeks**
8.	Data Mining	**8-12 weeks**

Note*:-1. Those subjects which are already studied in the core scheme from I to VIII semester cannot be opted.

2. Note: Pool of subjects for Honours & Minor degrees are subjected to change as floated by NPTEL/MOOC's/SWAYAM.

3. 20 credits additionally to be earned between V to VIII sem. Maximum 6 credits per semester from V sem. onwards will be permitted

4. Students must have to provide certificate of courses opted by **SWAYAM/NPTEL/ MOOC's for Minor Degree.**

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

Semester/Year		**III/II**		**Program**		**B.Tech – Artificial Intelligence and Data Science**				
Subject Category	**DC**	**Subject Code:**		**AI 302**	**Subject Name**	**Artificial Intelligence**				
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**	**150**	**3**	**0**	**2**	**4**

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	PO1	PO11	PO12	PSO-1	PSO2
CO-1	3	3	2	3	1							2	3	
CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-4		2	3	3										
CO-5		3	2	3										

Suggestive list of experiments:

1. 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		**III/II**		**Program**		**B.Tech – Artificial Intelligence and Data Science**					
Subject Category	**DC**	**Subject Code:**		**AI 303**		**Subject Name**	**Object Oriented Programming**				
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**	**150**	**3**	**0**	**2**	**4**

Prerequisites:

Fundamentals of programming Skills

Course Objective:

- Enable students to understand concepts and principles of object-oriented programming methodologies using JAVA as a vehicle.
- Also learn software development and problem solving using this JAVA technology.

UNITs	**Descriptions**	**Hrs.**
I	Introduction: Procedural Paradigms of programming, Object Oriented Paradigm for programming, Procedural vs. Object Oriented Programming, Principles of OOP, Benefits and applications of OOP. OOP Concepts: Data Abstraction, Encapsulation, Inheritance and Polymorphism. Introduction of Java, Features of Java, Byte Code and Java Virtual Machine, Java Development Kit (JDK). Basics of objects and classes in Java, tokens, keywords, identifiers, variables, data types, and operators in java, Type casting, strict fp keyword.	8
II	Control Statements — If, else, nested if, if-else ladders, Switch, while, do-while, for, for-each, break, continue. Command Line Argument, Classes and Objects, Encapsulation, Tightly Encapsulated classes, Nested class, Inner class, and Anonymous inner class. Inbuilt classes: Object, String, String Buffer, Array, Vector. Wrapper classes. Data members, member Function, Data Hiding: Visibility modifiers in java.	8
III	Is-A relationship, Has-A relationship, Inheritance in Java, types of inheritance, Super and sub class, Method Signature. Overloading, Constructor Overloading, Method Overloading, this and static keyword, finalize () method, Casting objects, Instance of operator, Overriding, covariant return type. Super, final keyword, overloading vs. overriding. Static control flow, instance control flow.	8
IV	Abstraction: Abstract class, Interface in Java, differences between classes and interfaces. Defining an interface, implementing interface, applying interfaces, variables in interface, extending interfaces. Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages. Coupling, Cohesion.	8
V	Exception Handling: Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally keywords, Built-in exceptions, creating own exception sub classes. Multithreading: Concepts of Multithreading, differences between process and thread, thread life cycle, creating multiple threads using Thread class, Runnable interface. Synchronization, thread priorities, inter thread communication, daemon threads, deadlocks, thread groups. Introduction of java micro services.	8
Total Hours		40

Course Outcomes:

CO-1 Define classes, objects, members of a class and relationships among them needed for a specific program.
CO-2 Write the java application programs using OOPs principles.
CO-3 Write java application on constructors, overloading.
CO-4 Demonstrate package creating and accessing members of a packages.
CO-5 Understand and develop collection frame work and its application programs.

Text Book

1. Naughton & Schildt, "The Complete Reference Java 2", Tata McGraw Hill
2. E Balaguruswamy, "Programming in Java", TMH Publications

Reference Books-

1. Deitel "Java-How to Program:" Pearson Education, Asia
2. Horstmann & Cornell, "Core Java 2" (Vol I & II), Sun Microsystems
3. Ivan Bayross, "java 2.0", BPB publications
4. Java Programming for the absolute beginners By Russell, PHI Learning
5. Java Programming by Hari Mohan Pandey, Pearson.

List/Links of e-learning resource

- https://archive.nptel.ac.in/courses/106/105/106105153/

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}	PSO1	PSO2
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

Suggestive list of experiments:

1. Write a java program to find the Fibonacci series using recursive and non-recursive functions.
2. Write a java program to multiply two given matrices.
3. Write a java program for Method overloading and Constructor overloading.
4. Write a java program to display the employee details using Scanner class.
5. Write a java program that checks whether a given string is palindrome or not.
6. A. Write a java program to represent Abstract class with example.

B. Write a java program to implement Interface using extends keyword.

7. A. Write a java program to create inner classes.

B. Write a java program to create user defined package.

8. A. Write a java program for creating multiple catch blocks.

B. Write a java program for producer and consumer problem using Threads.

9. Write a Java program that implements a multi-thread application that has three threads.
10. A. Write a java program to display File class properties.

B. Write a java program to represent ArrayList class.

C. Write a Java program loads phone no, name from a text file using hashtable.

11. Write an applet program that displays a simple message.
12. A. Write a Java program computes factorial value using Applet.

B. Write a program for passing parameters using Applet.

13. A. Write a java program for handling Mouse events and Key events.

B. Write a java program for handling Key events.

14. Write a java program that connects to a database using JDBC.
15. A. Write a java program to connect to a database using JDBC and insert values into it.

B. Write a java program to connect to a database using JDBC and delete values from it.

16. Write a java program that works as a simple calculator. Use a Grid Layout to arrange Buttons for digits and for the + - * %operations. Add a text field to display the result

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
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		**III/II**		**Program**			**B.Tech – Artificial Intelligence and Data Science**				
Subject Category	**DC**	**Subject Code:**		**AI-304**		**Subject Name**	**Operating System**				
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**	**150**	**3**	**0**	**2**	**4**

Prerequisites:

Computer Fundamentals

Course Objective:

To understand operating system architecture and functioning along with in-depth knowledge of internals and working of OS modules like process management, Storage management, file system, security and
Protection

UNITs	**Descriptions**	**Hrs.**
I	Overview-Introduction to Operating Systems, Evolution of Operating System mainframe, desktop, multiprocessor, Distributed, Network Operating System, and Clustered and Handheld System), Operating System Structure- Operating System Services and System Calls, System Programs. Types of Operating Systems: Batch Processing, Real-Time, Multitasking, and Multiprogramming, time-sharing system and Distributed Operating Systems, Objectives and functions of OS.	8
II	Process Management-Concept, Process Control Blocks (PCB), Process Scheduling. Scheduling Criteria, Scheduling Algorithms, and their Evaluation. Threads Overview and Multithreading .	8
III	Inter Processes Communication and Critical Section Problem and Solution-Semaphores and Monitors, Deadlock Characterization, Methods for Deadlock handling, deadlock prevention, deadlock avoidance, deadlock detection and Recovery from Deadlock	8
IV	Storage Management-Memory Hierarchy, Concepts of memory management, MFT and MVT, logical and physical address space, swapping, contiguous and non-contiguous allocation, Paging and Segmentation Structure and Implementation of Page table, Virtual memory, Cache Memory Organization, Demand paging, Page replacement Algorithms. Thrashing, Demand segmentation.	8
V	File and Disk Management-File concepts, Access methods, Directory Structure, File Sharing and Protection, Free space management, Disk Scheduling, Efficiency, and Performance- A case study on Unix, Linux, and Windows.	8
Total Hours		40

Course Outcomes:

CO1:Explain the inherent mechanism involved in the functioning of an operating system. Differentiate and justify the need for various operating systems.

CO2:Analyse various scheduling techniques with their comparisons.

CO3:Analyse various synchronization techniques with their comparisons to derive the solution for the deadlock situation.

CO4: Describe the memory management system of an operating system. Analyse and compare various management schemes.

CO5: Describe and Analyze File and Disk Management Techniques.

Text Book

1. Peterson, J.L. & Silberschatz, A.: Operating System Concepts, Addison, Wesley-Reading.
2. Brinch, Hansen: Operating System Principles, Prentice Hall of India.

Reference Books-

1. Haberman, A.N.: Introduction to Operating System Design Galgotia Publication, New Delhi.
2. Tanenbaum, A.S.: Operating Systems.
3. Hansen, P.B.: Architecture of Concurrent Programs, PHI.
4. Shaw, A.C.: Logic Design of Operating Systems, PHI.

List/Links of e-learning resource

- https://archive.nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs10/

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}	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

Suggestive list of experiments:

1. Implementation of Basic Linux Commands.
2. Implementation of Process Related System Calls (Fork).
3. Write a program to simulate the following non-preemptive CPU scheduling algorithms to find turnaround time and waiting time. a) FCFS b) SJF
4. Write a program to simulate the following CPU scheduling algorithms to find turnaround time and waiting time. a) Round Robin b) Priority
5. Write a C program to simulate page replacement algorithms) FIFO b) LRU c) OPTIMAL
6. Write a program to simulate Bankers algorithm for the purpose of deadlock avoidance.
7. Write a program to simulate disk scheduling algorithms a) FCFS b) SCAN c) C-SCAN

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of CS & IT

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

Semester/Year		**III/II**	**Program**		**B.Tech – Artificial Intelligence and Data Science**
Subject Category	**DL**	**Subject Code:**	**AI- 306**	**Subject Name**	**Internet Programming**

Maximum Marks Allotted								**Contact Hours**			**Total Credits**
Theory				**Practical**			**Total Marks**				
ES	**MS**	**Assignment**	**Quiz**	**ES**	**LW**	**Quiz**		**L**	**T**	**P**	
				30	**10**	**10**	**50**	**0**	**0**	**4**	**2**

Prerequisites:

Basic knowledge of computers, its components and programming skills

Course Objective:

Understand Static and Dynamic Web Pages.

UNITs	**Descriptions**	**Hrs.**
I	WEBSITE BASICS, Web Essentials: Clients, Servers and Communication, The Internet, Basic Internet protocols, World wide web.	7
II	HTTP Request Message, HTTP Response Message, Web Clients,Web Servers, HTML5, Tables, Lists, Image, HTML5 control elements, Semantic elements, Drag and Drop, Audio , Video control	8
III	CSS3, Inline, embedded and external style sheets, Rule cascading, Inheritance, Backgrounds, Border Images, Colors Shadows, Text, Transformations, Transitions, Animations.	7
IV	Java Script: An introduction to JavaScript, JavaScript DOM Model-Date and Objects, function, Regular Expressions.	7
V	Exception Handling-Validation-Built-in objects-Event Handling- DHTML with JavaScript. XML- Elements, attributes, parser, DOM, query.	7
Total Labs (practical's min)		36

Course Outcomes:

CO1: To understand and interpret the basic concepts of the Internet, tools.

CO2: To understand, analyse CSS components and apply them web page design tools like HTML, CSS.

CO3: To know and analyse client side scripting language concepts.

CO4: Design and Develop Internet applications with the help of Java script.

CO5: Understand the concept of exceptional handling

Text Book

1. Achyut Godbole, Atul Kahate & quot ; Web Technologies: TCP/IP, Web/Java Programming, and Cloud

Computing", Third Edition, McGraw Hill Education.

2. Deitel, Deitel, Goldberg, & quot; Internet & World Wide Web How to Program & quot;, Third Edition, Pearson Education.

Reference Books-

1. Raj Kamal, "Internet and Web Technologies", Tata McGraw-Hill.

List/Links of e-learning resource

- https://archive.nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs10/

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}	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

Suggestive list of experiments:

1. Design a web page to display your CV.
2. Design a web page using HTML tags to take the input in a form and display it in another page/frame.
3. Design a web page to isolate a part of the text that might be formatted in a different direction from other text outside it
4. Create a Zebra Striping a Table and make an image rounded with CSS3.
5. Create speech bubble shape and Image cross effect with CSS3 transition.
6. Using HTML, CSS create a styled checkbox with animation on state change.
7. Using HTML, CSS create display an image overlay effect on hover.
8. Using HTML, CSS create a list with floating headings for each section.
9. Using HTML, CSS, JavaScript create a typewriter effect animation.
10. Using HTML, CSS create an animated underline effect when the user hovers over the text.
11. Write a JavaScript program to set paragraph background color.
12. Write a JavaScript function to add rows to a table.
13. Write a JavaScript function that accepts a row, column (to identify a particular cell) and a string to update the cell's content.
14. Write a JavaScript program to highlight the bold words of the following paragraph, on mouse over a certain link.
15. Write a JavaScript program to get the window width and height (any time the window is resized).

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of CS & IT

Open Courses launched by respective Programmes are not applicable for students of parental programme.

Open Course Offered by AIADS Session: 2023-24 Semester III			
Open Elective-I OE-I	**OE-305 (A)**	**OE-305 (B)**	**OE-305 (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

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

Semester/Year		**III/II**		**Program**		**B.Tech – Artificial Intelligence and Data Science**
Subject Category	**OE**	**Subject Code:**	**OE-305-A**	**Subject Name**		**Computer System Organization**

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

Prerequisites:

Fundamental knowledge of digital electronics.

Course Objective:

- Understand the organization and architecture of computer systems and electronic computers.
- Study the assembly language program execution, instruction format, and instruction cycle.
- Design a simple computer using hardwired and microprogrammed control methods.
- Study the basic components of computer systems besides computer arithmetic.
- Understand input-output organization, memory organization and management, and pipelining

UNITs	**Descriptions**	**Hrs.**
I	Introduction: Function and structure of a computer, Functional components of a computer, Interconnection of components, Performance of a computer, Register Transfer language : Register Transfer, Bus and Memory Transfers, Three-Stare Bus Buffers, Memory Transfer, Arithmetic Microoperations Binary Adder, Binary Adder-Subtractor, Binary incrementor, Arithmetic Circuit, Logic Microoperations, Shift Microoperations, Arithmetic Logic Shift Unit, List of Logic Microoperations, , Shift Micro operations, Arithmetic Logic Shift Unit	7
II	Control unit: Control memory, address sequencing, micro program example, Microinstruction Format, Symbolic Microinstructions, The Fetch Routine, Symbolic Micro program and design of the control unit, Microprogram Sequencer.	7
III	CPU design: Instruction cycle, data representation, memory reference instructions, input-output, and interrupt, addressing modes, data transfer and manipulation, program control. Computer arithmetic: Addition and subtraction, floating point arithmetic operations, decimal arithmetic unit.	7
IV	Memory organization: Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory; Input or output organization: Input or output Interface, asynchronous data transfer, modes of transfer, priority interrupt, direct memory access	7
V	Pipeline: Parallel processing, pipelining-arithmetic pipeline, instruction pipeline; Multiprocessors: Characteristics of multiprocessors, interconnection structures, inter-processor arbitration, inter-processor communication and synchronization.	7
Total Hours		35

Course Outcomes:

CO1: Understand the organization and levels of design in computer architecture.
CO2: Describe Register transfer languages, arithmetic micro-operations, logic micro-operations, shift micro-operations address sequencing, micro program example, and design of control unit
CO3: Understand the Instruction cycle, data representation, memory reference instructions, input-output, and interrupt, addressing modes, data transfer, and manipulation, program control. Addition and subtraction, floating point arithmetic operations, decimal arithmetic unit.

CO4: Knowledge about Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory Input or output Interface, asynchronous data transfer, modes of transfer, Priority interrupt, and direct memory access.

CO5: Explore the Parallel processing, pipelining-arithmetic pipeline, instruction pipeline Characteristics of multiprocessors, interconnection structures, inter-processor arbitration, inter-processor Communication, and synchronization.

Text Book

- M. Morris Mano, "Computer Systems Architecture", Pearson, 3rdEdition,2007.

Reference Books-

- John D. Carpinelli, "Computer Systems Organization and Architecture", Pearson, 1stEdition,2001.
- Patterson, Hennessy,"Computer Organization and Design: TheHardware/Software Interface", Morgan Kaufmann, 5 thEdition,2013

List/Links of e-learning resource

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}	PSO1	PSO2
CO-1	1	1	2										1	2
CO-2	2	2	2										1	2
CO-3	2	1	2										1	2
CO-4	2	1	2											2
CO-5	2	2	1										1	2

Suggestive list of experiments:

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
Subject handled by department	Department of IT

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

Semester/Year		**III/II**		**Program**		**B.Tech – Artificial Intelligence and Data Science**
Subject Category	**OE**	**Subject Code:**		**OE-305 B**	**Subject Name**	**Operating System**

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

Prerequisites:

Computer Fundamentals

Course Objective:

To understand operating system architecture and functioning along with in-depth knowledge of internals and working of OS modules like process management, Storage management, file system, security and Protection

UNITs	**Descriptions**	**Hrs.**
I	Overview-Introduction to Operating Systems, Evolution of Operating System mainframe, desktop, multiprocessor, Distributed, Network Operating System, and Clustered and Handheld System), Operating System Structure- Operating System Services and System Calls, System Programs. Types of Operating Systems: Batch Processing, Real-Time, Multitasking, and Multiprogramming, time-sharing system and Distributed Operating Systems, Objectives and functions of OS	7
II	Process Management-Concept, Process Control Blocks (PCB), Process Scheduling. Scheduling Criteria, Scheduling Algorithms, and their Evaluation. Threads Overview and Multithreading .	7
III	Inter Processes Communication and Critical Section Problem and Solution-Semaphores and Monitors, Deadlock Characterization, Methods for Deadlock handling, deadlock prevention, deadlock avoidance, deadlock detection and Recovery from Deadlock	7
IV	Storage Management-Memory Hierarchy, Concepts of memory management, MFT and MVT, logical and physical address space, swapping, contiguous and non-contiguous allocation, Paging and Segmentation Structure and Implementation of Page table, Virtual memory, Cache Memory Organization, Demand paging, Page replacement Algorithms. Thrashing, Demand segmentation.	7
V	File and Disk Management-File concepts, Access methods, Directory Structure, File Sharing and Protection, Free space management, Disk Scheduling, Efficiency, and Performance- A case study on Unix, Linux, and Windows.	7
Total Hours		35

Course Outcomes:

CO1:Explain the inherent mechanism involved in the functioning of an operating system. Differentiate and justify the need for various operating systems.

CO2:Analyse various scheduling techniques with their comparisons.

CO3:Analyse various synchronization techniques with their comparisons to derive the solution for the deadlock situation.

CO4: Describe the memory management system of an operating system. Analyse and compare various management schemes.

CO5: Describe and Analyze File and Disk Management Techniques.

Text Book

3. Peterson, J.L. & Silberschatz, A.: Operating System Concepts, Addison, Wesley-Reading.
4. Brinch, Hansen: Operating System Principles, Prentice Hall of India.

Reference Books-

5. Haberman, A.N.: Introduction to Operating System Design Galgotia Publication, New Delhi.
6. Tanenbaum, A.S.: Operating Systems.
7. Hansen, P.B.: Architecture of Concurrent Programs, PHI.
8. Shaw, A.C.: Logic Design of Operating Systems, PHI.

List/Links of e-learning resource

- https://archive.nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs10/

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}	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

Suggestive list of experiments:

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
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		**III/II**		**Program**		**B.Tech – Artificial Intelligence and Data Science**
Subject Category	**OE**	**Subject Code:**		**OE-305 C**	**Subject Name**	**Data Structure**

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

Prerequisites:

Logical thinking and Computer Fundamentals

Course Objective:

- Introduce the fundamentals of data structures
- Utilization of the concepts are useful in problem solving.

UNITs	**Descriptions**	**Hrs.**
I	Problem solving concepts: top-down, bottom-up design, Concept of data type, variable, constant and pointers. Dynamic memory allocation. Algorithm: Definition and complexity Analysis. Introduction to data structure: Linear, Nonlinear, Primitive and Non primitive. Arrays-Concepts of Arrays, Single dimensional array, two-dimensional array-Representation and Address Calculation, Operations on arrays with algorithms (traversing, searching, inserting, deleting).	7
II	List-Singly linked lists: Representation in memory, Operations on singly linked list with algorithms (traversing, searching, insertion, deletion) Doubly linked list-Operations with algorithms and analysis. Circular linked lists- Operations with algorithms. Representation & manipulations of polynomials / sets using linked lists.	7
III	Stack- Introduction to Stack and its operations, Implementation of stack using array and linked list with comparison. Application of stacks (Polish Notations, converting infix to postfix notation, evaluating postfix notation, Parenthesis balancing, Recursion).Queue- Introduction to Queue and its operations. Implementation of queue using array and linked list. De- queue, circular queue, priority queue. Applications of queue.	7
IV	Tree-Definition and terminology, concept of binary tree and representation, Traversing binary tree (pre order, post order, in order) Operation with algorithm -insertion and deletion. Binary Search Trees and its Applications. Graph- Definition and terminology, Types of graphs, Representation of graph. Traversing of graph-Breadth First Traversing and Depth First Traversing.	7
V	Searching- Search methods- Linear search, Binary search and Hashing (collision, chaining and probing) with their algorithms. Sorting- Sorting Methods-Bubble sort, Selection sort, Insertion sort, Quick sort, Merge sort.	7
Total Hours		35

Course Outcomes:

CO-1 Understand-Problem solving using of data structure and various searching and sorting methods.
CO-2 Apply-Apply different concepts of data structures to solve different computing problems.
CO-3 Analyze-Analyze the access pattern of various data structure and understand their applicability.
CO-4 Evaluate-Evaluate and Compare the performance of different data structures on real world problems.
CO-5 Discuss-Graph and Tree structure with their operations and applicability

Text Book

- Data Structure-Horwitz and Sartaj Sahni

Reference Books-

- Data Structure-Schaum's Series-Mc Graw Hill Publication
- Data Structure through C, Yashwant Kanekar, BPB Publication.

List/Links of e-learning resource

- https://archive.nptel.ac.in/courses/106/106/106106127/

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}	PSO1	PSO2
CO-1	2	2	1										1	2
CO-2	2	2	2	1									1	2
CO-3	2	2	2	1									1	2
CO-4	2	2	2	1									1	2
CO-5	2	2	1										1	2

Recommendation by Board of studies on	
Approval by Academic council on	
Compiled and designed by	
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 – Artificial Intelligence and Data Science**
Subject Category	**DC**	**Subject Code:**	**AI 401**	**Subject Name**	**Computer Network**

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**	**150**	**3**	**0**	**2**	**4**

Prerequisites:

Student having fundamental knowledge of analog and digital communication.

Course Objective:

- Have fundamental knowledge of the various aspects of computer networking and enables students to appreciate recent developments in the area.
- Be familiar with various types of computer networks.
- Understand the concepts of Network Layer ,Transport Layer, Application Layer

UNITs	**Descriptions**	**Hrs.**
I	Computer Network: Definitions, goals, components, structure, Architecture, Classifications & types, Growth, Complexity and applications etc. Layered Architecture: Protocol hierarchy, Connection Oriented & Connectionless Services, Service primitive Design issues & its functionality. ISO-OSI Reference Model: Principle, Model, Descriptions of various layers and its comparison with TCP/IP. Network standardization	8
II	Transmission Media, Sources of transmission impairment. Network Topology: Mesh, Bus, Star, Ring, Tree, etc. Standards Connecting Devices: Active and Passive Hubs, Repeaters, Bridges, Two- & Three-layer switches & Gateway.	8
III	Data Link Layer: Need, Services Provided, Framing & its methods, Flow Control, Error control. DLL Protocol: Elementary & Sliding Window. Piggybacking & Pipelining. MAC Sub layer: Static & Dynamic channel allocation, Media access control for LAN & WAN. Collision free & limited contention protocol ALOHA : pure, slotted CSMA, CSMA/CD,CSMA/CA, IEEE 802 standards for LAN & MAN & their comparison.	8
IV	Network Layer: Need, Services Provided, Design issues, Routing algorithms: Least Cost Routing algorithm, Dijkstra's algorithm, Bellman-ford algorithm, Hierarchical Routing, Broadcast Routing, Multicast Routing, Routing Strategies, Congestion Control Algorithms: General Principles of Congestion control, Prevention Policies, Congestion Control in Virtual-Circuit Subnets, Congestion Control in Datagram subnets. Comparison of IPv4 & IPv6, Mobile IP.	8
V	Processes to Processes Delivery: Transmission Control Protocol (TCP) – User Datagram Protocol, Data Traffic, Congestion Control and Quality of Service, Techniques to improve QOS, Integrated Services, and Differentiated Services, DNS,SMTP, FTP, HTTP, WWW, Virtual Terminal Protocol, VoIP: Basic IP Telephone System.	8
Total Hours		40

Course Outcomes:

CO1: Develop a fundamental understanding of network design principles and structure of computer network.
CO2: Explain the importance of data communications, how communication works in data networks and the internet, recognize the different internetworking devices and their functions.
CO3: Explain the role of protocols in networking, Analyze the role and services and features of the various layers of data networks.
CO4: Analyze the features and operations of various routing protocols such as Bellman-ford algorithm, Hierarchical Routing, Broadcast Routing, Multicast Routing.
CO5: Describe and examine working of Transport Layer and Application Layer protocol.

Text Book

1. Tanenbaum A. S, "Computer Networks", Pearson Education , 4th Edition
2. William Stallings, "Data and Computer Communications", PHI 6th Edition .

Reference Books-

1. Douglas E. Comer ,"Computer Network & Internet", Pearson Education, 6th Edition.
2. Behraj A Forouzan,"Data Communication & Networking", McGraw-Hill,4th edition.
3. Natalia Olifar & Victor Olifer,"Computer Networks", Willey Pub.
4. Prakash C. Gupta, "Data Communications and Computer Networks", PHI,2end edition.
5. Gallo,"Computer Communication & Networking Technologies", Cengage Learning.1st edition.

List/Links of e-learning resource

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}	PSO1	PSO2
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	

Suggestive list of experiments:

1. Study of different types of Network cables and practically implement the cross-wired cable and straight through cable using clamping tool.
2. Study of Network Devices in detail.
3. Demonstrate single parity bit for error detection.
4. To understand error detection and correction technique Implement hamming code.
5. To understand error detection technique, Implement CRC.
6. To understand working of framing method Implement bit stuffing with start and end flag.
7. To understand farming methods, implement character count farming method.
8. To study and understand network IP.
9. Connect the computer in local Area Network.

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		**IV/II**		**Program**		**B.Tech – Artificial Intelligence and Data Science**
Subject Category	**DC**	**Subject Code:**	**AI 402**	**Subject Name**		**Database Management System**

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**	**150**	**3**	**0**	**2**	**4**

Prerequisites:

Basic Knowledge of Mathematics and Programming

Course Objective:

- To understand the different issues involved in the design and implementation of a database system.
- To represent a database system using ER diagrams and to learn normalization techniques
- To learn the fundamentals of data models, relational algebra, and SQL.
- To understand the basic issues of transaction processing and concurrency control.
- To become familiar with database storage structures and access techniques

UNITs	**Descriptions**	**Hrs.**
I	Introduction: Purpose of Database System –- Views of data – data models, database management system, three-schema architecture of DBMS, components of DBMS. E/R Model - Conceptual data modeling - motivation, entities, entity types, attributes relationships, relationship types, E/R diagram notation, examples.	6
II	Relational Model: Relational Data Model - Concept of relations, schema-instance distinction, keys, referential integrity and foreign keys, relational algebra operators, SQL - Introduction, data definition in SQL, table, key and foreign key definitions, update behaviors. Querying in SQL, notion of aggregation, aggregation functions group by and having clauses.	8
III	Database Design: Dependencies and Normal forms, dependency theory - functional dependencies, Armstrong's axioms for FD's, closure of a set of FD's, minimal covers, definitions of 1NF, 2NF, 3NF and BCNF, decompositions and desirable properties of them, algorithms for 3NF and BCNF normalization, 4NF, and 5NF.	9
IV	Transactions: Transaction processing and Error recovery - concepts of transaction processing, ACID properties, concurrency control, locking based protocols for CC, error recovery and logging, undo, redo, undo-redo logging and recovery methods.	9
V	Implementation Techniques: Data Storage and Indexes - file organizations, primary, secondary index structures, various index structures - hash-based, dynamic hashing techniques, multi-level indexes, B+ trees.	8
Total Hours		40

Course Outcomes:

CO-1: Understand the basic concepts, principles and applications of database systems.

CO-2: Discuss the components of DBMS, data models, Relational models.

CO-3: Use knowledge to find the functional dependencies and differentiate between different normal forms.

CO-4: Execute transaction concepts and concurrency protocols

CO-5: Articulate the basic concept of storage and access techniques.

Text Book

1. Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems , Pearson Education
2. Silberschatz, Korth, “Data base System Concepts”, 7th ed., McGraw hill.

Reference Books-

1. C. J. Date, “An Introduction to Database Systems”, 8th ed., Pearson.
2. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems McGraw Hill.
3. Peter Rob and Carlos Coronel, Database System- Design, Implementation and Management ,Cengage Learning.

List/Links of e-learning resource

- https://nptel.ac.in/courses/106/104/106104135/
- https://nptel.ac.in/courses/106/106/106106220

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}	PSO1	PSO2
CO-1	1	1	2										1	2
CO-2	3	2	2										1	2
CO-3	2	1	2		2								1	2
CO-4	2	1	2											2
CO-5	2	2	2											1

Suggestive list of experiments:

1. Design a Database and create required tables. For e.g. Bank, College Database
2. Apply the constraints like Primary Key , Foreign key, NOT NULL to the tables
3. Write a sql statement for implementing ALTER,UPDATE and DELETE
4. Write the queries to implement the joins
5. Write the query for implementing the aggregate functions
6. Write the query to implement the concept of Integrity constraints
7. Write the query to create the views
8. Perform the queries with group by and having clauses
9. Perform the following operation for demonstrating the insertion , updation and deletion using the referential integrity constraints
10. Write the query for creating the users and their role

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.
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DEPARTMENT OF IT

Semester/Year		IV/II		Program		B.Tech – Artificial Intelligence and Data Science				
Subject Category	DC	Subject Code:		AI-403	Subject Name	Foundation of Data Science				
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	150	3	0	2	4

Prerequisites:

Mathematics

Course Objective:

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

UNITs	Descriptions	Hrs.
I	Data Science-What is Data Science, Need for Data Science, Difference between Data Science & Business Intelligence, Data Science Components, Tools for Data Science, Data Science Life cycle, Applications of Data Science, Data Science Ethics. Representation of Data- Types of data, primary, secondary, quantitative and qualitative data. Types of Measurements, nominal, ordinal, discrete and continuous data.	8
II	Presentation of data by tables, construction of frequency distributions for discrete and continuous data. Graphical representation of a frequency distribution by histogram and frequency polygon, cumulative frequency distributions. Data Pre-processing- Knowing Data, Data Cleaning, Data Integration, Data Selection, Data Transformation	8
III	Descriptive Statistics-Arithmetic mean, Median, Mode, Geometric mean, Harmonic mean. Partition values: Quartiles, Deciles and percentiles. Measures of dispersion: Mean deviation, Quartile deviation, Standard deviation, Coefficient of variation. Moments: measures of skewness, Kurtosis	8
IV	Correlation-Scatter plot, Karl Pearson coefficient of correlation, Spearman's rank correlation coefficient, multiple and partial correlations. Regression: Concept of errors, Principles of Least Square, Simple linear regression and its properties. Types of Regressions.	8
V	Basics of Big Data, Problem handling large data, general techniques for handling large data, Basic concept of Machine Learning, training model, validating model, supervised & unsupervised learning.	8
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 data science, including their real-world applications and the toolkit used by data scientists.
CO3: To implement data collection and management scripts using Mongo DB.
CO4: Examine the techniques of Data Visualization.
CO5: Identification of various applications of Data Science.

Text Books

1. "Introducing Data Science" by Davy Cielen, Arno D. B. Meysman, Mohamed Ali, 1st Edition, Manning Publications Co.
2. "An Introduction to Probability and Statistics" by Rohatgi V.K and Saleh E, 3rd Edition, John Wiley & Sons Inc., New Jersey,
3. "Data Mining Concept & Techniques" by Han & Kember,3rd Edition, The Morgan Kaufmann,

Reference Books

1. Joel Grus, Data Science from Scratch, Shroff Publisher/O'Reilly Publisher Media
2. Annalyn Ng, Kenneth Soo, Num sense Data Science for the Layman, Shroff Publisher Publisher
3. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk from The Frontline. O'Reilly Publisher.

List/Links of e-learning resource

- https://nptel.ac.in/courses/106106179

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}	PSO1	PSO2
CO-1	1	3		2									**1**	**2**
CO-2	2	2											**2**	**2**
CO-3	2	1	3										**1**	**2**
CO-4	1	2											3	1
CO-5	3	3		2									2	3

Suggestive list of experiments:

1. Working with various types of data
2. Experiment on measurement of data
3. Experiments on presentation of Data
4. Develop program for Frequency distributions
5. Develop program for Variability
6. Develop program for Averages
7. Develop program for Normal Curves
8. Develop program for Correlation and scatter plots
9. Develop program for Correlation coefficient
10. Develop program for Simple Linear Regression

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.
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DEPARTMENT OF IT

Semester/Year		**IV/II**		**Program**		**B.Tech – Artificial Intelligence and Data Science**
Subject Category	**DC**	**Subject Code:**	**AI 404**	**Subject Name**		**Software Engineering**

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**	**0**	**4**

Prerequisites:

Fundamental knowledge of system, analysis and design

Course Objective:

- To introduce students to the basic concepts, testing techniques and applications of Software Engineering.
- To provide a brief, hands-on overview of software development life cycle.
- Develop and write a software project proposal.
- Develop and write a Software Requirements Specification.
- To understand and apply the various phases of software development like information gathering, feasibility, Process model, analysis, design, Estimations, quality, risk, maintenance, reengineering.

UNITs	**Descriptions**	**Hrs.**
I	Introduction to Software and Software Engineering The Evolving Role of Software, Software: Software Myths, Software Engineering: A Layered Technology, Software Process Models, The Linear Sequential Model, The Prototyping Model, The RAD Model, Incremental Model, Spiral, Evolutionary Process Models, Agile Process Model, Component-Based Development, the capability maturity model integration (CMMI) , ISO 9000 Models.	8
II	Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document. Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management. System models: Context models, behavioral models, data models, object models, structured methods.	6
III	Software Project Planning, Design Methodologies and Software Metrics, Software Project Planning: Project planning objectives, Decomposition Techniques, Empirical estimation models, Software Project Estimation Models, CPM/PERT. Design concept: Design Principles, Abstractions, refinement modularity, effective modular design, Cohesion & Coupling, Design notation, and specification, structure design methodologies, & design methods. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.	9
IV	Software Testing, Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.	9
V	Software Maintenance and Software Reengineering, Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Adaptive,Corrective and Perfective Maintenance, Cost of Maintenance, Software Reengineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools, Risk management: Reactive vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM plan.	8
Total Hours		40

Course Outcomes:

CO-1: Interpret and justify different software development life cycle models.
CO-2: Understand the requirement analysis and identify state & behavior of real world software projects.
CO-3: Use various design methodologies to derive solutions for software project.
CO-4: Evaluate and quantify the quality of software though evaluation metrics.
CO-5: Identify and analyse the risk in development. CO-5: Evaluate different testing methods for software project management.

Text Book

1. Roger S. Pressman, "Soflware Engineering — A Practitioner's Approach", Seventh Edition, McGraw-Hill International Edition,2010.

2. Rajib Mall, “Fundamentals of Software Engineering”, Third Edition, PHI Learning Private Limited,2009.
3. Srinivasan Desikan and Gopalaswamy : Software Testing, Principle.

Reference Books

1. Elis Awad, "System Analysis & Design", Galgotia publications.
2. Pankaj Jalote “Software Engg” Narosa Publications.
3. Ian Sommerville: Software Engineering 6/e (Addison-Wesley).
4. Richard Fairley: Software Engineering Concepts (TMH).
5. Hans Vans Vilet, “Software Engineering Principles and Practice”, Wiley.

List/Links of e-learning resource

https://onlinecourses.nptel.ac.in/noc23_cs122/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	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	3	3	1	1								2	3	1
CO-2	3	2	3	2								3	2	
CO-3	3	2	1	3	2							2	2	2
CO-4	2	3	2	2			3						2	2
CO-5	2	2	1									3	1	2

Suggestive list of design methodology tools:

1. Develop requirements specification for a given problem (The requirements specification should include both functional and non-functional requirements). For a set of about 10 sample problems .
2. Develop DFD Model (Level 0, Level 1 DFD and data dictionary) of the sample problem.
3. Develop UML Use case model for a sample problem .
4. Develop Sequence Diagrams.
5. Develop Class diagrams.
6. Use testing tool such as junit
7. To compute cyclometic complexity for any flow graph.
8. Using configuration management tool-libra.
9. Use CPM/PERT for scheduling the assigned project.
10. Use Gantt Charts to track progress of the assigned project.

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 IT

Semester/Year		**III/II**	**Program**		**B.Tech – Artificial Intelligence and Data Science**
Subject Category	**DL**	**Subject Code:**	**AI 406**	**Subject Name**	**Advance JAVA Programming**

Maximum Marks Allotted								**Contact Hours**			**Total Credits**
Theory				**Practical**			**Total Marks**				
ES	**MS**	**Assignment**	**Quiz**	**ES**	**LW**	**Quiz**		**L**	**T**	**P**	
--	--	--	--	**60**	**20**	**20**	**100**	**0**	**0**	**4**	**2**

Prerequisites:

Concepts of OOPS and Core JAVA.

Course Objective:

- To introduce and understand students to programming concepts and techniques using the Java language and programming environment, class, objects , also learn about lifetime, scope and the initialization mechanism of variables and improve the general problem solving abilities in programming. Be able to use the Java SDK environment to create, debug and run simple Java program

UNITs	**Descriptions**	**Hrs.**
I	Basic Java Features - C++ Vs JAVA, JAVA virtual machine, Exception Handling, File and Streams, Visibility, Constructors, Operator and Methods Overloading, Static Members, Inheritance: Polymorphism, Abstract methods and Classes.	7
II	Java Collective Frame Work - Generics: Introduction, Overloading Generic Methods, Generic Classes, Collections: Interface Collection and Class Collections, Lists, Array List and Iterator, Linked List, Vector. Collections Algorithms: sort, shuffle, reverse, fill, copy, max and min ,binary Search, Stack Class of Package java. Util, Class Priority Queue and Interface Queue, Maps, Properties Class, Unmodifiable Collections.	8
III	Advance Java Features - Multithreading: Multithreading with GUI, Monitors and Monitor Locks. Networking: Manipulating URLs, Reading a file on a Web Server, Socket programming, Security and the Network, RMI, Networking, Accessing Databases with JDBC.	7
IV	Advance Java Technologies - Servlet: Overview and Architecture, Handling HTTP & HTTPS, get Requests, JDBC, Using JDBC from a Servlet, Java Server Pages (JSP): First JSP Example, JSP elements, JSP tag library, Session tracking, , Java Cryptographic Architecture (JCA).	7
V	Advance Web/Internet Programming (Overview): Struts- Basics of MVC, architecture, action class, interceptors, tag library, validations, Hibernate-basics, architecture, CRUD, Spring- framework introduction.	7
Total Hours		36

Course Outcomes:

CO1: Use the syntax and semantics of java programming language and basic concepts of

OOP.

CO2: Write basic Java applications and use arrays.

CO3: Develop reusable programs using the concepts of RMI and JDBC.

CO4: Apply the concepts of Servlet and JSP using advanced tools.

CO5: Design event driven GUI and web related applications which mimic the real word scenarios.

Text Book & Reference Books-

1. E. Balaguruswamy, "Programming In Java"; TMH Publications
2. The Complete Reference: Herbert Schildt, TMH
3. Deitel & Deitel," JAVA, How to Program"; PHI, Pearson
4. Cay Horstmann, Big JAVA, Wiley India
5. Merlin Hughes, et al; Java Network Programming , Manning Publications/Prentice Hall
6.

List/Links of e-learning resource

Modes of Evaluation and Rubric

The evaluation modes consist of performance in Internal assessment/Lab assignments, Quiz, 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	PSO 2
CO-1	2	1	2										1	1
CO-2	2	1	2										1	1
CO-3	2	1	2										1	2
CO-4	2	2	2										1	2
CO-5	2	2	2										1	2

Suggestive list of experiments:

1. Installation of JDK.
2. Write a program to show Scope of Variables
3. Write a program to show Concept of CLASS in JAVA
4. Write a program to show Type Casting in JAVA
5. Write a program to show How Exception Handling is in JAVA
6. Write a Program to show Inheritance
7. Write a program to show Polymorphism
8. Write a program to show Access Specifiers (Public, Private, Protected) in JAVA
9. Write a program to show use and Advantages of CONSTRUCTOR

10. Write a program to show Interfacing between two classes
11. Write a program to Add a Class to a Package
12. Write a program to show Life Cycle of a Thread
13. Write a program to demonstrate AWT.
14. Write a program to Hide a Class
15. Write a Program to show Data Base Connectivity Using JAVA
16. Write a Program to show “HELLO JAVA ” in Explorer using Applet
17. Write a Program to show Connectivity using JDBC
18. Write a program to demonstrate multithreading using Java.
19. Write a program to demonstrate applet life cycle.
20. Write a program to demonstrate concept of servlet.

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

Open Courses launched by respective Programmes are not applicable for students of parental programme.

Open Course Offered by AIADS Session: 2023-24 Semester IV			
Open Elective-II (OE-405)	**A**	**B**	**C**
	Foundation of Data Science	Computer Graphics	Foundation of Blockchain Technology
Prerequisite	Mathematics	Mathematics and Programming Skills	Mathematics
Remark	Open to all	Open to all	Not applicable for - BC

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

Semester/Year		IV/II		Program		B.Tech – Artificial Intelligence and Data Science				
Subject Category	OE	Subject Code:		OE-405 (A)	Subject Name: OE-II	Foundation of Data Science				

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

Prerequisites:

Mathematics

Course Objective:

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

UNITs	Descriptions	Hrs.
I	Data Science-What is Data Science, Need for Data Science, Difference between Data Science & Business Intelligence, Data Science Components, Tools for Data Science, Data Science Life cycle, Applications of Data Science, Data Science Ethics. Representation of Data- Types of data, primary, secondary, quantitative and qualitative data. Types of Measurements, nominal, ordinal, discrete and continuous data.	7
II	Presentation of data by tables, construction of frequency distributions for discrete and continuous data. Graphical representation of a frequency distribution by histogram and frequency polygon, cumulative frequency distributions. Data Pre-processing- Knowing Data, Data Cleaning, Data Integration, Data Selection, Data Transformation	7
III	Descriptive Statistics-Arithmetic mean, Median, Mode, Geometric mean, Harmonic mean. Partition values: Quartiles, Deciles and percentiles. Measures of dispersion: Mean deviation, Quartile deviation, Standard deviation, Coefficient of variation. Moments: measures of skewness, Kurtosis	7
IV	Correlation-Scatter plot, Karl Pearson coefficient of correlation, Spearman's rank correlation coefficient, multiple and partial correlations. Regression: Concept of errors, Principles of Least Square, Simple linear regression and its properties. Types of Regressions.	7
V	Basics of Big Data, Problem handling large data, general techniques for handling large data, Basic concept of Machine Learning , Training model, validating model, supervised & unsupervised learning.	7
Total Hours		35

Course Outcomes:

CO1: To explain how data is collected, managed and stored for data science.
CO2: To understand the key concepts in data science, including their real-world applications and the toolkit used by data scientists.
CO3: To implement data collection and management scripts using Mongo DB.
CO4: Examine the techniques of Data Visualization.
CO5: Identification of various applications of Data Science.

Text Books

1. “Introducing Data Science” by Davy Cielen, Arno D. B. Meysman, Mohamed Ali, 1st Edition, Manning Publications Co.
2. “An Introduction to Probability and Statistics” by Rohatgi V.K and Saleh E, 3rd Edition, John Wiley & Sons Inc., New Jersey,
3. “Data Mining Concept & Techniques” by Han & Kember,3rd Edition, The Morgan Kaufmann,

Reference Books

1. Joel Grus, Data Science from Scratch, Shroff Publisher/O’Reilly Publisher Media
2. Annalyn Ng, Kenneth Soo, Numsense Data Science for the Layman, Shroff Publisher Publisher
3. Cathy O’Neil and Rachel Schutt. Doing Data Science, Straight Talk from The Frontline. O’Reilly Publisher.

List/Links of e-learning resource

- https://nptel.ac.in/courses/106106179

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}	PSO1	PSO2
CO-1	1	3		2									**1**	**2**
CO-2	2	2											**2**	**2**
CO-3	2	1	3										**1**	**2**
CO-4	1	2											3	1
CO-5	3	3		2									2	3

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.
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DEPARTMENT OF IT

Semester/Year	IV/II	Program	B.Tech – Artificial Intelligence and Data Science

Subject Category	OE	Subject Code:	OE-405 (B)	Subject Name: OE-II	Computer Graphics

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

Prerequisites:

Mathematics and Programming Skills

Course Objective:

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

UNITs	Descriptions	Hrs.
I	Basic of Computer Graphics, Applications of computer graphics, Display devices, Cathode Ray Tube, quality of phosphors, CRTs for color display, beam penetration CRT, The Shadow - Mask CRT, Direct View Storage Tube, LED and LCD. Graphics input devices, Graphics software and standards.	7
II	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, Line drawing- various algorithms and their comparison, circle generation - Bresenham's midpoint circle drawing algorithm.	7
III	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.	7
IV	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	7
V	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.	7
Total Hours		35

Course Outcomes:

CO1: To understand the Graphics systems, its applications, hardware& software requirement.
CO2: To apply scan conversion algorithms of various graphics output primitives.
CO3: To understand the basic principles of homogeneous coordinate systems, 2-dimensional & 3-dimensional computer graphics systems.
CO4: To create geometrical transformation on 2-dimensional & 3-dimensional objects.
CO5: To apply window into viewport, clipping algorithms of graphics objects against a window.

Text Books

1. "Computer Graphics C Version, Donald Hearn & M. Pauline Baker , Pearson Education, New Delhi,
2. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics- Principles and practice, Second Edition in C, Pearson Education.

Reference Books

1. OpenGL ES 3.0 Programming Guide 2nd Edition (English, Paperback, Budi RijantoPurnomo, Dan Ginsburg), PEARSON.
2. Rogers, "Procedural elements of Computer Graphics", Tata McGraw Hill.
3. Parekh, "Principles if multimedia", Tata McGraw Hill

List/Links of e-learning resource

- https://archive.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_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	1	3		2									1	2

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

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

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

Semester/Year		IV/II	Program		B.Tech – Artificial Intelligence and Data Science
Subject Category	OE	Subject Code:	OE-405 (C)	Subject Name	Database Management System

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

Prerequisites:

Basic Knowledge of Mathematics and Programming

Course Objective:

- To understand the different issues involved in the design and implementation of a database system.
- To represent a database system using ER diagrams and to learn normalization techniques
- To learn the fundamentals of data models, relational algebra, and SQL.
- To understand the basic issues of transaction processing and concurrency control.
- To become familiar with database storage structures and access techniques

UNITs	Descriptions	Hrs.
I	Introduction: Purpose of Database System –– Views of data – data models, database management system, three-schema architecture of DBMS, components of DBMS. E/R Model - Conceptual data modeling - motivation, entities, entity types, attributes relationships, relationship types, E/R diagram notation, examples.	6
II	Relational Model: Relational Data Model - Concept of relations, schema-instance distinction, keys, referential integrity and foreign keys, relational algebra operators, SQL - Introduction, data definition in SQL, table, key and foreign key definitions, update behaviors. Querying in SQL, notion of aggregation, aggregation functions group by and having clauses.	8
III	Database Design: Dependencies and Normal forms, dependency theory - functional dependencies, Armstrong's axioms for FD's, closure of a set of FD's, minimal covers, definitions of 1NF, 2NF, 3NF and BCNF, decompositions and desirable properties of them, algorithms for 3NF and BCNF normalization, 4NF, and 5NF.	9
IV	Transactions: Transaction processing and Error recovery - concepts of transaction processing, ACID properties, concurrency control, locking based protocols for CC, error recovery and logging, undo, redo, undo-redo logging and recovery methods.	9
V	Implementation Techniques: Data Storage and Indexes - file organizations, primary, secondary index structures, various index structures - hash-based, dynamic hashing techniques, multi-level indexes, B+ trees.	8
Total Hours		40

Course Outcomes:

CO-1: Understand the basic concepts, principles and applications of database systems.

CO-2: Discuss the components of DBMS, data models, Relational models.

CO-3: Use knowledge to find the functional dependencies and differentiate between different normal forms.

CO-4: Execute transaction concepts and concurrency protocols

CO-5: Articulate the basic concept of storage and access techniques.

Text Book

3. Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems , Pearson Education
4. Silberschatz, Korth, "Data base System Concepts", 7th ed., McGraw hill.

Reference Books-

4. C. J. Date, "An Introduction to Database Systems", 8th ed., Pearson.
5. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems McGraw Hill.
6. Peter Rob and Carlos Coronel, Database System- Design, Implementation and Management ,Cengage Learning.

List/Links of e-learning resource

- https://nptel.ac.in/courses/106/104/106104135/
- https://nptel.ac.in/courses/106/106/106106220

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}	PSO1	PSO2
CO-1	1	1	2										1	2

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

Suggestive list of experiments:

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

DETAILS OF HOLISTIC EDUCATION COURSES

Name of Faculty Mentor	**Ms. Rashi Kumar (Asst. Prof)**
Holistic Education Course Title	**Technical Writing Skills**
Objectives of Course	1. To build up the calibre to convey complex technical information in a simpler manner. 2. To be able explain a topic in detail while being accessible to a general audience.
Content	Language support and writing tools- Grammarly-cloud based writing assistant, Turnitin - Plagiarism checking tool, Introduction to Typesetting in Latex; Writing a technical report in Latex- outline & Contents, Mathematical style- Mathematics in Science and Technology, writing manuscript in Latex- working with figures, tables, Making presentation in Latex, Beamer, Online tools- CV, Sharelatex, OverLeaf,
Contact hrs	30 hrs
Outcomes of Course	Upon completion of the course, the students will be able to: • To Identify the Common Errors in Writing technical documents. • To Achieve better technical writing and Presentation skills for employment. • To learn about Tools and Techniques for Information representation by making informative tables, figures etc.

Name of Faculty Mentor	**Ms. Sheena Kumar (Asst. Prof)**
Holistic Education Course Title	: **Yoga and Meditation**
Objectives of Course	Take care of their own physical, mental, emotional, social and spiritual health.
Content	**Introduction to Yoga and yogic practices**: Yoga: Definition, aim, objectives and misconceptions, its origin, history and development, perform warming up exercise. Loosening practices, Sukshma vyayama, Surya namaskar, shav asanas for relaxation. **Asanas:** Sarvangasna,Halasana, Kandharasana(setubandhasana) , Bhujangasana etc. **Breathing Exercises**: anuloma viloma ,nadi shodhana, brrahmri, Kapal bhati, Bhastrika. **Practicing Meditation:,** Rajyoga meditation, breathing meditation, om dhyana, mantra enchanting, introspection , SWOT analysis.
Contact hrs	30 hrs
Outcomes of Course	Upon completion of the course, the students will be able to: CO1. Understanding and knowledge of yoga and meditation. CO2: Able to perform asanas, breathing exercises, surya namaskar etc. CO3: Able to improve their focus and mindfulness.

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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				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:

Basic Knowledge of Electronic Devices, Electronic Circuits

Course Objective:

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

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

Course Outcomes:

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

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

CO3. design fuzzy rule-based system.

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

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

Text Book

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

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

Reference Books-

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

List/Links of e-learning resource

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

Modes of Evaluation and Rubric

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

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}	PSO-1	PSO2
CO-1	3	3	2	3	1							2	3	
CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-4		2	3	3										
CO-5		3	2	3										

Suggestive list of experiments:

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

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

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

Semester/Year		V/III		Program		B.Tech – Artificial Intelligence and Data Science				
Subject Category	DC	Subject Code:		AI 502	Subject Name	Data Science Analytics				
Maximum Marks Allotted							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	150	3	0	2	4

Prerequisites:

- Data Science,
- Machine Learning

Course Objective:

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

UNITs	Descriptions	Hrs.
I	**Statistical Analysis System(SAS)**: Collection of Data, Sample Measurement and Scaling Techniques, Statistical Derivatives and Measures of Central Tendency, Measures of Variation and Skewness, Correlation and Simple Regression, Time Series Analysis, Index Numbers, Probability and Probability Rules Probability Distributions, Tests of Hypothesis–I, Tests of Hypothesis – II, Chi-Square Test	8
II	**Apache Spark**: Introduction, Features, Spark built on Hadoop,Components of Spark: Apache Spark Core, Spark SQL, Spark Streaming, MLlib (Machine Learning Library), GraphX **BigML: Web Interface, Command Line Interface, API, Creating a deep learning model with BigML**	8
III	**Data-Driven Documents (D3.js)**: Introduction, Web Standards: HyperText Markup Language (HTML), Document Object Model (DOM), Cascading Style Sheets (CSS), Scalable Vector Graphics (SVG), JavaScript. **MatLab**: Matlab Environment Setup, Syntax, Variables, Commands, M-files, Datatypes and Operators.	8
IV	**Natural Language Toolkit (NLTK)**:Tokenizing Text, Training Tokenizer & Filtering Stopwords, Looking up words in Wordnet Stemming & Lemmatization, Natural Language Toolkit - Word Replacement, Synonym & Antonym Replacement. **TensorFlow**: Convolutional Neural Networks, TensorBoard Visualization, TensorFlow - Word Embedding, TensorFlow - Linear Regression	8
V	**Tableau**: Design Flow, File Types, Data Types, Data Terminology, Data source, worksheet and calculations. **Scikit-learn**: Introduction, Modelling Process, Data Representation, Estimator	8

	API, Conventions, Linear Modeling	
Total Hours		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	PO1	PO_{11}	PO_{12}	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. Test of Significance : Application of t test for single mean, t-test for independent samples, paired t test, F-test, Chi-square test

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

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

4. Install Apache Hadoop

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

6. Coding a Chart, the D3.js way

7. Lexical analysis: Word and text tokenizer;

8. Naive Bayes / Decision tree classifier with NLTK.

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

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

Recommendation by Board of studies on	
Approval by Academic council on	

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

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

Semester/Year		V/III		Program		B.Tech – Artificial Intelligence and Data Science				
Subject Category	DC	Subject Code:		AI 503	Subject Name	Cloud Computing				
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:

- Basic Knowledge of algorithms, Discrete Mathematics Computer Networks.

Course Objective:

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

UNITs	Descriptions	Hrs.
I	Introduction Cloud, Types – NIST model, Cloud Cube model, Deployment models Service models ,Reference model, Characteristics, Benefits and advantages ,Cloud Architecture Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications, Connecting to Cloud by Clients Services and Applications, Types.	8
II	Abstraction and Virtualization (access, application, CPU, storage), Mobility patterns (P2V, V2V, V2P, P2P, D2C, C2C, C2D, D2D) ,Load Balancing, Network resources, Application Delivery Controller and Application Delivery Network, Google Cloud. Hypervisors: Virtual machine technology and types, VMware vSphere Machine Imaging Distinction between SaaS and PaaS.	8
III	Application frameworks Google Web Services ,Google Applications Portfolio – Indexed search, Dark Web, Aggregation and disintermediation, Productivity applications and service, Adwords, Google Analytics, Google Translate, Google Toolkit, features of Google App Engine service, Amazon Web Service components and services: Amazon Elastic Cloud, Amazon Simple Storage system, Amazon Elastic Block Store.	8
IV	Windows Azure platform: Microsoft's approach, architecture, and main elements, AppFabric, Content Delivery Network, SQL Azure, and Windows Live services, Types of services, Consulting, Configuration, Customization and Support Cloud Management. network management systems ,vendors, Monitoring cloud computing deployment stack , Lifecycle management cloud services .	8
V	Cloud security concerns, service boundary Security of data, Brokered cloud storage access, Storage location 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}	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. Create Amazon Account to store images.
2. Create Google Account to store files and programs.
3. Create IBM cloud account and access storage space.
4. Create Microsoft Azure Account and working on Azure Cloud
5. Create salesforce.com Account and working onTrailhead.com

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

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

Semester/Year			Program		Program B.Tech – Artificial Intelligence and Data Science						
Subject Category		DE	Subject Code:		AI-504-A	Subject Name Human Computer Interaction					
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	0	4

Prerequisites:

- Basic Knowledge of algorithms, Discrete Mathematics

Course Objective:

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

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

Course Outcomes:

CO-1 Design effective dialog for HCI
CO-2 Design effective HCI for individuals and persons with disabilities.
CO-3 Assess the importance of user feedback.
CO-4 Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
CO-5 Develop meaningful user interface.

Text Book

Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, ―Human Computer Interaction‖, 3rd Edition, Pearson Education, 2004 (UNIT I, II & III)
2. Brian Fling, ―Mobile Design and Development‖, First Edition, O'Reilly Media Inc., 2009 (UNIT – IV)

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

Reference Books-

List/Links of e-learning resource

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

Modes of Evaluation and Rubric

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

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}	PSO-1	PS
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		V/III		Program		B.Tech – Artificial Intelligence and Data Science				
Subject Category	DE	Subject Code:		AI 504 - B	Subject Name	Image Processing				
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	0	4

Prerequisites:

Basic Knowledge of algorithms, Discrete Mathematics

Course Objective:

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

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

Course Outcomes:

CO-1: Ability to apply principles and techniques of digital image processing in applications related to design and analysis of digital imaging systems.
CO-2: Ability to analyze and implement image processing algorithms to real problems.
CO-3: Gaining of hands-on experience in using software tools for processing digital images.
CO-4: Interpret image segmentation and representation techniques.
CO-5: Apply Mathematical Morphology using Polynomial approximation.

Text Book

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

Reference Books-

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

List/Links of e-learning resource

1. www.nptel.co.in

Modes of Evaluation and Rubric

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

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}	PSO-1	PSO2
CO-1	3	3	2	3	1							2	3	
CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-4		2	3	3										
CO-5		3	2	3										

Suggestive list of experiments:

NO LAB

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

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

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

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10				100	3	1	0	4

Prerequisites:

Basic Knowledge of algorithms.

Course Objective:

1. To facilitate students to understand android SDK
2. To help students to gain a basic understanding of Android application development
3. To inculcate working knowledge of Android Studio development tool

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

Course Outcomes:

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

CO-2: Apply machine learning techniques to text classification and clustering which is used for efficient Information Retrieval.

CO-3: Analyze the Web content structure.

CO-4: Design an efficient search engine.

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

Text Book

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

Reference Books-

1. Neural Networks: A Comprehensive Foundation (2nd Edition), Simon Haykin, Prentice Hall.
2. Elements of artificial neural networks by Kishan Mehrotra, Chilukuri K. Mohan and Sanjay Ranka.
3. Neural networks and fuzzy systems by Bart Kosko, Prentice Hall of India.
4. S. Fundam tats of artificial neural networks by Mohammad H. I-lassoun, Prentice Hall of India.

List/Links of e-learning resource

1.https://mrcet.com/pdf/Lab%20Manuals/MOBILE%20APPLICATION%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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}	PSO-1	PSO2
CO-1	3	3	2	3	1							2	3	
CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-4		2	3	3										
CO-5		3	2	3										

Suggestive list of experiments:

NO LAB

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

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

Semester/Year	V/III	Program	B.Tech – Artificial Intelligence and Data Science

Subject Category	OC-3	Subject Code:	AI 505-A	Subject Name	Fuzzy Logic

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

Prerequisites:

Basic Knowledge of Electronic Devices, Electronic Circuits

Course Objective:

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

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

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

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

10. To learn different fuzzy classification methods.

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

Course Outcomes:

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

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

CO3. design fuzzy rule-based system.

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

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

Text Book

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

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

Reference Books-

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

List/Links of e-learning resource

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

Modes of Evaluation and Rubric

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

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}	PSO-1	PSO2
CO-1	3	3	2	3	1							2	3	
CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-4		2	3	3										
CO-5		3	2	3										

Suggestive list of experiments:

NO LAB

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

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DEPARTMENT OF IT

Semester/Year		V/III		Program		B.Tech – Artificial Intelligence and Data Science				
Subject Category	OC	Subject Code:		AI 505 - B	Subject Name	Computer Graphics and Multimedia				
Maximum Marks Allotted								Contact Hours		Total Credits
Theory				Practical			Total Marks			
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P
60	20	10	10				100	3	0	0	3

Prerequisites:

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

Course Objective:

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

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

Course Outcomes:

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

CO-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

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COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}	PSO-1	PSO2
CO-1	3	3	2	3	1							2	3	
CO-2		3	3	2	3									
CO-3	2	3	3	3	2									
CO-4		2	3	3										
CO-5		3	2	3										

Suggestive list of experiments:

NO LAB

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

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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DEPARTMENT OF IT

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

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

Prerequisites:

Programming Basics

Course Objective:

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

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

Course Outcomes:

CO1. explain the various fundamental concepts of software engineering.

CO2. develop the concepts related to software design & analysis.
CO3. compare the techniques for software project management & estimation.
CO4. choose the appropriate model for a real life software project.
CO5. design the software using modern tools and technologies

Text Book

1. Software Engineering for Absolute Beginners, by Nico Loubser

Reference Books-

7. Clean Code by Uncle Bob Martin
8. Design Patterns, by Erich Gamma.

List/Links of e-learning resource

1.www.nptel.ac.in

Modes of Evaluation and Rubric

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

CO-PO Mapping:

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

Suggestive list of experiments:

NO LAB

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

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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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**	Advance Data Science Lab I

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

Prerequisites:

- Basic Knowledge of algorithms, Discrete Mathematics

Course Objective:

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

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

Course Outcomes:

CO1: Demonstrate how to install and configure RStudio

CO2: Explain critical R programming concepts

CO3: Explain the use of data structure and loop functions

CO4: Analyze data and generate reports based on the data

CO5: Apply OOP concepts in R programming

Text Book

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

Reference Books-

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

Experiment List:

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

Modes of Evaluation and Rubric

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

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

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

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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Semester/Year		VI/III		Program			B.Tech – Artificial Intelligence and Data Science				
Subject Category	DC	Subject Code:		AI 601	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	150	3	0	2	4

Prerequisites:

- Basic Knowledge of algorithms, Discrete Mathematics

Course Objective:

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:

CO-1: Gain knowledge about basic concepts of Machine Learning.
CO-2: Identify machine learning techniques suitable for a given problem
CO-3: Solve the problems using various machine learning techniques
CO-4: Apply Dimensionality reduction techniques.
CO-5: Design application using machine learning techniques

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	PO1	PO_{11}	PO_{12}	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	DC	Subject Code:		AI 602	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	150	3	0	2	4

Prerequisites:

- Basic Knowledge of algorithms, Discrete Mathematics

Course Objective:

1. To provide students with knowledge, advanced skills and understanding of Data Warehousing.
2. Its components, design principles and modelling.
3. Provide students with in-depth concepts in knowledge discovery.
4. 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. 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	PO1	PO_{11}	PO_{12}	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	DE-2	Subject Code:		AI 603 (A)	Subject Name	Optimization Technique				
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10				100	3	0	-	3

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	PO1	PO_{11}	PO_{12}	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
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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			
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10				100	3	0	0	3

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	PO1	PO_{11}	PO_{12}	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.
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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(C)	Subject Name	Computer Vision

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

Prerequisites:

- Basic Knowledge of algorithms, 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

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CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}	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
Subject handled by department	Department of IT

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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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	Descriptions	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	PO1	PO_{11}	PO_{12}	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.
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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				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10	-	-	-	100	3	1	0	4

Prerequisites:

NA

Course Objective:

- To make students know the IoT ecosystem.
- To provide an understanding of the technologies and the standards relating to theInternet 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 Madisetti, "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", 1 st 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	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	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
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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(C)	Subject Name		Robotics and process automation

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:

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	PO1	PO_{11}	PO_{12}	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.
(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-4	Subject Code:	AI 605-A	Subject Name		Cloud Computing

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

Prerequisites:

- Basic Knowledge of algorithms, Discrete Mathematics Computer Networks.

Course Objective:

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

UNITs	Descriptions	Hrs.
I	Introduction Cloud, Types – NIST model, Cloud Cube model, Deployment models Service models ,Reference model, Characteristics, Benefits and advantages ,Cloud Architecture Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications, Connecting to Cloud by Clients Services and Applications, Types.	8
II	Abstraction and Virtualization (access, application, CPU, storage), Mobility patterns (P2V, V2V, V2P, P2P, D2C, C2C, C2D, D2D) ,Load Balancing, Network resources, Application Delivery Controller and Application Delivery Network, Google Cloud. Hypervisors: Virtual machine technology and types, VMware vSphere Machine Imaging Distinction between SaaS and PaaS.	8
III	Application frameworks Google Web Services ,Google Applications Portfolio – Indexed search, Dark Web, Aggregation and disintermediation, Productivity applications and service, Adwords, Google Analytics, Google Translate, Google Toolkit, features of Google App Engine service, Amazon Web Service components and services: Amazon Elastic Cloud, Amazon Simple Storage system, Amazon Elastic Block Store.	8
IV	Windows Azure platform: Microsoft's approach, architecture, and main elements, AppFabric, Content Delivery Network, SQL Azure, and Windows Live services, Types of services, Consulting, Configuration, Customization and Support Cloud Management. network management systems ,vendors, Monitoring cloud computing deployment stack , Lifecycle management cloud services .	8
V	Cloud security concerns, service boundary Security of data, Brokered cloud storage access, Storage location 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}	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	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		V/III		Program		B.Tech – Artificial Intelligence and Data Science				
Subject Category	OC-4	Subject Code:		AI 605(B)	Subject Name	Data Science Analytics				
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
60	20	10	10				100	3	0	0	3

Prerequisites:

- 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 thetoolkit used for Big Data

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

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

CO5: Identification of various applications of Tableau.

Text Book

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

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

Reference Books-

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

List/Links of e-learning resource

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

Modes of Evaluation and Rubric

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

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO_{11}	PO_{12}	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
(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	OC-4	Subject Code:	AI 605(C)	Subject Name		Artificial Intelligence

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

Prerequisites:

- Basic Knowledge of algorithms, 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	PO1	PO_{11}	PO_{12}	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	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		VI/II I	Program	B.Tech – Artificial Intelligence and Data Science	
Subject Category	**DLC**	**Subject Code:**	**AI 506**	**Subject Name**	**Advance Data Science Lab II**

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
ES	MS	Assignment	Quiz	ES	LW	Quiz		L	T	P	
	----	----	-----	30	10	10	50	------	-------	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	Descriptions	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 acrossarray 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, Creatingdata 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 preprocessingCO2: 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

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	PO1	PO_{11}	PO_{12}	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
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(An Autonomous Institute Affiliated to RGPV Bhopal)

Department of Information Technology

Syllabus applicable to July 2022 admitted

Name of the course:	B. Tech in **Artificial Intelligence and Data Science**
Semester and Year of study	B. Tech 4th Year 7thSemester
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**				
End Sem	Mid-Sem	Quiz	Assign	End Sem	Lab-Work	Quiz		L	T	P	
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 architechures - BPTT for training RNN, Long Short Term Memory Networks.		
V	**Auto Encoders:** Under complete Autoencoders – Regulraized Autoencoders – stochastic Encoders and Decoders – Contractive Encoders **Deep Generative Models:** Deep Belief networks – Boltzmann Machines – Deep Boltzmann Machine - Generative Adversial Networks. RecentTrends	9	5
Guest Lectures (if any)			
Total Hours		40	

Suggestive list of experiments:

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

Total Laboratory Hours 30 hours

Text Book-

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-

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 Zaccone, Md. Rezaul Karim, Ahmed Menshawy "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_1	PO_{11}	PO_{12}	PSO1	PSO2
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.

(An Autonomous Institute Affiliated to RGPV Bhopal)

Department of Information Technology

Syllabus applicable to July 2022 admitted

Name of the course:	B. Tech in **Artificial Intelligence and Data Science**
Semester and Year of study	B. Tech 4rd Year 7thSemester
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**				
End Sem	Mid-Sem	Quiz	Assign	End Sem	Lab-Work		L	T	P	
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_1	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 to July 2022 admitted onwards

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

Maximum Marks Allotted							Contact Hours			Total Credits
Theory				Practical		**Total Marks**				
End Sem	Mid-Sem	Quiz	Assign	End Sem	Lab-Work		L	T	P	
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 ToolkitSteven 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	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	PO_{11}	PO_{12}	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

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Department of Information Technology

Syllabus applicable to July 2022 admitted

Semester/Year		7th /4-year		Program		B.Tech. AIADS					
Subject Category	DE-4	Subject Code:		AI-702(C)	Subject Name:	Business Intelligence					
Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Assignment/Quiz		End Sem	Lab-Work	Quiz		L	T	P	
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-

- 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-

- 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_1**	**PO_{11}**	**PO_{12}**	**PSO1**	**PSO2**
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
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Department of Information Technology

Syllabus applicable to July 2022 admitted

Name of the course:	B. Tech in **Artificial Intelligence and Data Science**
Semester and Year of study	B. Tech 4th Year 7thSemester
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**				
End Sem	Mid-Sem	ASS	QUIZ	End Sem	Lab-Work		L	T	P	
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 Hodoop 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.

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_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	1	1	2										1	2
CO-2	3	2	2										1	2
CO-3	2	1	2		2								1	2
CO-4	2	1	2											2
CO-5	2	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
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Department of Information Technology

Syllabus applicable to July 2022 admitted onwards

Name of the course:	B. Tech in **Artificial Intelligence and Data Science**
Semester and Year of study	B. Tech 4th Year 7thSemester
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**				
End Sem	Mid-Sem	Quiz	Assi	End Sem	Lab-Work		L	T	P	
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

List and Links of e-learning resources:

1.

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_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	**1**	**1**	**2**										**1**	**2**
CO-2	**3**	**2**	**2**										**1**	**2**
CO-3	**2**	**1**	**2**		**2**								**1**	**2**
CO-4	**2**	**1**	**2**											**2**
CO-5	**2**	**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
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Department of Information Technology

Syllabus applicable to July 2022 admitted onwards

Name of the course:	B. Tech in **Artificial Intelligence and Data Science**
Semester and Year of study	B. Tech 4th Year 7thSemester
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**				
End Sem	Mid-Sem	Quiz	Assi	End Sem	Lab-Work		L	T	P	
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.

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}	PSO1	PSO2
CO-1	1	1	2		2							2	1	2
CO-2	3	2	2										1	2
CO-3	2	1	2		2								1	2
CO-4	2	1	2											2
CO-5	2	2	2								1			1

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

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Department of Information Technology

Name of the course:	B. Tech in **Artificial Intelligence and Data Science**
Semester and Year of study	B. Tech 4rd Year 8thSemester
Subject Category	Engineering Science Course (OE-4)
Subject Code: AI-2082 (A)	Subject Name: AI: Constraint Satisfaction

Maximum Marks Allotted							Contact Hours			Total Credits
Theory				Practical		**Total Marks**				
End Sem	Mid-Sem	Quiz	Assign	End Sem	Lab-Work		L	T	P	
										3

Prerequisites:

Exposure to AI: Search Methods for Problem Solving and AI: Knowledge Representation & Reasoning helps, but is not necessary

Course Objective:

Human beings solve problems in many different ways. Problem solving in artificial intelligence (AI) is inspired from these diverse approaches. AI problem solvers may be based on search, on memory, or on knowledge representation and reasoning. An approach to problem solving is to pose problems as constraint satisfaction problems (CSP), and employ general methods to solve them. The task of a user then is only to pose a problem as a CSP, and then call an off-the-shelf solver. CSPs are amenable to combining search based methods with reasoning. In this 2 credit course we will look at general approaches to solving finite domain CSPs, and explore how search can be combined with constraint propagation to find solutions.

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

CO1. Understand the fundamental principles of Constraint satisfaction problems.
CO2. Learn different types of consistency.
CO3. Develops skills for solving CSPs.
CO4. Understand the role of lookahead and lookback methods.
CO5. Apply industry best practices for model based diagnosis.

UNITs	Descriptions	Hrs.	CO's
I	Constraint satisfaction problems (CSP), examples. Constraint networks, equivalent and projection networks.	8	1
II	Constraint propagation, arc consistency, path consistency, i-consistency. Directional consistency and graph ordering, backtrack free search, adaptive consistency.	8	2
III	Search methods for solving CSPs, lookahead methods, dynamic variable and value ordering.	8	3
IV	Look back methods, Gaschnig's backjumping, graph based backjumping, conflict directed back jumping. Combing lookahead with lookback, learning.	10	4
V	Model based systems, model based diagnosis, truth maintenance systems, planning as CSP. Wrapping up.	8	5
Guest Lectures (if any)		Nil	
Total Hours		42	

Suggestive list of experiments:

NO Lab

Text Book-

Reference Books-

List and Links of e-learning resources:
https://nptel.ac.in/courses/106106158

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	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_1	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
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Department of Information Technology

Name of the course:	B. Tech in **Artificial Intelligence and Data Science**
Semester and Year of study	B. Tech 4th Year 8thSemester
Subject Category	Engineering Science Course (OE-4)
Subject Code: AI-2082 (B)	Subject Name: Artificial Intelligence: Knowledge representation and reasoning

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			**Total Marks**				
End Sem	Mid-Sem	Quiz	Assign	End Sem	Lab-Work	Quiz		L	T	P	
											3

Prerequisites:

Formal languages, logic and programming

Course Objective:

An intelligent agent needs to be able to solve problems in its world. The ability to create representations of the domain of interest and reason with these representations is a key to intelligence. In this course we explore a variety of representation formalism's and the associated algorithms for reasoning. We start with a simple language of propositions, and move on to first order logic, and then to representations for reasoning about action, change, situations, and about other agents in incomplete information situations.

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

CO1. Have a good understanding of the propositional logic and basics of Tableau.
CO2. Ability to differentiate the concept of backward and forward chaining.
CO3. Understand the concept of Horn Clauses and Logic Programming
CO4. Learned to use first order logic and apply default reasoning.
CO5. Use circumscription and epistemic logic.

UNITs	Descriptions	Hrs.	CO's
I	Introduction. History and Philosophy. Symbolic Reasoning. Truth, Logic, and Provability. Propositional Logic. Direct Proofs. The Tableau Method.	8	1
II	First Order Logic. Universal Instantiation. The Unification Algorithm. Forward and Backward Chaining. The Resolution Refutation Method.	7	2
III	Horn Clauses and Logic Programming. Prolog. Rule Based Systems. The OPS5 Language. The Rete Algorithm.	8	3
IV	Representation in First Order Logic. Conceptual Dependency. Frames. Description. Logics and the Web Ontology Language. Taxonomies and Inheritance. Default Reasoning.	8	4
V	Circumscription. Auto-epistemic Reasoning. Event Calculus. Epistemic Logic. Knowledge and Belief.	9	5
Guest Lectures (if any)			
Total Hours		40	

Text Book-

Reference Books-

List and Links of e-learning resources:https://nptel.ac.in/courses/106106140

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_1**	**PO_{11}**	**PO_{12}**	**PSO1**	**PSO2**
CO-1	**1**	**1**	**2**		**2**							**2**	**1**	**2**
CO-2	**3**	**2**	**2**										**1**	**2**
CO-3	**2**	**1**	**2**		**2**								**1**	**2**
CO-4	**2**	**1**	**2**											**2**
CO-5	**2**	**2**	**2**								**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.
(An Autonomous Institute Affiliated to RGPV Bhopal)

Department of Information Technology

Name of the course:	B. Tech in **Artificial Intelligence and Data Science**
Semester and Year of study	B. Tech 4th Year 8thSemester
Subject Category	Engineering Science Course (OE-5)
Subject Code: AI-2083 (A)	Subject Name: Optimisation for Machine Learning: Theory and Implementation

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			**Total Marks**				
End Sem	Mid-Sem	Quiz	Assign	End Sem	Lab-Work	Quiz		L	T	P	
											3

Prerequisites:

Linear Algebra, Calculus, Basic Programming

Course Objective:

Optimisation is the workhorse of machine learning. Knowing optimisation is a key prerequisite in understanding theory and practise of machine learning. In this course, we will discuss the foundations required for solving optimization problems in the context of machine learning through various case-studies/running-examples. We will start with covering the basics of linear algebra and calculus required for learning optimization theory. We will learn both the theory and implement optimization algorithms like stochastic gradient descent and its various variants to solve machine learning problems of classification, clustering etc using standard problem formulations which are convex (SVM etc) and non-convex (Neural Networks and Deep Neural Networks) etc.

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

CO1. Describe a basics of linear algebra and calculus.
CO2. Classify convex and non convex optimization problems.
CO3. Develop gradient descent.
CO4. Correlate variants of gradient descent and train a neural network.
CO5. Assess the newton's method.

UNITs	Descriptions	Hrs.	CO's
I	Basics of Linear Algebra and Calculus: Subspaces, EigenValue Decomposition, Singular Value Decomposition - Algorithms and Methods, PSD Matrices and Kernel Functions, Vector Calculus	8	1
II	Convex Functions, First and Second Order Conditions for Optimisations, Convex and Non Convex Optimisation problems in Machine Learning.	**7**	2
III	Gradient Descent: math, programming basic optimisation problems and their solutions	8	3
IV	Variants of Gradient Descent: Projected, Stochastic, Proximal, Accelerated, Coordinate Descent, Training a Neural Network: Theory	8	4
V	Newton's Method, Optimization for ML in practice: Pytorch/Tensor Flow. Training a Neural Network, Implementation	9	5
Guest Lectures (if any)			
Total Hours		40	

Text Book-

Reference Books-

List and Links of e-learning resources:https://nptel.ac.in/courses/106106245

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_1	PO_{11}	PO_{12}	PSO1	PSO2
CO-1	**1**	**1**	**2**										**1**	**2**
CO-2	**3**	**2**	**2**										**1**	**2**
CO-3	**2**	**1**	**2**		**2**								**1**	**2**
CO-4	**2**	**1**	**2**											**2**
CO-5	**2**	**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.
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Department of Information Technology

Name of the course:	B. Tech in **Artificial Intelligence and Data Science**
Semester and Year of study	B. Tech 4th Year 8thSemester
Subject Category	Engineering Science Course (OE-5)
Subject Code: AI-2083 (B)	Subject Name: Fuzzy Sets, Logic and Systems & Applications

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			**Total Marks**				
End Sem	Mid-Sem	Quiz	Assign	End Sem	Lab-Work	Quiz		L	T	P	
											3

Prerequisites:

Linear Algebra, Calculus, Basic Programming

Course Objective:

The course is designed to give a solid grounding of fundamental concepts of fuzzy logic and its applications. The level of the course is chosen to be such that all students aspiring to be a part of computational intelligence directly or indirectly in near future should get these concepts.

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

CO1. Understand the concept of fuzzy sets theory.
CO2. Learn to create fuzzy relations.
CO3. Develops fuzzy interface systems.
CO4. Understand the Wang and Mendel Model.
CO5. Apply fuzzifiers and defuzzifiers in machine learning.

UNITs	Descriptions	Hrs.	CO's
I	Introduction and Fuzzy Sets Theory. Membership Functions	8	1
II	Set Theoretic Operations. Fuzzy Arithmetic. Fuzzy Relations	**7**	2
III	Fuzzy Inference Systems I. Fuzzy Inference Systems II	8	3
IV	Wang and Mendel Model. TSK Model	8	4
V	Fuzzifiers and Defuzzifiers. ANFIS Architecture Fuzzy Systems and Machine Learning	9	5
Guest Lectures (if any)			
Total Hours		40	

Text Book-

Reference Books-

List and Links of e-learning resources:https://nptel.ac.in/courses/108104157

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_1**	**PO_{11}**	**PO_{12}**	**PSO1**	**PSO2**
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**

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