MAHENDRA ENGINEERING COLLEGE
Autonomous | Accredited by NAAC with 'A++' Grade (Cycle-2)
Accredited by NBA Tier-I (WA) UG : CSE, ECE, EEE
Mahendhirapuri, Mallasamudram (W), Namakkal (Dt) - 637 503, Tamil Nadu
04288-288 500 / 521 / 522 | www.mahendra.info

B.TECH
ARTIFICIAL INTELLIGENCE & DATA SCIENCE

CURRICULUM FOR

CHOICE BASED CREDIT SYSTEM

(Regulations-2024)

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

MAHENDRA ENGINEERING COLLEGE

(AUTONOMOUS)

MAHENDHIRAPURI, MALLASAMUDRAM,

NAMAKKAL Dt. TAMIL NADU- 637503

MAHENDRA ENGINEERING COLLEGE, (AUTONOMOUS)
MALLASAMUDRAM WEST, TAMIL NADU 637503
DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

Institute Vision

- To be an internationally recognized institute for engineering education and research with ethical values.

Institute Mission

- To ensure the effective use of resources to mould the students as professionals and entrepreneurs
- To enhance industry institute interaction for innovative technology practice
- To encourage the faculty members and students for advanced research
- To inculcate ethical values among the faculty members and students

Department Vision

- To be a centre of excellence in the domain of Artificial Intelligence and Data Science and produce globally competent professionals to solve futuristic societal challenges.
-

Department Mission

- To establish a unique learning environment and enable the students to equip with skills and face the challenges in Artificial Intelligence and Data Science.
- To impart knowledge in cutting edge Artificial Intelligence and Data Science technologies as per industrial standards.
- To inculcate research and life-long learning skills to serve the society at large.
- To inculcate professional ethics, rules and life skills.

Programme Educational Objectives

- PEO1 – To impart knowledge to create, analyze and design novel solutions required for broader social context.
- PEO2 – To design and develop solutions for real-world problems based on professional and societal needs.
- PEO3 – To engage in constructive research, professional development and life-long learning to conversant with emerging technologies.

Programme Specific Outcomes

1. PSO1 - Demonstrate AI and data analysis skills to achieve effective insights and decision making to solve real-life problems.
2. PSO2 - Apply mathematical and statistical models to solve the computational tasks, and model real-world problems using appropriate AI / ML algorithms.

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

Regulations 2024

I Semester

Sl. No.	Course code	Course Title	L	T	P	C	Cate-Gory
	THEORY						
1	24MA12101	Engineering Mathematics –I	3	1	0	4	BS
2	24PY12001	Engineering Physics	3	0	0	3	BS
3	24CS13001	Problem Solving Techniques using C	3	0	0	3	PC
4	24EE13101	Basics of Electrical and Electronics Engineering	3	0	0	3	ES
5		□□□□□□ □□□□ /Heritage of Tamils	1	0	0	1	HS
6		Induction Program	-	-	-	-	MC
	PRACTICAL						
7	24PY22001	Physics Laboratory	0	0	3	1.5	BS
8	24CS23001	Problem Solving Techniques using C Laboratory	0	0	3	1.5	PC
9		Engineering Practices Lab	0	0	3	1.5	ES
		TOTAL	**13**	**1**	**9**	**18.5**	

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

Regulations 2024

II Semester

Sl. No.	Course code	Course Title	L	T	P	C	Cate-Gory
	THEORY						
1	24MA12201	Engineering Mathematics –II	3	1	0	4	BS
2	24CY12001	Engineering Chemistry	3	0	0	3	BS
3	24HS11001	Communicative English	3	0	0	3	HS
4	24GE33201	Engineering Graphics and Design	3	0	2	4	ES
5	24AI14201	Data Structures and Algorithms	3	0	0	3	PC
6		□□□□□□□□ □□□□□□□□□□□□□□□ / Tamils and Technology	1	0	0	1	HS
	PRACTICAL						
7	24CY22001	Chemistry Laboratory	0	0	3	1.5	BS
8	24AI24201	Data Structures and Algorithms Laboratory	0	0	3	1.5	PC
9	24HS21001	Personality Development Practice Lab	0	0	2	1	EEC
		TOTAL	**17**	**1**	**10**	**22**	

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

Regulations 2024

III Semester

Sl. No.	Course code	Course Title	L	T	P	C	Cate-Gory
	THEORY						
1	24MA12302	Probability and Statistics	3	1	0	4	BS
2	24AI14301	Application Based Programming In Python	4	0	0	4	PC
3	24IT14302	Computer Architecture	3	0	0	3	PC
4	24AI14302	Database Technology	3	0	0	3	PC
5		Open Elective - 1	2	1	0	3	OE
6		Universal Human Values	2	1	0	3	HS
	PRACTICAL						
7	24AI24301	Application Based Programming In Python Laboratory	0	0	3	1.5	PC
8	24AI24302	Database Technology Laboratory	0	0	3	1.5	PC
		TOTAL	**17**	**3**	**6**	**22**	

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

Regulations 2024

IV Semester

Sl. No.	Course code	Course Title	L	T	P	C	Cate-Gory
	THEORY						
1	24MA12401	Discrete Mathematics & Graph Theory	3	1	0	4	BS
2	24IT14401	Computer Networks	3	0	0	3	PC
3	24AI14401	Foundations of AI & Data Science	3	0	0	3	PC
4	24CS14403	JAVA Programming	3	0	0	3	PC
5		Open Elective -2	3	0	0	3	OE
6	24CY11001	Environmental Science and Sustainability	2	0	0	2	HS
7	24AI34401	Operating Systems (Integrated)	2	0	2	3	PC
	PRACTICAL						
8	24AI24401	Java Programming Laboratory	0	0	3	1.5	PC
9	24HS6001	Professional Communicative Skills	0	1	2	2	EEC
		TOTAL	**19**	**2**	**5**	**24.5**	

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

Regulations 2024

V Semester

Sl. No.	Course code	Course Title	L	T	P	C	Cate-Gory
	THEORY						
1	24AI14501	Big Data Analytics	3	0	0	3	PC
2	24AI14502	Data Visualization	3	0	0	3	PC
3	24AI14503	Machine Learning Techniques	3	0	0	3	PC
4		Program Elective – 1(Advanced Java programing)	3	0	0	3	PE
5		Open Elective – 3	3	0	0	3	OE
6		Open Elective – 4 (Aptitude – III)	2	1	0	3	OE
	PRACTICAL						
7	22AI24501	Big Data Analytics Laboratory	0	0	3	1.5	PC
8	22AI24502	Machine Learning Techniques Laboratory	0	0	3	1.5	PC
9	24HS60002	Interview Skills and Soft Skills	0	1	3	2	EEC
10	24AI24503	Internship	-	-	-	1	EEC
		TOTAL	**17**	**2**	**9**	**24**	

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

Regulations 2024

VI Semester

Sl. No.	Course code	Course Title	L	T	P	C	Cate-Gory
	THEORY						
1	24AI14601	Deep Learning	3	0	0	3	PC
2	24AI14602	Generative AI	3	0	0	3	PC
3	24AI14603	Natural Language Processing	3	0	0	3	PC
4		Program Elective-2	3	0	0	3	PE
5		Program Elective-3	3	0	0	3	PE
6		Open Elective-5	3	0	0	3	OE
7		Constitution of India	3	0	0	-	MC
	PRACTICAL						
7	24AI24601	Deep Learning Laboratory	0	0	3	1.5	PC
8	24AI24602	Natural Language Processing Laboratory	0	0	3	1.5	PC
9	24AI26601	Mini Project	0	0	6	3	EEC
		TOTAL	**21**	**0**	**12**	**24**	

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

Regulations 2024

VII Semester

Sl. No.	Course code	Course Title	L	T	P	C	Cate-Gory
	THEORY						
1	24AI14701	Data Modeling & Business Intelligence	3	0	0	3	PC
2	24AI14702	Prompt Engineering	3	0	0	3	PC
3		Program Elective – 4	3	0	0	3	PE
4		Program Elective – 5	3	0	0	3	PE
5		Program Elective – 6	3	0	0	3	PE
6		Principles of Management	3	0	0	3	HS
	PRACTICAL						
7	24AI36701	Project work Phase-I	0	0	3	3	EEC
		TOTAL	**18**	**0**	**9**	**21**	

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

Regulations 2024

VIII Semester

Sl. No.	Course code	Course Title	L	T	P	C	Cate-Gory
	PRACTICAL						
3	24AI36801	Project Work Phase-II	0	0	12	6	EEC
		TOTAL	**6**	**0**	**12**	**12**	

TOTAL NUMBER OF CREDITS: 18.5+22+22+24.5+24+24+21+06 = 162

BoS Chairman

Dr.M.Kannan

HUMANITIES AND SOCIAL SCIENCES INCLUDING MANAGEMENT (HS)

S.NO	COURSE CODE	COURSE TITLE	L	T	P	C	CATEGORY
1		Heritage of Tamils	1	0	0	1	HS
2		Tamils and Technology	1	0	0	1	HS
3	24HS11001	Communicative English	3	0	0	3	HS
4	24HS21001	Personality Development Practice Laboratory	0	0	2	1	EEC
5	24HS11006	Universal Human Values	2	1	0	3	HS
6	24HS60001	Professional Communication Skills	0	1	2	2	EEC
7		Principles of Management	3	0	0	3	HS

BASIC SCIENCES (BS)

S.NO	COURSE CODE	COURSE TITLE	L	T	P	C	CATEGORY
1	24MA12101	Engineering Mathematics- I	3	1	0	4	BS
2	24PY12001	Engineering Physics	3	0	0	3	BS
3	24PY22001	Physics Laboratory	0	0	3	1.5	BS
4	24MA12201	Engineering Mathematics –II	3	1	0	4	BS
5	24CY12001	Engineering Chemistry	3	0	0	3	BS
6	24CY22001	Chemistry Laboratory	0	0	3	1.5	BS
7	24MA12302	Propability and Statistics	3	1	0	4	BS
8	24MA12401	Discrete Mathematics and Graph Theory	3	1	0	4	BS

ENGINEERING SCIENCES (ES)

S.NO	COURSE CODE	COURSE TITLE	L	T	P	C	CATEGORY
1	24EE13101	Basics of Electrical and Electronics Engineering	3	0	0	3	ES
2		Engineering Practices Lab	0	0	4	2	ES

PROFESSIONAL CORE (PC)

S.NO	COURSE CODE	COURSE TITLE	L	T	P	C	CATEGORY
1	24CS13001	Problem Solving Techniques using C	3	0	0	3	PC
2	24CS23001	Problem Solving Techniques in C Laboratory	0	0	3	1.5	PC
3	24AI14201	Data Structures & Algorithms	3	0	0	3	PC
4	24AI24201	Data Structures & Algorithms Laboratory	0	0	3	1.5	PC
5	24AI14301	Application Based Programming In Python	3	0	0	3	PC
6	24IT14302	Computer Architecture	3	0	0	3	PC
7	24AI14302	Database Technology	3	0	0	3	PC
8	24AI24301	Application Based Programming In Python Laboratory	0	0	3	1.5	PC
9	24AI24302	Database Technology Laboratory	0	0	3	1.5	PC
10	24IT14401	Computer Networks	3	0	0	3	PC
11	24AI14401	Foundations of AI & Data Science	3	0	0	3	PC
12	24CS14403	Core-7(Java Programing)	3	0	0	3	PC
13	24AI24401	Java Programming Laboratory	0	0	3	1.5	PC
14	24AI34401	Operating Systems (Integrated)	2	0	2	3	PC
15	24AI14501	Big Data Analytics	3	0	0	3	PC
16	24AI14502	Data Visualization	3	0	0	3	PC
17	24AI14503	Machine Learning Techniques	3	0	0	3	PC
18	22AI24501	Big Data Analytics Laboratory	0	0	3	1.5	PC
19	22AI24502	Machine Learning Techniques Laboratory	0	0	3	1.5	PC
20	24AI14601	Deep Learning	3	0	0	3	PC
21	24AI14602	Genrative AI	3	0	0	3	PC
22	24AI14603	Natural Language Processing	4	0	0	4	PC
23	24AI24601	Deep Learning Laboratory	0	0	3	1.5	PC
24	24AI24602	Natural Language Processing Laboratory	0	0	3	1.5	PC
25	24AI14701	Data Modeling & Business Intelligence	3	0	0	3	PC
26	24AI14702	Prompt Engineering	3	0	0	3	PC

PROGRAM ELECTIVE COURSES: VERTICALS

Vertical I Networking	Vertical II Computing Techniques	Vertical III Application Development	Vertical IV Data Analytics & Deep Learning	Vertical V Cyber Security
Information Storage and Management	Introduction To IOT	Open Source Software	Data Warehousing and Data Mining	Introduction To Cyber Security
Social Network Analysis	Cloud Computing	Healthcare Informatics	Text And Speech Analytics	Cryptography and Network Security
Software Defined Networks	Multi-Core Computing	Block Chain Technology	Biometric Technologies	Information Retrieval Techniques
Network Management	Distributed Computing	Object Oriented Analysis and Design	Predictive Analysis	Cyber Forensics
Artificial Neural Networks	Virtualization Techniques	Software Testing	Large Language Model	Ethical Hacking
5G Networks	Graph Theory And Applications	Software Engineering	Social Media Analysis	Information Security
Satellite Communication	Computer Vision	Distributed Databases	Image & Video Analytics	Swarm Intelligence
Wireless Sensor Networks	Soft Computing	R Programming	Reinforcement Learning	Data Security
	Optimization Techniques	AI for Robotics	Healthcare Analytics	

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

Regulation 2024

NETWORKING

Sl. No.	Course code	Course Title	L	T	P	C	Cate-gory
1	24AI15001	Information Storage and Management	3	0	0	3	PE
2	24AI15002	Social Network Analysis	3	0	0	3	PE
3	24AI15003	Software Defined Networks	3	0	0	3	PE
4	24AI15004	Network Management	3	0	0	3	PE
5	24AI15005	Artificial Neural Networks	3	0	0	3	PE
6	24AI15006	5G Networks	3	0	0	3	PE
7	24AI15007	Satellite Communication					
8	24AI15008	Wireless Sesor Networks					
COMPUTING TECHNIQUES							
9	24AI15009	Introduction To IOT	3	0	0	3	PE
10	24AI15010	Cloud Computing	3	0	0	3	PE
11	24AI15011	Multi-Core Computing	3	0	0	3	PE
12	24AI15012	Distributed Computing	3	0	0	3	PE
13	24AI15013	Virtualization Techniques	3	0	0	3	PE
14	24AI15014	Graph Theory And Applications	3	0	0	3	PE
15	24AI15015	Computer Vision	3	0	0	3	PE
16	24AI15016	Soft Computing	3	0	0	3	PE
17	24AI15017	Optimization Techniques	3	0	0	3	PE
APPLICATION DEVELOPMENT							
18	24AI15018	Open Source Software	3	0	0	3	PE
19	24AI15018	Healthcare Informatics	3	0	0	3	PE

20	24AI15019	Block Chain Technology	3	0	0	3	PE
21	24AI15020	Object Oriented Analysis and Design	3	0	0	3	PE
22	24AI15021	Software Testing	3	0	0	3	PE
23	24AI15022	Software Engineering	3	0	0	3	PE
24	24AI15023	Distributed Databases	3	0	0	3	PE
25	24AI15024	R Programming	3	0	0	3	PE
26	24AI15025	AI for Robotics	3	0	0	3	PE
DATA ANALYTICS & DEEP LEARNING							
27	24AI15026	Data Warehousing and Data Mining	3	0	0	3	PE
28	24AI15027	Text And Speech Analytics	3	0	0	3	PE
29	24AI15028	Biometric Technologies	3	0	0	3	PE
30	24AI15029	Predictive Analysis	3	0	0	3	PE
31	24AI15030	Large Language Model	3	0	0	3	PE
32	24AI15031	Social Media Analysis	3	0	0	3	PE
33	24AI15032	Image & Video Analytics	3	0	0	3	PE
34	24AI15033	Reinforcement Learning	3	0	0	3	PE
35	24AI15034	Healthcare Analytics	3	0	0	3	PE
CYBER SECURITY							
36	24AI15035	Introduction To Cyber Security	3	0	0	3	PE
37	24AI15036	Cryptography and Network Security	3	0	0	3	PE
38	24AI15037	Information Retrieval Techniques	3	0	0	3	PE
39	24AI15038	Cyber Forensics	3	0	0	3	PE
40	24AI15039	Ethical Hacking	3	0	0	3	PE
41	24AI15040	Information Security	3	0	0	3	PE
42	24AI15041	Swarm Intelligence	3	0	0	3	PE

43	24AI15042	Data Security	3	0	0	3	PE

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S.NO	COURSE CODE	COURSE TITLE	L	T	P	C	CATEGORY
1		Interview Skills and Soft Skills	0	1	2	2	EEC
2	24AI24503	Internship - I	0	0	3	1.5	EEC
3	24AI36601	Mini Project	0	0	6	3	EEC
4	24AI36701	Project work Phase – I	0	0	6	3	EEC
5	24AI36801	Project Work	0	0	12	6	EEC

MANDATORY COURCE (MC)

S.NO	COURSE CODE	COURSE TITLE	L	T	P	C	CATEGORY
1		Induction program	-	-	-	-	MC
2		Environmental Science	3	0	0	-	MC
3		Constitution of India	3	0	0	-	MC

OPEN ELECTIVES (OE)

S.NO	COURSE CODE	COURSE TITLE	L	T	P	C	CATEGORY
1	24AI0001	Networking Essentials	3	0	0	3	OE
2	24AI0002	Database Management Systems	3	0	0	3	OE
3	24AI0003	Object Oriented Programming	3	0	0	3	OE
4	24AI0004	Python Programming	3	0	0	3	OE
5	24AI0005	Operating Systems	3	0	0	3	OE
6	24AI0006	Data Structures	3	0	0	3	OE
7	24AI0007	Introduction to Artificial Intelligence	3	0	0	3	OE
8	24AI0008	Mobile Application Development	3	0	0	3	OE
9	24AI0009	Introduction to Data Science	3	0	0	3	OE
10	24AI0010	Internet of Things	3	0	0	3	OE
11	24AI0011	Digital Marketing	3	0	0	3	OE

12	24AI0012	Blockchain Technology	3	0	0	3	OE
13	24AI0013	Cryptography & Network Security	3	0	0	3	OE
14	24AI0014	E-Learning Techniques	3	0	0	3	OE
15	24AI0015	Data Mining	3	0	0	3	OE
16	24AI0016	Artificial Intelligence & Machine Learning	3	0	0	3	OE

VALUE ADDED COURSES(VAC)

S.NO	COURSE CODE	COURSE TITLE
1	24AI01	Full Stack Development
2	24AI02	Android APP Development
3	24AI03	Web based APP Development
4	24AI04	PHP Training
5	24AI05	R Programming

SEMESTER WISE SUMMARY

Sl. No	Course Area	Semester wise Credits								Credits Total	Credits %
		I	II	III	IV	V	VI	VII	VIII		
1	HS	1	4	3	2			3		**13**	**7.83**
2	BS	8.5	8.5	4	4					**25**	**15.06**
3	ES	4.5	4							**8.5**	**5.12**
4	PC	4.5	4.5	12	13.5	12	12	6		**64.5**	**41.26**
5	PE					3	6	9		**18**	**10.84**
6	OE			3	3	6	3			**15**	**9.03**
7	EEC		1		2	3	3	3	6	**18**	**10.84**
8	MC	*	-	-	-	-	*	-	-	**-**	**-**
	Total	**18.5**	**22**	**22**	**24.5**	**24**	**24**	**21**	**06**	**162**	**-**

***-Non Credit Mandatory Course (MC)**

BoS Chairman

Dr.M.Kann an

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

Regulations 2024

I Semester

Sl. No.	Course code	Course Title	L	T	P	C	Cate-Gory
	THEORY						
1	24MA12101	Engineering Mathematics –I	3	1	0	4	BS
2	24PY12001	Engineering Physics	3	0	0	3	BS
3	24CS13001	Problem Solving Techniques using C	3	0	0	3	PC
4	24EE13101	Basics of Electrical and Electronics Engineering	3	0	0	3	ES
5		தமிழர் மரபு /Heritage of Tamils	1	0	0	1	HS
6		Induction Program	-	-	-	-	MC
	PRACTICAL						
7	24PY22001	Physics Laboratory	0	0	3	1.5	BS
8	24CS23001	Problem Solving Techniques using C Laboratory	0	0	3	1.5	PC
9		Engineering Practices Lab	0	0	3	1.5	ES
		TOTAL	**14**	**1**	**9**	**18.5**	

Dr.M.Kannan
BoS Chairman

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

Syllabus

Department	Computer Science and Engineering	Programme Code	1031

I Semester

Course code	Course Name	Hours/week			Credit	Maximum marks
		L	T	P	C	
24CS13001	PROBLEM SOLVING TECHNIQUES USING C	3	0	0	3	100

Objective(s)	The student should be made to: ● Understand developing applications using Office package. ● Formulate problems and implement algorithms using Scratch and Raptor tool ● Make use of arrays and functions in C. ● Learn how to use pointer concepts. ● Know the concepts of structures, unions and files
Outcome(s)	The students will be able to: ● Demonstrate the applications of Office Packages ● Solve the real world problems using Scratch and Raptor Tool ● Develop programs using arrays and functions in C. ● Illustrate the working of pointers in C ● Develop the concepts using structures, unions and files in C

UNIT-I	**PROBLEM SOLVING ASPECTS**	**9**

Computers: Hardware – Software – Processor – Memory – I/O devices – Interface – Programming Languages Problem Solving Aspects: Algorithms Pseudo code, Flowchart-Steps in Problem Solving – simple strategies for developing algorithms (iteration, recursion) – Steps for Creating and Running programs -Illustrative problems: Exchanging The Values – Find minimum in a list - Factorial Computation - Fibonacci Sequence

UNIT-II	**C PROGRAMMING BASICS**	**9**

Introduction to C programming – Header files – Structure of a C program – compilation and linking processes – Constants, Variables – Data Types – Expressions-, Expression Evaluation, Type conversion Statements – operators – Input and Output operations – Decision Making and Branching – Looping statements- Programming Examples

UNIT-III	**C PROGRAMMING BASICS**	**9**

Arrays: Introduction – One-Dimensional Arrays – Two and multi-Dimensional Arrays - Strings: Operations of Strings. Function – definition of function – Declaration of function – Function prototype – Types of functions- user defined functions – Pass by value – Pass by reference – Recursion - Programming Examples

UNIT-IV	**POINTERS AND STRUCTURES**	**9**

Pointers - Definition – Initialization - Pointer variables, Pointer arithmetic, Pointers to Pointers, Pointers with Arrays, Pointers with Functions- Introduction to Structure – structure definition – Structure declaration – Structure within a structure-Structures fusion with Arrays- Unions – Storage classes

UNIT-V	FILE PROCESSING	9
Files: File modes – File functions – Types of file processing: Sequential access, Random access – Text and binary files - Command line arguments – C Preprocessor directives: Macros – Definition – Types of Macros - Creating and implementing user defined header files		
	Total hours to be taught	**45PERIODS**

TEXT BOOK :	
1	Anita Goeland Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India)Pvt. Ltd. Pearson Education, 2016.
REFERENCES:	
1	Dromey R.G, "How to Solve it by Computer" Prentice Hall of India, Delhi., 2010.
2	E Balagurusamy, "Computer Programming", First Edition, Tata McGraw Hill Education (India) Private Ltd, New Delhi., 2013.
3	PradipDey, Manas Ghosh, " Computer Fundamentals and Programming in C", 2nd Edition, Oxford University Press.,2013.
4	M.Rajaram and P.UmaMaheshwari" Computer Programming with C", Pearson Education., 2013.
5	NPTEL course, Problem Solving Through Programming in C, https://nptel.ac.in/courses/106105171
6	NPTEL course, Introduction to Programming in C, https://nptel.ac.in/courses/106104128

Dr.M.Kannan
BoS Chairman

MAHENDRA ENGINEERING COLLEGE

(Autonomous)

Syllabus

Department	Computer Science and Engineering	Programme Code	1031

I Semester

Course Code	Course Name	Hours/Week			Credit	Maximum marks
		L	T	P	C	
24CS23001	PROBLEM SOLVING TECHNIQUES USING C LAB (Common to All Branches)	0	0	3	1.5	100

Objective(s)	**The student should be made to:** ● Expertise in developing applications using Office package. ● Formulate problems and implement algorithms using Scratch and Raptor tool ● Make use of arrays and functions in C. ● Learn how to use pointer concepts. ● Know the concepts of structures, unions and files
Outcome(s)	**Upon completion of this course , students will be able to:** ● Demonstrate the applications of Office Packages ● Obtain solutions for the real world problems using Scratch and Raptor Tool ● Develop programs using arrays and functions in C. ● Illustrate the working of pointers in C ● Develop the concepts using structures, unions and files in C

LIST OF EXPERIMENTS

1	Prepare A bio-data Using MS Word With Appropriate Page ,Text And Table Formatting Options And Send The Same To Recipients Using Mail Merge
2	Create budget planning of your family with cell referencing, formulae, conditional formatting using Excel
3	Create a Program flow to illustrate the use of Variables and Constants using Scratch Tool
4	Construct flowchart to find the Factorial for a given number Using Raptor
5	Students mark generation using decision statements
6	Calculator using switch statement
7	Prime number generation and to check whether the given number is armstrong or not using looping
8	Greatest number using array (one dimensional)
9	Matrix multiplication using array (two dimensional)
10	Check the given string is palindrome or not.
11	Write a C Program to swap two numbers using two functions one using pointer and other one without using pointer
12	Factorial calculation and Fibonacci series using function
13	Student mark sheet using structures
14	Copy text from one file to other File
	TOTAL HOURS **30**

Dr.M.Kannan
BoS Chairman

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

Regulations 2024

II Semester

Sl. No.	Course code	Course Title	L	T	P	C	Cate-Gory
	THEORY						
1	24MA12201	Engineering Mathematics –II	3	1	0	4	BS
2	24CY12001	Engineering Chemistry	3	0	0	3	BS
3	24HS11001	Communicative English	3	0	0	3	HS
4	24GE33201	Engineering Graphics and Design	3	0	2	4	ES
5	24AI14201	Data Structures and Algorithms	3	0	0	3	PC
6		தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	1	0	0	1	HS
	PRACTICAL						
7	24CY22001	Chemistry Laboratory	0	0	3	1.5	BS
8	24AI24201	Data Structures and Algorithms Laboratory	0	0	3	1.5	PC
9	24HS21001	Personality Development Practice Lab	0	0	2	1	EEC
		TOTAL	**17**	**1**	**10**	**23**	

Dr.M.Kannan
BoS Chairman

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

Syllabus

Department	Artificial Intelligence & Data Science	Programme Code	1161

II Semester

Course code	Course Name	Hours/week			Credit	Maximum marks
		L	T	P	C	
24AI14201	DATA STRUCTURES AND ALGORITHMS	3	1	0	4	100

Objective(s)	**The students should be made to:** ● Know the concepts of abstract data types ● Learn the linear data structures – lists, stacks, and queues ● Be familiar with non linear data structures -Tree ● Understand the non linear data structure - Graph ● Learn the sorting, searching and hashing algorithms
Outcome(s)	**Upon completion of this course , students will be able to** ● Explain the concepts of abstract data types ● Classify the linear data structures to problem solutions ● Apply the different tree data structures to problem solutions ● Demonstrate the non linear data structure- graph ● Interpret the various sorting, searching and hashing algorithms

UNIT-I	**INTRODUCTION TO DATA STRUCTURES AND ALGORITHMS**	**9+3**

Data Structures: Basic concepts of Data structures – Classification of data structures – Static and Dynamic data structures – Operations of Data structures – Abstract Data Types
Algorithms: Introduction – Algorithm complexity – Algorithmic Analysis – Mathematical Notation – Algorithmic Design Techniques: Divide and Conquer, Backtracking, Dynamic programming

UNIT-II	**LINEAR DATA STRUCTURES – STACKS, QUEUES, LISTS**	**9+3**

Stack ADT – Operations - Applications - Evaluating arithmetic expressions- Conversion of Infix to postfix expression - Queue ADT – Operations –Types of Queues – Applications of queues
Linked List ADT: Operations of Lists – Types of Linked Lists – Applications

UNIT-III	**NON LINEAR DATA STRUCTURES – TREES**	**9+3**

Tree ADT – tree traversals - Binary Tree ADT – expression trees – applications of trees – binary search tree ADT - AVL Trees – B-Tree - B+ Tree - Heap – Applications of heap.

UNIT-IV	**NON LINEAR DATA STRUCTURES - GRAPHS**	**9+3**

Definition – Representation of Graph – Types of graph - Breadth-first traversal - Depth-first traversal –Applications of graphs – Graph Algorithms: Minimum spanning tree, Kruskal's algorithm, Prim's algorithm, Floyd Warshall's algorithm, Dijkstra's algorithm

UNIT-V	**SEARCHING, SORTING AND HASHING TECHNIQUES**	**9+3**

Searching: Linear Search - Binary Search - Sorting: Bubble sort - Selection sort - Insertion sort - Selection sort – Quick sort – Heap sort – Merge sort Shell sort - Hashing: Hash Functions and its characteristics – Universal hashing – Rehashing – Hash tables and applications – Open addressing techniques – Popular hash functions: Division method, Duplication method, mid square method, folding method

Total hours to be taught	**(L:45+T:15): 60PERIODS**

TEXT BOOK :	
1	Mark Allen Weiss, ―Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education,1997.
2	ReemaThareja, ―Data Structures Using C, Second Edition , Oxford University Press, 2011
REFERENCES:	
1	Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, ―Introduction to Algorithms", Second Edition, Mcgraw Hill, 2002.
2	Aho, Hopcroft and Ullman, ―Data Structures and Algorithms, Pearson Education,1983
3	Stephen G. Kochan, ―Programming in C, 3rd edition, Pearson Education.
4	Ellis Horowitz, SartajSahni, Susan Anderson-Freed, ―Fundamentals of Data Structures in C,Second Edition, University Press, 2008
5	Nptel course, Data Structures and Algorithms, https://nptel.ac.in/courses/106102064/

Dr.M.Kannan
BoS Chairman

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

Syllabus

Department	Artificial Intelligence & Data Science	Programme Code	1161

III Semester

Course Code	Course Name	Hours/Week			Credit	Maximum marks
		L	T	P	C	
24AI24201	DATA STRUCTURES AND ALGORITHMS LABORATORY	0	0	3	1.5	100

Objective(s)	**The students should be made to:** • Learn to implement linear data structures and its applications • Know the applications of tree and implement its types • Understand the basics of sorting and searching algorithms • Familiarize the basics of hashing and graph traversal techniques • Identify the Techniques for Hashing Function
Outcome(s)	**Upon completion of this course , students will be able to:** • Implement linear data structures and its applications • Develop programs for applications of tree and its types • Build various sorting and searching algorithms • Illustrate programs for hashing and graph traversal techniques • Design hash functions that result in a collision free scenario for data storage and retrieval

LISTOF EXPERIMENTS

1.	Array implementation of: a) Stack, b) Queue, and c) List
2	Linked list implementation of: a) List, b) Stack and c) Queue
3	Implementation of Binary Trees a) Creation, b) Insertion, c) Deletion, d) Searching, e) Display all nodes
4	Implementation of Binary Search Trees a) Creation, b) Insertion, c) Deletion, d) Searching, e) Display all nodes
5	Implementation of Tree traversal algorithms
6	Graph representation and Traversal algorithms
7	Implementation of Floyd Warshall's algorithm
8	Implementation of Dijkstra's algorithm
9	Implementation of searching and sorting algorithms
10	Implementation of Hashing functions
	TOTAL HOURS **30**

Dr.M.Kannan
BoS Chairman

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

Regulations 2024

III Semester

Course code	Course Title	L	T	P	C	Cate-gory
THEORY						
24MA12302	Probability and Statistics	3	1	0	4	BS
24AI14301	Application Based Programming in Python	4	0	0	4	PC
24IT14302	Computer Architecture	3	0	0	3	PC
24AI14302	Database Technology	3	0	0	3	PC
	Open Elective - 1	2	1	0	3	OE
	Universal Human Values	2	1	0	3	HS
PRACTICAL						
24AI24301	Application Based Programming in Python Laboratory	0	0	3	1.5	PC
24AI24302	Database Technology Laboratory	0	0	3	1.5	PC
	TOTAL	**16**	**3**	**6**	**23**	

Dr.M.Kannan
BoS Chairman

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

Syllabus

Department	Artificial Intelligence & Data Science	Programme Code	1161

II Semester

Course code	Course Name	Hours/week			Credit	Maximum Marks
		L	T	P	C	
24AI14301	APPLICATION BASED PROGRAMMING IN PYTHON	3	0	0	3	100

Objective(s)	**The Student should be made to** • Be exposed with python data structures – list, tuples, and dictionaries • Learn the basics of python Modules, packages, files and standard library. • Know the basic principles of Python programming language • Familiar with C++ classes using appropriate Inheritance and design principles. • Demonstrate significant experience in data bases and web frame works.
Outcome(s)	**Upon completion of this course , students will be able to** • Apply basic constructs of Python Programming to solve simple problems • Implement Python programs using control statement and functions • Get familiar with implementation of object oriented concepts in python • Perform string, file and Regular expression operations and process data • Develop applications using Databases and web frameworks

UNIT-I	INTRODUCTION	9
Basic Concepts: Keywords, identifiers and variables- Data types - type casting – user input – modules – operators – Flow control statements- Strings – Calendars and clocks		

UNIT-II	FUNCTIONS AND DATA TYPES	9
Functions: Basics –function arguments – modules – Recursion – Special functions. Lists: Creating, traversing and slicing -functions – nested lists. Tuples: Creating, initializing and accessing – tuple functions – swapping tuples, unpacking tuples – Dictionaries: Basics of Creating, initializing and accessing – dictionary functions and methods-view objects.		

UNIT-III	STRINGS, FILES AND REGULAR EXPRESSIONS	9
Strings: Built-in methods for string manipulation – Case studies. Modules and Packages : import statement – creating user defined modules and packages. Files: File operations –Reading and Writing a file. Regular Expressions: match, search, sub, find all and finite functions - Case studies.		

UNIT-IV	OBJECT ORIENTED PROGRAMMING	9
Concepts of OOP- OOP concepts for Python – Built in Attributes and methods –polymorphism- operator overloading - Inheritance and Namespace – Method types - Exceptions: Built-in and User defined exceptions.		
UNIT-V	**DATABASES AND WEB FRAMEWORKS**	9
Connecting with databases – Database operations – Web Frameworks: Web servers – Introduction to web server frameworks – Creating and running a flask application.		
	TOTAL HOURS	**45**

TEXT BOOKS:	
1	Anurag Gupta, G P Biswas. “Python Programming”, 1st Edition, McGraw Hill Education, 2020
2	https://www.javatpoint.com/flask-app-routing
REFERENCES:	
1	Bill Lubanovic, “Introducing Python Modern Computing in Simple Packages”, 2nd Edition, O’Reilly Media, 2019.
2	Samuel Dauzon, AidasBendoraitis and ArunRavindran. “Django: Web Development with Python”, 1st Edition, Packt Publisher, 2017.

Dr.M.Kannan
BoS Chairman

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

Syllabus

Department	Artificial Intelligence & Data Science	Programme Code	1161

III Semester

Course code	Course Name	Hours/week			Credit	Maximum Marks
		L	T	P	C	
24IT14302	COMPUTER ARCHITECTURE	3	0	0	3	100

Objective(s)	The student should be able to: • Elaborate about the basic structure, arithmetic and memory operations of a digital computer. • Describe the various types of organization with addressing modes for set of instructions. • Understand the different arithmetic algorithms to perform the basic arithmetic operations • Know about various types of memory organization with control unit design. • Learn basic concepts of pipelining with advance architectures.
Outcome(s)	**Upon completion of this course , students will be able to** • Describe the basic structure, arithmetic and memory operations of a digital computer. • Illustrate the addressing modes for set of instructions with various types of organization. • Describe and apply algorithms for performing different arithmetic operations along with various control unit design. • Distinguish between different types of memory and apply the mapping functions between different levels of memory. • Apply the concepts of pipelining with design issues and understand the various architecture.

UNIT-I	INTRODUCTION	9

Basics of computer architecture - Stored program organization - Register transfer language - Arithmetic - Logic - Shift micro-operations - Instruction code - Timing and control - Instruction cycle - Basic computer design.

UNIT-II	CENTRAL PROCESSING UNIT	9

CPU Organization: General register organization - Stack organization – Instruction formats - Addressing modes - Data transfer and manipulation - Program control.

UNIT-III	COMPUTER ARITHMETIC AND CONTROL UNIT	9

Fixed point arithmetic operations: Addition - Subtraction - Multiplication - Division - Floating point arithmetic operations: Basics - Control unit design: Hardwired control - Micro-programmed control.

UNIT-IV	MEMORY AND I/O SYSTEMS	9
Memory hierarchy - Main memory - Auxiliary memory - Associative memory - Cache memory - Virtual memory - Interleaved memories - I/O SYSTEMS: Asynchronous data transfer - Modes of data transfer: Programmed I/O - Interrupt initiated I/O - Direct Memory Access (DMA) - I/O processor.		
UNIT-V	**PARALLEL PROCESSING AND ADVANCED ARCHITECTURE**	9
Pipelining - Instruction and arithmetic pipelining - Design Issues - RISC and CISC architectures.		
	TOTAL HOURS	**45**

TEXT BOOKS:	
1	Morris Mano M. and Rajib Mall, "Computer System Architecture",3rd Edition, Pearson Education, New Delhi,2019
2	John L. Hennessy and David A. Patterson, "Computer Architecture: A Quantitative Approach", 5th Edition, Elsevier, New Delhi, 2017
REFERENCES:	
1	John P Hayes, "Computer Organization and Architecture", 3rd Edition, McGraw Hill International Edition, New Delhi, 2014
2	William Stallings, "Computer Organization and Architecture, Designing for Performance", 10th Edition, Pearson Education, USA, 2018.
3	Kai Hwang and Briggs F.A, "Computer Architecture and Parallel Processing", Tata McGraw Hill, New Delhi, 2016
4	Heuring V.P., Jordan H.F. and Venkatesh T.G., "Computer Systems Design and Architecture", 2nd Edition, Pearson Education, New Delhi, 2013

Dr.M.Kannan
BoS Chairman

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

Syllabus

Department	Artificial Intelligence & Data Science	Programme Code	1161

III Semester

Course code	Course Name	Hours/week			Credit	Maximum Marks
		L	T	P	C	
24AI14302	DATABASE TECHNOLOGY	3	0	0	3	100

Objective(s)	**The student should be made to:** • Indicate the fundamentals of data models and to represent a database system using ER diagrams. • Familiar with the concepts of SQL and relational database design. • Learn the basic concepts of transaction processing- concurrency control techniques and recovery procedures • Understand the internal storage structures using different file and indexing techniques which will help in physical DBdesign. • Have an introductory knowledge about the Storage and Query processing Techniques
Outcome(s)	**Upon completion of this course, students will be able to** • Explain the basic concepts of database model and data requirements using conceptual modeling. • Demonstrate the solutions to a broad range of query problems using relational algebra/SQL. • Interpret the queries using normalization criteria and optimize queries. • Compare and contrast various indexing strategies in different database systems. • Appraise how advanced databases differ from traditional databases.

UNIT-I	INTRODUCTION TO RDBMS	9

Purpose of Database System – Views of Data – Data Models – Database System Architecture – Introduction to Relational Databases – Relational Model – Keys –Relational Algebra: Relational operations-Extended Operators of Relational Algebra– Relational Calculus-SQL Fundamentals –SQL Joins– Triggers.

UNIT-II	DATABASE DESIGN	9

Entity-Relationship Model – ER Diagrams-Mapping ER Model to relational Model to a Schema – Extended ER Features-Functional Dependencies –First Normal Form – Second Normal Form –Third Normal Form – Dependency Preservation – Boyce/Codd Normal Form – Multi-Valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

UNIT-III	TRANSACTION MANAGEMENT	9

Transaction Concepts – ACID Properties –Transaction states–Conflict Serializability – Transaction Isolation Levels –Concurrency Control – Concurrency Control and its need – Lock-Based Protocols – Deadlock Handling– Recovery System – Failure Classification – Database Recovery management-Recovery based on Deferred update-Shadow Paging Algorithm.

UNIT-IV	IMPLEMENTATION TECHNIQUES	9

Overview of Physical Storage Media – RAID – File Organization – Organization of Records in Files – Indexing and Hashing – Ordered Indices – B+ tree Index Files–Bitmap Indexes – Static Hashing –Dynamic Hashing – Query Processing Overview –Query Optimization-Join Query Optimization

using Indexing and Hashing		
UNIT-V	**DATABASE SECURITY AND ADVANCED TOPICS**	**9**
Database Security: Authentication, Authorization and Access control, DAC, MAC and RBAC models, Intrusion Detection, SQL injection. Advanced SQL: Database Tuning - XML Databases – XML Schema – NOSQL Database: Characteristics – CAP theorem - Data Warehousing and Data Mining.		
	TOTAL HOURS	**45**

TEXT BOOKS:	
1	Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database SystemConcepts", Seventh Edition, Tata McGraw Hill, 2019. (Unit I to Unit 3)
2	RamezElmasri,Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2017.(Unit 4 & 5)
REFERENCES:	
1	C. J. Date, A. Kannan, S. Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.
2	Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", FourthEdition, Tata McGraw Hill, 2010.
3	G. K. Gupta, "Database Management Systems", Tata McGraw Hill, 2011.
4	Carlos Coronel, Steven Morris, Peter Rob, "Database Systems: Design,Implementation and Management", Ninth Edition, Cengage Learning, 2011.

Dr.M.Kannan
BoS Chairman

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

Syllabus

Department	Artificial Intelligence & Data Science	Programme Code & Name	1161

II Semester

Course Code	Course Name	Hours/Week			Credit	Maximum marks
		L	T	P	C	
24AI24301	Application Based Programming In Python Lab	0	0	3	1.5	100

Objective(s)

The Student should be made to

- Create basic constructs of Python Programming .
- Learn Python programs with conditionals and loops.
- Understand the OOP concepts in Python
- Represent compound data using Python lists, tuples, dictionaries.
- Review data from/to web application in Python.

Outcome(s)

Upon completion of this course, students will be able to

- Use functions and data structures to solve problems
- Implement the OOP concepts in Python
- Perform string, file and Regular expression operations
- Develop a web application using Flask

LIST OF EXPERIMENTS

1.	Write a python program to find largest of three numbers
2.	Write a python program to construct the following pattern using nested for loop:
3.	Write a program to demonstrate working with tuples in python
4.	Write a program to demonstrate working with dictionaries in python
5.	Write a python program to find factorial of a number using recursion
6.	Install packages requests, flask and explore using (pip)
7.	Elliptical orbits in Pygame
8.	Simulate bouncing ball using Pygame
	TOTAL HOURS **30**

Dr.M.Kannan
BoS Chairman

MAHENDRA ENGINEERING COLLEGE(Autonomous)						
Syllabus						
Department	**Artificial Intelligence & Data Science**	**Programme Code & Name**			**1161**	
III Semester						
Course Code	**Course Name**	**Hours/Week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
24AI24302	**DATABASE TECHNOLOGY LABORATORY**	**0**	**0**	**3**	**1.5**	**100**
Objective(s)	**The student should be made to:** • Learn and implement important commands in SQL. • Learn the usage of nested and joint queries. • Be familiar with the use of a front end tool for GUI based application development.					
Outcome(s)	**Upon completion of this course, students will be able to** • Write simple and complex SQL queries using DML and DCL commands. • Formulate a database design using 3NF and BCNF. • Use advanced features such as stored procedures and triggers and incorporate in GUI based application development.					

LIST OF EXPERIMENTS	
1.	Create a database table, add constraints (primary key, unique, check, Not null) insert rows, update and delete rows using SQL DDL and DML commands.
2.	Create set of tables, add foreign key constraints and incorporate referential integrity.
3.	Queries to facilitate acquaintance of Built-In Functions, String Functions, Numeric Functions, Date Functions and Conversion Functions.
4.	Query the database tables and explore sub queries, simple join operations, explore natural, equi and outer joins.
5.	Database Design using ER Modelling,Normalization and Implementation for any application
6.	To implement PL/SQL program using control structures, procedures and functions.
7.	Execute complex transactions and realize DCL and TCL commands.
8.	Write SQL Triggers for insert, delete, and update operations in database table.
9.	Create View and index for database tables with large number of records.
10.	Design a XML database and validate it using XML schema.
11.	Create Document, column and graph based data using NOSQL database tools.
12.	Develop a simple GUI based database application (Mini Project). 1. Inventory Control Systems 2. Personal Information Systems 3. Library Management Systems 4. Hospital Management Systems 5. EB Bill Maintenance Systems
	TOTAL HOURS **30**

Dr.M.Kannan
BoS Chairman

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

Regulations 2024

IV Semester

Sl. No.	Course code	Course Title	L	T	P	C	Cate-Gory
	THEORY						
1	24MA12401	Discrete Mathematics & Graph Theory	3	1	0	4	BS
2	24IT14401	Computer Networks	3	0	0	3	PC
3	24AI14401	Foundations of AI & Data Science	3	0	0	3	PC
4	24CS14403	JAVA Programming	3	0	0	3	PC
5		Open Elective -2	3	0	0	3	OE
6	24CY11001	Environmental Science and Sustainability	2	0	0	2	HS
7	24AI34401	Operating Systems (Integrated)	2	0	2	3	PC
	PRACTICAL						
8	24AI24401	Artificial Intelligence and Java Programming Laboratory	0	0	3	1.5	PC
9	24HS6001	Professional Communicative Skills	0	1	2	2	EEC
		TOTAL	**19**	**2**	**5**	**24.5**	

Dr.M.Kannan
BoS Chairman

MAHENDRA ENGINEERING COLLEGE(Autonomous)							
Syllabus							
Department	**Information Technology**		**Programme Code**			**2071**	
IV Semester							
Course code	**Course Name**	**Hours/week**				**Credit**	**Maximum marks**
		L	**T**	**P**		**C**	
24IT14401	**COMPUTER NETWORKS**	3	0	0		3	**100**
Objective(s)	**The student should be made to:** • Understand the protocol layering and physical level communication. • Analyze the performance of a network. • Know the various components required to build different networks. • Learn the functions of network layer and the various routing protocols. • Familiarize the functions and protocols of the Transport layer.						
Outcome(s)	**On Completion of the course, the students should be able to:** • Explain the basic layers and its functions in computer networks. • Evaluate the performance of a network. • Summarize the basics of how data flows from one node to another. • Analyze and design routing algorithms. • Design protocols for various functions in the network.						
UNIT-I	**INTRODUCTION & PHYSICAL LAYER**						9
Networks – Network Types – Protocol Layering – TCP/IP Protocol suite – OSI Model – Physical Layer: Performance – Transmission media – Switching – Circuit-switched Networks – Packet Switching.							
UNIT-II	**DATA-LINK LAYER & MEDIA ACCESS CONTROL**						9
Introduction – Link-Layer Addressing – DLC Services –Goback N - Sliding Windows-Selective Repeat-Stop& Wait-Data-Link Layer Protocols – HDLC-– PPP - Media Access Control - Wired LANs: Ethernet - Wireless LANs – Introduction – IEEE 802.11, Bluetooth – Connecting Devices.							
UNIT-III	**NETWORK LAYER**						9
Network Layer Services - Packet Switching - IPV4 Addresses - Forwarding of IP Packets - Network Layer - Protocols: IP, ICMPv4, Mobile IP - Routing Algorithms- Unicast Routing Protocols- Multicast Routing Protocols - Next Generation IP: IPv6 Addressing, IPv6 Protocol.							
UNIT-IV	**TRANSPORT LAYER**						9
Introduction – Transport Layer Protocols – Services – Port Numbers – User Datagram Protocol – Transmission Control Protocol - Congestion Control – SCTP.							
UNIT-V	**APPLICATION LAYER**						9
WWW and HTTP – Electronic Mail - Telnet - SSH - DNS - SNMP – DHCP – IMAP – TLS/SSL – IP Security							
						TOTAL HOURS	**45**

TEXT BOOKS:	
1.	Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2013.

2.	Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.
REFERENCES:	
1	James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach", Seventh Edition, Pearson Education, 2017.
2	William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.
3	Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.
4	Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, Computer Networks: An Open Source Approach, McGraw Hill Publisher, 2011.
5	James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Sixth Edition, Pearson Education, 2013.

Dr.M.Kannan
BoS Chairman

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

Syllabus

Department	**Artificial Intelligence & Data Science**	**Programme Code**	**1161**

IV Semester

Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
24AI14401	**Foundations of AI &Data Science**	3	0	0	3	**100**

Objective(s)	**The student should be made to:** • Study the concepts of Artificial Intelligence • Define the methods of solving problems using Artificial Intelligence • Gain knowledge in the basic concepts of Data Analysis • Acquire skills in data preparatory and preprocessing steps • Learn the tools and packages in Python for data science
Outcome(s)	**Upon completion of this course, students will be able to:** • Identify problems that are amenable to solution by AI methods. • Describe appropriate AI methods to solve a given problem. • Apply the skills of data inspecting and cleansing. • Determine the relationship between data dependencies using statistics • Can handle data using primary tools used for data science in Python

UNIT-I	**INTELLIGENT AGENTS**	**9**

Introduction to AI – Agents and Environments – concept of rationality – nature of environments – structure of agents. Problem solving agents – search algorithms – uninformed search strategies.

UNIT-II	**REPRESENTATION OF KNOWLEDGE**	**9**

Game playing - Knowledge representation- Knowledge representation uses Predicate logic- Introduction to predicate calculus- Resolution- Use of predicate calculus- Knowledge representation using other logic-Structured representation of knowledge.

UNIT-III	**DATA SCIENCE**	9

Need for data science – benefits and uses – facets of data – data science process – setting the research goal – retrieving data – cleansing, integrating, and transforming data – exploratory data analysis – build the models – presenting and building applications.

UNIT-IV	**DESCRIBING DATA**	9

Frequency distributions – Outliers – relative frequency distributions – cumulative frequency distributions –frequency distributions for nominal data –interpreting distributions- graphs – averages – mode – median – mean – averages for qualitative and ranked data – describing variability – range – variance – standard deviation – degrees of freedom – interquartile range

UNIT-V	**DESCRIPTIVE STATISTICS**	9

Normal distributions – z scores – normal curve problems – finding proportions – finding scores – more about z scores – correlation – correlation coefficient for quantitative data – computational formula for correlation coefficient – regression – regression line – least squares regression line – standard error of estimate – interpretation of r2.

TOTAL HOURS	**45**

TEXT BOOKS :	
1	Kevin Night and Elaine Rich, Nair B., “Artificial Intelligence (SIE)”, McGraw Hill- 2008. .
2	Dan W. Patterson, “Introduction to AI and ES”, Pearson Education, 2007.
REFERENCES:	
1	Peter Jackson, “Introduction to Expert Systems”, 3rd Edition, Pearson Education, 2007.
2	Stuart Russel and Peter Norvig “AI – A Modern Approach”, 3rd Edition, Pearson Education 2016.
3	Deepak Khemani “Artificial Intelligence”, Tata McGraw Hill Education 2013.

Dr.M.Kannan
BoS Chairman

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

Syllabus

Department	Computer Science and Engineering	Programme Code & Name	1031 & CSE

IV Semester

Course code	Course Name	Hours/week			Credit	Maximum marks
		L	T	P	C	
24CS14403	JAVA PROGRAMMING	3	0	0	3	100

Objective(s)	**The student should be made to:** • Understand Object Oriented Programming concepts and basics of Java programming language • Know the principles of packages, inheritance and interfaces • Learn java application with threads and generics classes • Define exceptions and use I/O streams • Be Familiar in Graphical User Interface Application using JAVAFX
Outcome(s)	**Upon completion of this course , students will be able to:** • Apply the concepts of classes and objects to solve simple problems • Develop programs using inheritance, packages and interfaces • Demonstrate exception handling mechanisms and multithreaded model to solve real world problems • Build Java applications with I/O packages, string classes, Collections and generics concepts • Design the concepts of event handling and JavaFX components and controls for developing GUI based applications

UNIT-I	**INTRODUCTION TO OOP AND JAVA**	**9**

Overview of OOP – Object oriented programming paradigms – Features of Object Oriented Programming – Java Buzzwords – Overview of Java – Data Types, Variables and Arrays – Operators – Control Statements – Programming Structures in Java – Defining classes in Java – Constructors-Methods -Access specifiers - Static members- Java Doc comments

UNIT-II	**INHERITANCE, PACKAGES AND INTERFACES**	**9**

Overloading Methods – Objects as Parameters – Returning Objects –Static, Nested and Inner Classes. Inheritance: Basics– Types of Inheritance -Super keyword -Method Overriding – Dynamic Method Dispatch –Abstract Classes – final with Inheritance. Packages and Interfaces: Packages – Packages and Member Access –Importing Packages – Interfaces.

UNIT-III	**EXCEPTION HANDLING AND MULTITHREADING**	**9**

Exception handling basics – Multiple catch Clauses – Nested try Statements – Java's Built-in Exceptions – User defined Exception. Multithreaded Programming: Java Thread Model–Creating a Thread and Multiple Threads – Priorities – Synchronization – Inter Thread Communication, Suspending –Resuming and Stopping Threads –Multithreading. Wrappers – Auto boxing.

UNIT-IV	I/O, STRING HANDLING, DATABASE CONNECTIVITY	9
I/O Basics – Reading and Writing Console I/O – Reading and Writing Files. Strings: Basic String class, methods and String Buffer Class. Database Connectivity: Introduction to JDBC - JDBC Drivers & Architecture- CURD operation Using JDBC- Working with Result Set.		
UNIT-V	**JAVAFX EVENT HANDLING, CONTROLS AND COMPONENTS**	**9**
JAVAFX Events and Controls: Event Basics – Handling Key and Mouse Events. Controls: Checkbox, ToggleButton – RadioButtons – ListView – ComboBox – ChoiceBox – Text Controls – ScrollPane. Layouts – FlowPane – HBox and VBox – BorderPane – StackPane – GridPane. Menus – Basics – Menu – Menu bars – MenuItem.		
	TOTAL HOURS	**45**

TEXT BOOK :	
1	Herbert Schildt, “Java: The Complete Reference”, 12th Edition, McGraw Hill Education, New Delhi, 2022(Unit I,II, III, IV & V)
2	Herbert Schildt, “Introducing JavaFX 8 Programming”, 1 st Edition, McGraw Hill Education, New Delhi, 2015(Unit V)
REFERENCES:	
1	Cay S. Horstmann, “Core Java Fundamentals”, Volume 1, 11 th Edition, Prentice Hall, 2018
2	ElliotteRustry Harold, “Java Network Programming”, O’Reilly, 2014.
3	Nptel course, “Programming in Java”, https://onlinecourses.nptel.ac.in/noc24_cs43/preview
4	Coursera, Java Programming: Solving Problems with Software, https://www.coursera.org/learn/java-programming

Dr.M.Kannan
BoS Chairman

MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus						
Department	**Artificial Intelligence And Data Science**	**Programme Code**				**1161**
IV Semester						
Course Code	**Course Name**	**Hours /Week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
22AI24401	**JAVA PROGRAMMING LABORATORY**	**0**	**0**	**3**	**1.5**	**100**
Objective(s)	**The student should be made to:** • Write simple programs of Python programming language • Develop simple java programs with object oriented programming concepts • Learn to develop a solution for real world problems using i/o operations, generics and collections					
Outcome(s)	**Upon completion of this course, student will be able to** • Simulate their sample proposed systems for AI • Develop simple java programs using object oriented concepts • Build a solution for real world problems using i/o operations, generics and collections					

LISTOF EXPERIMENTS

1.	a.Write a java program to find the Fibonacci series using recursive and non-recursive functions b. Write a program to multiply two given matrices. c. Write a program for Method overloading and Constructor overloading
2.	a.Write a program to demonstrate execution of static blocks ,static variables & static methods. b.Write a program for sorting a given list of names in ascending order
3.	a.Write a program to implement single and Multi level inheritance b.Write a program to implement Hierarchical Inheritance c.Write a program to implement method overriding.
4.	a. Write a program to implement Interface. b. Write a program to implement multiple and Hybrid Inheritance
5.	a.Write a program to create user defined package and demonstrate various access modifiers b.Write a program to demonstrate the use of super and final keywords
6.	Implement exception handling and creation of user defined exception.
7.	Develop application to demonstrate database connectivity
8.	Implement the concepts of collection frameworks.
	TOTAL HOURS **30**

Dr.M.Kannan
BoS Chairman

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

Syllabus

Department	Information Technology	Programme Code	1161

IV Semester

Course code	Course Name	Hours/week			Credit	Maximum marks
		L	T	P	C	
24IT34401	OPERATING SYSTEMS (Integrated Course)	2	0	2	3	100

Objective(s)	**The student should be able to:** **Theory:** • Learn the fundamentals of Processes and Threads • Analyze various scheduling and memory management schemes • Familiarize the concepts of file management **Laboratory:** • Learn Unix commands and shell programming • Implement various CPU Scheduling Algorithms • Ability to develop OS for distributed systems
Outcome(s)	**Upon completion of this course , students will be able to:** **Theory:** • Analyze various Processes and Threads, scheduling algorithms. • Compare and contrast memory and storage management schemes. • Describe the concepts of file management **Laboratory**: • Compare the performance of various CPU Scheduling Algorithms • Implement Deadlock avoidance and Detection Algorithms • Analyze the performance of the various Page Replacement Algorithms

UNIT-I	INTRODUCTION AND PROCESS MANAGEMENT	7

Operating system overview- Evolution of Operating System- Computer System Organization - Operating System Structure and Operations- System Calls, System Programs, OS Generation and System Boot- Processes - Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication; CPU Scheduling - Scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real time scheduling.

UNIT-II	THREADS AND DEADLOCK	8

Threads- Overview, Multithreading models, Threading issues; Process Synchronization - The critical-section problem, Synchronization hardware, Mutex locks, Semaphores, Classic problems of synchronization, Critical regions, Monitors; Deadlock - System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

UNIT-III	MEMORYAND STORAGE MANAGEMENT

Main Memory – Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Segmentation with paging,Virtual Memory – Background, Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory- Mass Storage system- File-System Interface- File System Implementation.

LISTOF EXPERIMENTS	
1. Study of hardware and software requirements of different Operating Systems.(UNIX,LINUX,WINDOWS) 2. Basic Unix file system commands such as ls, cd, mkdir, rmdir, cp, rm, mv, more, lpr, man, grep, sed, etc. 3. Write programs using the following system calls of UNIX operating system fork, exec, getpid, exit, wait, close, stat, opendir, readdir. 4. Implement the various CPU Scheduling Algorithms a)FCFS b)SJS 5. Implement the various CPU Scheduling Algorithms a) Priority Scheduling b)Round Robin Scheduling 6. Bankers Algorithm for Deadlock Avoidance 7. Implementation of Deadlock Detection Algorithm 8. Implement the Producer-Consumer Problem in Semaphore. 9. Write C program to implement Threading Applications. 10. Implementation of the following Memory Allocation Methods for fixed partition a)First Fit b) Worst Fit c) Best Fit 11. Implementation of the following Page Replacement Algorithms a)FIFO b) LRU c) LFU	
TOTAL HOURS	**45**

TEXT BOOKS:	
1	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, ―Operating System Concepts, 9th Edition, John Wiley and Sons Inc., 2012.
REFERENCES:	
1	RamazElmasri, A. Gil Carrick, David Levine, ―Operating Systems – A Spiral Approach, Tata McGraw Hill Edition, 2010.
2	AchyutS.Godbole, AtulKahate, ―Operating Systems, McGraw Hill Education, 2016.
3	Andrew S. Tanenbaum, ―Modern Operating Systems, Second Edition, Pearson Education, 2004.
4	Gary Nutt, ―Operating Systems, Third Edition, Pearson Education, 2004.
5	Harvey M. Deitel, ―Operating Systems, Third Edition, Pearson Education, 2004.
6	Daniel P Bovet and Marco Cesati, ―Understanding the Linux kernel, 3rd edition, O‘Reilly, 2005.
7	Neil Smyth, ―iPhone iOS 4 Development Essentials – Xcode, Fourth Edition, Payload media, 2011.

Dr.M.Kannan
BoS Chairman

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

Regulations 2024

V Semester

Sl. No.	Course code	Course Title	L	T	P	C	Cate-Gory
	THEORY						
1	24AI14501	Big Data Analytics	3	0	0	3	PC
2	24AI14502	Data Visualization	3	0	0	3	PC
3	24AI14503	Machine Learning Techniques	3	0	0	3	PC
4		Program Elective – 1(Advanced Java programming)	3	0	0	3	PE
5		Open Elective – 3	3	0	0	3	OE
6		Open Elective – 4 (Aptitude – III)	2	1	0	3	OE
	PRACTICAL						
7	24AI24501	Big Data Analytics Laboratory	0	0	3	1.5	PC
8	24AI24502	Machine Learning Techniques Laboratory	0	0	3	1.5	PC
9	24HS60002	Interview Skills and Soft Skills	0	1	3	2	EEC
10	24AI24503	Internship in Industry	-	-	-	1	EEC
		TOTAL	**17**	**2**	**9**	**24**	

Dr.M.Kannan

BoS Chairman

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

Syllabus

Department	Artificial Intelligence And Data Science	Programme Code	1161

V Semester

Course code	Course Name	Hours/week			Credit	Maximum marks
		L	T	P	C	
24AI14501	BIG DATA ANALYTICS	3	0	0	3	100

Objective(s)	**The student should be made to:** • Familiarize the concepts of big data • Explore the fundamental concepts of big data and analytics • Learn the basics of big data technologies. • Design applications using Map Reduce Concepts • Gain the usage of Hadoop related tools for Big Data Analytics
Outcome(s)	**Upon completion of this course, students will be able to:** • Explain the different types of quantitative data. • Summarize the empirical distribution of data and create simple visualizations. • Illustrate big data platform and explore the big data analytics techniques business applications. • Analyze the HADOOP and Map Reduce technologies associated with big data analytics • Apply Hadoop-related tools such as HBase, Cassandra, Pig, and Hive for big data analytics.

UNIT-I	INTRODUCTION TO BIG DATA	9

Evolution of Big data – Best Practices for Big data Analytics – Big data characteristics – Validating – The Promotion of the Value of Big Data – Big Data Use Cases- Characteristics of Big Data Applications – Perception and Quantification of Value -Understanding Big Data Storage.

UNIT-II	BIG DATA ANALYTICS	8
Overview of Business Intelligence - Data Science and Analytics - Meaning and Characteristics of big data analytics - Need of big data analytics - Classification of analytics – Challenges and important to big data analytics - Basic terminologies in big data environment.		
UNIT-III	**BIG DATA TECHNOLOGIES AND DATABASES**	**10**
Introduction to NoSQL - Uses - Features and Types – Need – Advantage - Disadvantages and Application of NoSQL - Overview of NewSQL - Comparing SQL - NoSQL and NewSQL - Introduction to MongoDB and its needs - Characteristics of MongoDB - Introduction of apache cassandra and its needs - Characteristics of Cassandra.		
UNIT-IV	**HADOOP FOUNDATION FOR ANALYTICS AND MAPREDUCE**	**9**
History –Features - Key advantage and Versions of Hadoop - Essential of Hadoop ecosystems - RDBMS versus Hadoop - Key aspects and Components of Hadoop - Hadoop architectures - Hadoop MapReduce: Introduction to MapReduce - Processing data with Hadoop using MapReduce. Hbase – data model and implementations – Hbase clients – Hbase examples – praxis. Pig – Grunt – pig data model – Pig Latin – developing and testing and scripts .Hive – data types and file formats – HiveQL data definition and manipulation – HiveQL queries.		
UNIT-V	**DATA ANALYTICS**	**9**
Data analytics with R: Machine Learning ,types of machine learning ,Big Data analytics with Big R. Data analysis with Spark Shell: Writing Spark Application-Spark Programming in Scala ,Python, R, Java - Application Execution. Spark SQL and GraphX: SQL Context – Importing and Saving data – Data frames – using SQL – GraphX overview – Creating Graph – Graph Algorithms. SparkStreaming:Overview–ErrorsandRecovery–StreamingSource–Streaminglivedatawith spark.Recent Trends in Big Data Analytics.		
	TOTAL HOURS	**45**

TEXT BOOK :

1	Seema Acharya, Subhashini Chellappan – “Big Data and Analytics”, Wiley 2015 Edition.
2	Minelli, Chambers, Dhiray- “Big Data Big Analytics”, John Wiley & Sons, Inc, Copyright 2013.
3	Eric Sammer, "Hadoop Operations", O'Reilley, 2012.

REFERENCES:

1	Bart Baesens – "Analytics in a Big Data World", John Wiley & Sons, Inc, Copyright 2013
2	Boris Lublinsky, Kevin T. Smith – "Hadoop Solutions", Wrox, 1st Edition, Kindle Edition.
3	Chuck Lam – "Hadoop in Action", Dreamtech- Paperback – 25 Dec 2010.
4	TomPlunkett,MarkHornick,"UsingRtoUnlocktheValueofBigData:BigDataAnalyticswith Oracle R Enterprise and Oracle R Connector for Hadoop", McGraw-Hill/Osborne Media (2013), Oracle press.
5	https://nptel.ac.in/courses/106104189/big data computing

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	-	-	3	3	2	2	-
CO2	3	2	2	-	-	-	-	-	-	-	3	3	2	2	-
CO3	3	1	-	-	-	-	-	-	-	-	3	3	1	2	-
CO4	3	2	2		-	-	-	-	-	-	3	3	2	2	-
CO5	3	1	-	-	-	-	-	-	-	-	3	3	1	2	-
Average	**3**	2	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**2**	**2**	**-**

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

<table>
<tr><td colspan="7">MAHENDRA ENGINEERING COLLEGE
(Autonomous)</td></tr>
<tr><td colspan="7">Syllabus</td></tr>
<tr><td>Department</td><td colspan="4">Artificial Intelligence And Data Science</td><td>Programme Code</td><td>1161</td></tr>
<tr><td colspan="7">V Semester</td></tr>
<tr><td rowspan="2">Course code</td><td rowspan="2">Course Name</td><td colspan="3">Hours/week</td><td rowspan="2">Credit</td><td rowspan="2">Maximum marks</td></tr>
<tr><td>L</td><td>T</td><td>P</td></tr>
<tr><td>24AI14502</td><td>DATA VISUALIZATION</td><td>3</td><td>0</td><td>0</td><td>3</td><td>100</td></tr>
<tr><td>Objective(s)</td><td colspan="6">The student should be made to:
• To understand the fundamental concepts and components used in the data visualization.
• To learn tools and techniques for creating interactive and effective visualizations
• To apply visualization methods for solving real-world and security relate problems</td></tr>
<tr><td>Outcome(s)</td><td colspan="6">Upon completion of this course, students will be able to:
• Applydatavisualizationprinciplestodesigneffectiveandmeaningfulvisualrepresentations.
• Analyze various data visualization methods to select appropriate techniques for different data types.</td></tr>
</table>

	• Implement data acquisition and processing techniques for extracting and preparing data for visualization. • Implement interactive visualization tools and frameworks to develop dynamic and engaging visualizations. • Evaluatesecuritydatavisualizationtechniquestoassessandmitigatecybersecuritythreats.	
UNIT-I	**INTRODUCTIONTODATA VISUALIZATION**	**9**
Context of data visualization – Definition,Methodology, Visualization design objectives. Key Factors – Purpose, visualization function and tone, visualization design options – Data representation, Data Presentation, Seven stages of data visualization, widgets, data visualization tools.		
UNIT-II	**DATAVISUALIZATIONMETHODS**	**8**
Mapping-Timeseries-Connectionsandcorrelations–Indicator-AreaChart-Pivottable-Scattercharts, Scatter maps - Tree maps, Space filling and non-space filling methods-Hierarchies and Recursion - Networks and Graphs -Matrix representation for graphs- Info graphics		
UNIT-III	**DATAVISUALIZATIONPROCESS**	**10**
Acquiring data, - Tools for Acquiring Data from the Internet, Locating Files for Use with Processing,LoadingTextData,Parsingdata,LevelsofEffort,ToolsforGatheringClues,TextMarkup Languages, Regular Expressions (regexps), Vectors and Geometry, Binary Data Formats.		
UNIT-IV	**INTERACTIVEDATAVISUALIZATION**	**9**
Technology Fundamentals- Setting up D3- Drawing with data – Scales – Axes – Updates, Transition and Motion – Interactivity - Layouts – Geomapping – Exporting, Framework – T3 JavaScript Framework- Tableau		
UNIT-V	**SECURITYDATAVISUALIZATION**	**9**
Port scan visualization - Vulnerability assessment and exploitation - Firewall log visualization – Intrusion detection log visualization-Attacking and defending visualization systems Creating security visualization system.		
	TOTAL HOURS	**45**

TEXT BOOK :	
1	Ben Fry, "Visualizing data: Exploring and explaining data with the processing environment", O'Reilly, 2008

REFERENCES:

1	Scott Murray, “Interactive data visualization for the web”, O’Reilly Media, Inc., Second Edition, 2017.
2	Greg Conti, “Security Data Visualization: Graphical Techniques for Network Analysis”,NoStarch Press Inc, 2007

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	-	2	-	-	-	-	-	-	-	-	2	2
CO2	2	2	2	-	3	-	-	-	-	-	-	-	-	2	3
CO3	2	3	2	-	2	-	-	-	-	-	-	-	-	2	3
CO4	1	-	1	-	-	-	-	-	-	-	-	-	-	2	3
CO5	2	2	1	3	-	-	-	-	-	-	-	-	-	2	3
Average	**2**	2	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**

1 - Low, 2 - Medium, 3 - High, ‘-“- No Correlation

MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus						
Department	**Artificial Intelligence And Data Science**	**Programme Code**			**1161**	
V Semester						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
24AI14503	**MACHINE LEARNING TECHNIQUES**	3	0	0	3	**100**
Objective(s)	**The student should be made to** • Know the concepts of Machine Learning. • Familiarize the supervised learning and their applications. • Gain knowledge about the concepts and algorithms of unsupervised learning. • Understand the theoretical and practical aspects of Probabilistic Graphical					

	Models. • Learn the concepts and algorithms of advanced learning.	
Outcome(s)	**Upon completion of this course, students will be able to:** • Define a learning model appropriate to the application. • Design a Neural Network for an application of your choice. • Implement Probabilistic Discriminative and Generative algorithms for an application of your choice and analyze the results. • Apply tool to implement typical Clustering algorithms for different types of applications. • Identify applications suitable for different types of Machine Learning with suitable justification.	
UNIT-I	**INTRODUCTION**	**9**
Machine Learning–Types and Process of Machine Learning-Machine Learning algorithms, Turning data into Probabilities, and Statistics for Machine Learning- Probably Approximately Correct (PAC) learning, Hypothesis spaces, Inductive bias, Generalization, Bias variance trade-off.-Probability theory and Distributions – Decision Theory.		
UNIT-II	**SUPERVISED LEARNING**	**9**
Linear Models for Regression – Linear Models for Classification- – Decision Tree Learning – Bayesian Learning, Naïve Bayes –-Neural Networks-The Perceptron Learning Algorithm, Multi-layer Perceptron, Feed- forward Network, Error Back propagation - Support Vector Machines-Random Forest.		
UNIT-III	**UNSUPERVISED LEARNINGAND ENSEMBLE TECHNIQUES**	**9**
Clustering- K-means – EM Algorithm- Mixtures of Gaussians –Dimensionality Reduction, Linear Discriminant Analysis, Factor Analysis, Principal Components Analysis, Independent Components Analysis.Ensemble Methods, Bagging, Boosting, Stacking,Sampling-Basic Sampling methods, Monte Carlo, Gibbs Sampling		
UNIT-IV	**NEURAL NETWORKS**	**8**
Artificial Neural Networks: Introduction, Biological motivation, ANN representation, appropriate problem for ANN learning, Perceptron, multilayer networks and the back propagation algorithm, Popular CNN Architectures, RNNs, LSTM, BERT, GANS and Generative Models		
UNIT-V	**ADVANCED MACHINE LEARNING**	**10**
Reinforcement learning – Markov Decision processes,Gaussian Process Regression- Gaussian Process Classification-Guidelines for machine learning experiments, Cross Validation (CV) and resampling – K-fold CV, bootstrapping, measuring classifier performance, assessing a single		

classification algorithm and comparing two classification algorithms – t test, McNemar's test, K-fold CV paired t test.	
TOTAL HOURS	**45**

TEXT BOOK:	
1	Stephen Marsland, "Machine Learning: An Algorithmic Perspective, "Second Edition", CRC Press, 2014.
2	Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Third Edition, 2014
REFERENCES:	
1	Christopher Bishop, "Pattern Recognition and Machine Learning" Springer, 2007
2	Tom Mitchell, "Machine Learning", McGraw-Hill, 1997.
3	Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, "Foundations of Machine Learning",Second Edition, MIT Press, 2012, 2018.
4	Sebastain Raschka, Vahid Mirjalili , "Python Machine Learning", Packt publishing, 3rd Edition,2019.

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	2	1	2	1	-	-	-	-	3	3	2	2	2	1	-
CO2	1	3	3	1	2	-	-	-	2	2	2	1	3	1	-
CO3	2	1	3	3	2	-	-	-	1	1	1	1	1	1	-
CO4	2	3	3	2	1	-	-	-	3	2	3	2	1	1	-
CO5	1	1	3	3	1	-	-	-	3	1	1	3	3	2	-
Average	**2**	**2**	**3**	**2**	**2**	**-**	**-**	**-**	**2**	**2**	**2**	**2**	**2**	**1**	**-**

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

MAHENDRA ENGINEERING COLLEGE (Autonomous)			
Syllabus			
Department	**Artificial Intelligence And Data Science**	**Programme Code**	**1161**
V Semester			

<table>
<tr><th>Course code</th><th>Course Name</th><th colspan="4">Hours/week</th><th>Credit</th><th>Maximum marks</th></tr>
<tr><td rowspan="2">24AI24501</td><td rowspan="2">BIG DATA ANALYTICS LABORATORY</td><td>L</td><td>T</td><td>P</td><td>C</td><td rowspan="2">100</td></tr>
<tr><td>0</td><td>0</td><td>3</td><td>1.5</td></tr>
<tr><td>Objective(s)</td><td colspan="7">The student should be made to:
• Know Map Reduce programs for processing big data.
• Realize storage of big data using H base, Mongo DB.
• Analyze big data using linear models.
• Analyze big data using machine learning techniques such as SVM / Decision tree classification and clustering.
• Learn the usage of Hive related tools for Big Data Analytics</td></tr>
<tr><td>Outcome(s)</td><td colspan="7">Upon completion of this course, students will be able to:
• Process big data using Hadoop framework.
• Build and apply linear and logistic regression models.
• Perform data analysis with machine learning methods.
• Perform graphical data analysis.
• Illustrate and apply different operations on relations and databases using Hive.</td></tr>
<tr><td colspan="8">LIST OF EXPERIMENTS</td></tr>
<tr><td colspan="8">Hadoop

1. To Study of Hadoop installation and HDFS.

2. Implement word count / frequency programs using Map Reduce

3. Implement an MR program that processes a weather dataset

R - Programming

1. Implement Linear and logistic Regression

2. To implement the SVM / Decision tree classification techniques

3. Implement clustering techniques

4. Visualize data using any plotting framework

5. Implement an application that stores big data in Hbase / MongoDB / Pig using Hadoop / R.

Hive</td></tr>
</table>

1. Installation of Hive along with practice examples. 2. Practice importing and exporting data from various databases. Spark SQL: 1. Distributed Cache & Map Side Join, reduce side Join Building and Running a Spark Application Word count in Hadoop and Spark Manipulating RDD 2. Inverted Indexing in Spark Sequence alignment problem in Spark Implementation of Matrix algorithms in Spark Sql programming, Building Spark Streaming application	
TOTAL HOURS	**30**

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	3	3	-	-	-	-	1	1	2	1	3	3	-
CO2	1	2	3	3	-	-	-	-	3	2	3	3	3	3	-
CO3	3	1	3	3	-	2	-	-	1	3	1	2	3	3	-
CO4	2	1	1	1	-	-	-	-	2	3	1	2	3	2	-
CO5	3	1	1	1	-	-	-	-	1	3	3	3	2	3	-
Average	**3**	1	**2**	**2**	**-**	**-**	**-**	**-**	**2**	**2**	**2**	**2**	**3**	**2.8**	**-**

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

Syllabus

Department	**Artificial Intelligence And Data Science**	**Programme Code & Name**	**1161**

V Semester

Course Code	Course Name	Hours/Week			Credit	Maximum marks
		L	T	P	C	
24AI24502	**MACHINE LEARNING TECHNIQUES LABORATORY**	**0**	**0**	**3**	**1.5**	**100**

Objective(s)	**The student should be made to** • Apply the concepts of Machine Learning to solve real-world problems. • Implement basic algorithms in clustering & classification applied to text & numeric data. • Implement algorithms emphasizing the importance of bagging & boosting in classification &regression. • Implement algorithms related to dimensionality reduction. • Apply machine learning algorithms for Natural Language Processing applications.
Outcome(s)	**Upon completion of this course, students will be able to:** • Learn to use Weka tool for implementing machine learning algorithms related to numeric data. • Learn the application of machine learning algorithms for text data. • Use dimensionality reduction algorithms for image processing applications. • Apply crfs in text processing applications. • Use fundamental and advanced neural network algorithms for solving real-world data.

LIST OF EXPERIMENTS

1.	Solving Regression & Classification using Decision Trees
2.	Root Node Attribute Selection for Decision Trees using Information Gain
3.	Bayesian Inference in Gene Expression Analysis
4.	Pattern Recognition Application using Bayesian Inference

5.	Bagging in Classification and Boosting applications using Regression Trees
6.	Non-parametric Locally Weighted Regression algorithm in order to fit data points.
7.	Data & Text Classification using Neural Networks
8.	Using Weka tool for SVM classification for chosen domain application
9.	Data & Text Clustering using K-means algorithm and Gaussian Mixture Models
10.	Build the graph based learning models for standard data sets.
	TOTAL HOURS **30**

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	1	-	-	-	-	-	2	3	3	3	2	-
CO2	2	1	1	3	2	-	-	-	-	2	3	2	3	1	-
CO3	2	2	1	1	2	-	-	-	-	1	1	1	2	3	-
CO4	2	2	3	3	2	-	-	-	-	2	1	1	1	1	-
CO5	2	2	3	1	2	-	-	-	-	2	1	1	2	2	-
Average	**2**	2	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**2**	**2**	**2**	**2**	**2**	**-**

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

Regulations 2024

VI Semester

Sl. No.	Course code	Course Title	L	T	P	C	Cate-Gory
	THEORY						
1	24AI14601	Deep Learning	3	0	0	3	PC
2	24AI14602	Generative AI	3	0	0	3	PC
3	24AI14603	Natural Language Processing	3	0	0	3	PC
4		Program Elective-2	3	0	0	3	PE
5		Program Elective-3	3	0	0	3	PE
6		Open Elective-5	3	0	0	3	OE
7		Constitution of India	3	0	0	-	MC
	PRACTICAL						
7	24AI24601	Deep Learning Laboratory	0	0	3	1.5	PC
8	24AI24602	Natural Language Processing Laboratory	0	0	3	1.5	PC
9	24AI26601	Mini Project	0	0	6	3	EEC
		TOTAL	**19**	**0**	**12**	**24**	

Dr.M.Kannan
BoS Chairman

<table>
<tr><td colspan="6">MAHENDRA ENGINEERING COLLEGE
(Autonomous)</td></tr>
<tr><td colspan="6">Syllabus</td></tr>
<tr><td>Department</td><td colspan="2">Artificial Intelligence And Data Science</td><td colspan="2">Programme Code</td><td>1161</td></tr>
<tr><td colspan="6">VI Semester</td></tr>
<tr><td>Course code</td><td>Course Name</td><td colspan="3">Hours/week</td><td>Credit</td><td>Maximum marks</td></tr>
<tr><td rowspan="2">24AI14601</td><td rowspan="2">DEEP LEARNING</td><td>L</td><td>T</td><td>P</td><td>C</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Objective(s)</td><td colspan="5">The student should be made to:
• Learn the principles of deep neural networks
• Gain CNN and RNN architectures of deep neural networks
• Comprehend advanced deep learning models
• To study Deep Reinforcement Learning and the use of real-time applications.
• Gain the basics of deep neural networks</td></tr>
<tr><td>Outcome(s)</td><td colspan="5">Upon completion of this course , students will be able to :
• Explain the basics in deep neural networks
• Apply Convolution Neural Network for image processing
• Apply Recurrent Neural Network and its variants for text analysis
• Understanding deep reinforcement Learning
• Apply auto encoders and generative models for suitable applications</td></tr>
<tr><td>UNIT-I</td><td colspan="4">DEEP NETWORKS BASICS</td><td>9</td></tr>
<tr><td colspan="6">Linear Algebra: Scalars -Vectors - Matrices and tensors; Probability Distributions – Gradient based Optimization – Machine Learning Basics: Capacity – Over fitting and under fitting – Hyper parameters and validation sets - Estimators - Bias and variance - Stochastic gradient descent - Challenges motivating deep learning; Deep Networks: Deep feed forward networks; Regularization - Optimization.</td></tr>
</table>

UNIT-II	CONVOLUTIONAL NEURAL NETWORKS	9
Convolution Operation - Sparse Interactions -Parameter Sharing -- Equivariance - Pooling - Convolution Variants: Strided - Tiled - Transposed and dilated convolutions; CNN Learning: Nonlinearity Functions - Loss Functions - Regularization - Optimizers-Gradient Computation.		
UNIT-III	**RECURRENT NEURAL NETWORKS**	9
Unfolding Graphs - RNN Design Patterns: Acceptor - Encoder -Transducer; Gradient Computation - Sequence Modeling Conditioned on Contexts - Bidirectional RNN - Sequence to Sequence RNN – Deep Recurrent Networks - Recursive Neural Networks -Long Term Dependencies; Leaky Units: Skip connections and dropouts; Gated Architecture: LSTM.		
UNIT-IV	**DEEP REINFORCEMENT LEARNING**	9
Reinforcement Learning Theory – Markov Decision process – Monte Carlo methods – Temporal Difference methods – Value functions – Q learning – Deep Q-learning – Policy gradient methods – Model-based methods -Actor-Critic Methods		
UNIT-V	**AUTO ENCODERS AND GENERATIVE MODELS**	9
Auto encoders: Under complete auto encoders - Regularized auto encoders - Stochastic encoders and decoders - Learning with auto encoders; Deep Generative Models: Variational auto encoders – Generative adversarial networks.		
	TOTAL HOURS	**45**

TEXT BOOKS :

1	Ian Goodfellow, Yoshua Bengio, Aaron Courville, ``Deep Learning", MIT Press, 2016.
2	Andrew Glassner, “Deep Learning: A Visual Approach”, No Starch Press, 2021.

REFERENCES:

3	Salman Khan, Hossein Rahmani, Syed Afaq Ali Shah, Mohammed Bennamoun, ``A Guide to Convolutional Neural Networks for Computer Vision", Synthesis Lectures on Computer Vision, Morgan & Claypool publishers, 2018.
4	Yoav Goldberg, ``Neural Network Methods for Natural Language Processing",

	Synthesis Lectures on Human Language Technologies, Morgan & Claypool publishers, 2017
5	Francois Chollet, ``Deep Learning with Python'', Manning Publications Co, 2018
6	Charu C. Aggarwal, ``Neural Networks and Deep Learning: A Textbook'', Springer International Publishing, 2018
	Josh Patterson, Adam Gibson, ``Deep Learning: A Practitioner's Approach'', O'Reilly Media, 2017

COs Vs POs and PSOs Mapping

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	2	3	1	-	-	-	2	1	3	1	3	1	-
CO2	2	2	2	3	3	-	-	-	1	2	2	1	3	1	-
CO3	3	3	3	3	3	-	-	-	2	3	1	2	1	1	-
CO4	3	3	1	1	1	-	-	-	1	2	1	1	1	1	-
CO5	3	2	2	2	3	-	-	-	2	2	2	2	2	2	-
Average	**3**	2	**2**	**2**	**2**	**-**	**-**	**-**	**2**	**2**	**2**	**1**	**2**	**1**	**-**

1 - Low, 2 - Medium, 3 - High, ‘-“- No Correlation

<table>
<tr><td colspan="7">MAHENDRA ENGINEERING COLLEGE
(Autonomous)</td></tr>
<tr><td colspan="7">Syllabus</td></tr>
<tr><td>Department</td><td colspan="2">Artificial Intelligence And Data Science</td><td colspan="2">Programme Code</td><td colspan="2">1161</td></tr>
<tr><td colspan="7">VI Semester</td></tr>
<tr><td rowspan="2">Course code</td><td rowspan="2">Course Name</td><td colspan="3">Hours/week</td><td>Credit</td><td rowspan="2">Maximum marks</td></tr>
<tr><td>L</td><td>T</td><td>P</td><td>C</td></tr>
<tr><td>24AI14602</td><td>GENERATIVE AI</td><td>3</td><td>0</td><td>0</td><td>3</td><td>100</td></tr>
<tr><td>Objective(s)</td><td colspan="6">The student should be made to:
• Understand the principles and Key technological trends behind generative AI
• To enhance the performance and control the behavior of generative AI models and effective prompt engineering Techniques.
• Gain the knowledge about Generative models.
• Apply generative AI techniques to real-world problems and domains.</td></tr>
</table>

	• Keep up-to-date with the ethical issue and limitations in the field of generative AI.	
Outcome(s)	**Upon completion of the course, the students should be able to:** • Acquire insights into the key technological trends driving generative AI models. • Acquire the ability to apply effective prompt engineering techniques to enhance the performance and control the behavior of generative AI models. • Build, train and apply generative models and develop familiarity with platforms. • Ability to comprehend ethical issues and limitations of generative AI models.	
UNIT-I	**INTRODUCTION TO GENERATIVE AI**	9
Capabilities - History and Evolution -Benefits- Challenges - Applications of Generative AI – Tools for Text, Image Code, Audio and Video generation– Economic Potential of Generative AI - Use cases		
UNIT-II	**PROMPT ENGINEERING TECHNIQUES AND APPROACHES**	9
Prompt Creation -Writing effective prompts -Techniques for using text prompts: Zero shot and few-shot prompt techniques – Prompt engineering approaches: Interview pattern, Chain-of Thought, Tree-of Thought - Benefits of using text prompts - Challenges in generating meaningful and coherent prompts.		
UNIT-III	**MODELS FOR GENERATIVE AI**	10
Basics of Sequential data processing – Building blocks of Generative AI - Discriminative modelling – Generative modelling –Recurrent Neural Networks – Long Short-Term Memory (LSTM) Networks - Generative Adversarial Networks (GANs) - Variational Autoencoders (VAEs) – Transformer–based Models - Diffusion models- Applications		
UNIT-IV	**PLATFORMS FOR GENERATIVE AI**	9
Introduction to Platforms – Features of platforms – Capabilities -Applications - Pre-trained Models - Challenges – Generation of Text to Text – Generation of Text to Image – Text to Code Generation – Explainable AI – Benefits – Use cases.		
UNIT-V	**ETHICAL ISSUES AND LIMITATIONS OF GENERATIVE AI**	8
Limitations of Generative AI – Issues and concerns – Considerations for Responsible Generative AI – Economic Implications – Social Implications – Future and professional Growth of Generative AI.		
TOTAL HOURS		**45**

TEXT BOOKS:	
1	Deep Learning: Teaching Machines to Paint, Write, Compose and Play, David Foster, 2023. 2nd edition. O'Reilly Media, Inc.
2	Deep Learning, Ian Good fellow, Yoshua Bengio, Aaron Courville, MIT Press, 2016.
REFERENCES:	
1	Hands-on Generative Adversarial Networks with Keras, Rafael Valle. Packt Publisher, 2019

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	-	-	-	2	-	-	2	-	-	-
CO2	-	3	3	2	3	2	3	3	2	2	3	2	3	2	2
CO3	-	-	3	2	3	2	3	3	2	2	3	2	3	2	2
CO4	-	-	-	2	-	2	3	3	2	-	-	2	-	-	2
CO5	-	2	2	3	-	3	2	3	-	-	-	2	2	-	-
Average	**-**	2	**3**	**2**	**3**	**2**	**3**	**3**	**2**	**2**	**3**	**2**	**-**	**2**	**2**

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

MAHENDRA ENGINEERING COLLEGE (Autonomous)				
Syllabus				
Department	**Artificial Intelligence And Data Science**	**Programme Code**	**1161**	
VI Semester				
Course code	**Course Name**	**Hours/week**	**Cred**	**Maximu**

					it	**m marks**
24AI14603	**NATURAL LANGUAGE PROCESSING**	**L**	**T**	**P**	**C**	**100**
		3	0	0	3	
Objective(s)	**The student should be made to:** • Learn the fundamentals of natural language processing • Gain knowledge in current methods for statistical approaches to machine translation • Understand the use of CFG and PCFG in NLP • Know the role of semantics of sentences and pragmatics • To learn about NLP Tools and real-time examples of NLP.					
Outcome(s)	**Upon completion of the course, the students should be able to:** • Elaborate tag in a given text with basic Language features • Design an innovative application using NLP components • Implement a rule based system to tackle morphology/syntax of a language • Create a tag set to be used for statistical processing for real-time applications • Design an innovative application using NLP components.					
UNIT-I	**INTRODUCTION**					9
Introduction- Phases of NLP-Challenges of NLP, Language Modeling: Grammar-based LM, Statistical LM -Regular Expressions, Finite-State Automata – English Morphology, Finite state Transducer, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.						
UNIT-II	**WORD LEVEL ANALYSIS**					9
Unsmoothed N-grams, Evaluating N-grams, Smoothing, Laplace Smoothing, Interpolation and Back pyhoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.						
UNIT-III	**SYNTACTIC ANALYSIS**					10
Context-Free Grammars, Grammar rules for English, Dependency Parsing: Dependency Grammar, Graph-based dependency parsing – Syntactic Parsing, Ambiguity, Normal Forms for grammar, CYK algorithm – Dynamic Programming parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs - Feature structures, Unification of feature structures.						

UNIT-IV	**SEMANTICS ANALYSIS AND DISCOURSE PROCESSING**	9
Semantic representation, First-Order Logic– Syntax-Driven Semantic analysis, Semantic attachments – Lexical Semantics, Sense ambiguity, Word Sense Disambiguation, Discourse Processing: cohesion-Reference Resolution, Discourse Coherence and Structure.		
UNIT-V	**NLP TOOLS AND APPLICATIONS**	8
Tools: Natural Language Toolkit, Apache Open NLP. Applications of Text Analytics – Applications in social media - Life science - Legal Text – Visualization - Case studies.		
	TOTAL HOURS	**45**

TEXT BOOKS:	
1	Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
2	Sunil Patel, "Deep Learning for Natural Language Processing", BPB Publications, 2021
REFERENCES:	
1	Breck Baldwin, —Language Processing with Java and Ling Pipe Cookbook, Atlantic Publisher, 2015.
2	Richard M Reese, —Natural Language Processing with Javall, O_Reilly Media, 2015.
3	Nitin Indurkhya and Fred J. Damerau, —Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
4	Tanveer Siddiqui, U.S. Tiwary, —Natural Language Processing and Information Retrievalll, Oxford University Press, 2008.

COs Vs POs and PSOs Mapping

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	3	1	3	-	-	-	1	2	3	1	3	1	-
CO2	3	1	2	1	3	-	-	-	2	2	2	2	3	2	-
CO3	2	2	1	3	1	2	-	-	3	3	1	2	1	3	-
CO4	2	1	1	1	2	-	-	-	3	2	2	1	1	1	-
CO5	1	3	2	2	1	-	-	-	2	2	2	2	2	3	-
Average	**2**	2	**2**	**2**	**2**	**-**	**-**	**-**	**2**	**2**	**2**	**2**	**2**	**2**	**-**

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

MAHENDRA ENGINEERING COLLEGE (Autonomous)			
Syllabus			
Department	**Artificial Intelligence And Data Science**	**Programme Code & Name**	**1161**
VI Semester			

Course Code	Course Name	Hours /Week			Credit	Maximum marks
		L	T	P	C	
24AI24601	**DEEP LEARNING LABORATORY**	**0**	**0**	**3**	**1.5**	**100**

Objective(s)	**The student should be made to:** • Learn the basics of deep neural networks • Familiarize the tools and techniques to implement deep neural networks • Learn different deep learning architectures for solving problems • Familiar with generative models for suitable applications • Learn to build and validate different models
Outcome(s)	**Upon completion of this course , students will be able to :** • Apply deep neural network for simple problems • Apply Convolution Neural Network for image processing • Apply Recurrent Neural Network and its variants for text analysis • Apply generative models for data transformation and implementation of belief networks. • Develop real-world solutions using suitable deep neural networks

LIST OF EXPERIMENTS

1.	Solving XOR problem using DNN
2.	Character recognition using CNN
3.	Face recognition using CNN
4.	Language modeling using RNN

5.	Sentiment analysis using LSTM	
6.	Parts of speech tagging using Sequence to Sequence architecture	
7.	Machine Translation using Encoder-Decoder model	
8.	Implement Deep Belief networks	
9.	Transformer Implementation	
10	Mini-project on real world applications	
	TOTAL HOURS	**30**

COs Vs POs and PSOs Mapping

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	1	1	3	-	-	-	-	1	1	3	1	3	3	-
CO2	3	2	1	3	2	-	-	-	2	2	2	1	3	3	-
CO3	3	2	3	2	1	2	-	-	3	3	1	2	1	3	-
CO4	2	3	1	3	1	-	-	-	1	2	1	1	1	3	-
CO5	2	3	1	3	2	-	-	-	2	2	2	2	2	2	-
Average	**3**	2	**2**	**3**	**2**	**-**	**-**	**-**	**2**	**2**	**2**	**1**	**2**	**3**	**-**

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

Regulations 2024

VII Semester

Sl. No.	Course code	Course Title	L	T	P	C	Cate-Gory
	THEORY						
1	24AI14701	Data Modeling & Business Intelligence	3	0	0	3	PC
2	24AI14702	Prompt Engineering	3	0	0	3	PC
3		Program Elective – 4	3	0	0	3	PE
3		Program Elective – 5	3	0	0	3	PE
4		Program Elective – 6	3	0	0	3	PE
5		Principles of Management	3	0	0	3	HS
	PRACTICAL						
8	24AI36701	Project work Phase-I	0	0	3	3	EEC
		TOTAL	**15**	**0**	**9**	**21**	

MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus						
Department	**Artificial Intelligence And Data Science**	**Programme Code**			**1161**	
VII Semester						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
24AI14701	**DATA MODELLING AND BUSINESS INTELLIGENCE**	**L**	**T**	**P**	**C**	**100**
		3	0	0	3	
Objective(s)	**The student should be made to:** • Apply MySQL Workbench to design database model and logical data model. • To know the logical data model for apply data patterns • Design Geospatial data models for applications involving location-based analytics • To know the real word business problem. • To extract knowledge about analytics model and use marketing and sales					
Outcome(s)	**Upon completion of the course, the students should be able to:** • Apply MySQL Workbench to design database model and Apply logical Data model to design Patterns • Design Geospatial data models for applications involving location-based analytics • Apply predictive analytics for business fore-casting. • Apply analytics for supply chain and logistics management • Use analytics for marketing and sales.					
UNIT-I	**INTRODUCTION TO ADVANCED DATA MODELING**					**10**
Overview of Data Modeling in Data science– Importance of Advanced data Modeling – Types of data Model– Dimensional modelling-Design-MySQL Workbench- Build Data model using MySQL workbench– Forward Engineering Feature. Logical Data Model: Cross enterprise Analysis- Modern Driven analysis-Baseline data patterns-complex data Patterns Generation of Entity types-Transition from meta data to data-static vs dynamic Entity types-data coupling -cohesion.						
UNIT-II	**DATA PATTERNS &GRAPH AND TEMPORAL DATA MODELING**					**9**
Advanced subtype variations-Multi recursive networks-conditional Recursions-Rules based entity types-state Transition rules-Meta patterns. Graph Databases – Nodes – Edges – Properties– Graph query Languages – Understanding Temporal Databases – Valid time vs Transition Time– Temporal Data mining						

UNIT-III	GEOSPATIAL AND METADATA MODELING	7
Representing geospatial data in models-Geospatial Query Language-Applications in Mapping and Location-based Analytics-Metadata Definition and Importance-Encryption and Masking in Data Models-Access Controls and Authorization.		
UNIT-IV	**BUSINESS FORECASTING AND COMPETITIVE ANALYSIS**	**10**
Data Warehouses and Data Mart - Knowledge Management –Types of Decisions - Decision Making Process - Decision Support Systems – Business Intelligence –OLAP – Analytic functions. Introduction to Business Forecasting and Predictive analytics - Logic and Data Driven Models – Data Mining and Predictive Analysis Modelling –Machine Learning for Predictive analytics-Industry analysis- Profit Frontier, Risk vs Return, Competition Positioning- Enterprise Diagnosis		
UNIT-V	**MARKETING & SALES ANALYTIC**	**9**
Logistics – Analytics applications in HR- Applying HR Analytics to make a prediction of the demand for talent. Marketing Strategy, Marketing Mix, Customer Behavior –selling Process – Sales Planning – Analytics applications in Marketing and Sales - predictive analytics for customers' behavior in marketing and sales.		
	TOTAL HOURS	**45**

TEXT BOOKS:	
1	Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and Maintainable Systems (Greyscale Indian Edition) 2017.
2	Mahadevan B, “Operations Management -Theory and Practice”,3rd Edition, Pearson Education,2018.
REFERENCES:	
1	The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling". Authors: Ralph Kimball and Margy Ross 2013 3rd Edition
2	R. Evans James, Business Analytics, 2nd Edition, Pearson, 2017
3.	Philip Kotler and Kevin Keller, Marketing Management, 15th edition, PHI, 2016

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	3	-	3	-	-	-	-	-	-	-	-	-	-
CO4	3	3	3	-	3	2	-	-	-	-	-	-	3	-	-
CO5	-	-	3	-	3	3	-	-	-	-	-	-	-	-	2
Average	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

MAHENDRA ENGINEERING COLLEGE

(Autonomous)

Syllabus

Department	**Artificial Intelligence & Data Science**	**Programme Code**	**1161**

VII Semester

Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
24AI14702	**PROMPT ENGINEERING**	3	0	0	3	**100**

Objective(s)	**Upon completion of this course, the student should be able to get an idea on :** • Understand the Basics of Prompt Engineering. • Develop Skills in Crafting Effective Prompts. • Analyze and Evaluate Prompt Performance. • Apply Prompt Engineering in Real-World Scenarios. • Understand Ethical Considerations and Best Practices.
Outcome(s)	**Upon completion of this course, students will be able to:** • Proficiency in Prompt Creation. • Ability to Evaluate and Refine Prompts • Apply Real-World Application Skills • Apply Ethical Awareness • Develop Hands-On Experience with Language Models

UNIT-I	**INTRODUCTION TO PROMPT ENGINEERING**	9

Types of Prompts: Open-ended vs. closed-ended prompts- Instructional vs. conversational prompts. Techniques for Prompt Design**:** Prompt specificity and clarity- Using context effectively- Iterative refinement of prompts.

UNIT-II	**UNDERSTANDING LANGUAGE MODELS**	9

Architecture of Language Models: Transformer architecture- Training and fine-tuning processes model Capabilities and Limitations: Strengths and weaknesses- Biases and ethical considerations.

UNIT-III	**CRAFTING EFFECTIVE PROMPTS**	9

Types of Prompts: Open-ended vs. closed-ended prompts- Instructional vs. conversational prompts. Techniques for Prompt Design: Prompt specificity and clarity- Using context effectively- Iterative refinement of prompts.

UNIT-IV	**EVALUATING PROMPT PERFORMANCE**	9

Metrics for Evaluation: Quality and relevance of responses- Coherence and accuracy. Testing and Debugging Prompts: Identifying and fixing issues- A/B testing different prompts.		
UNIT-V	**ADVANCED PROMPT ENGINEERING TECHNIQUES**	9
Few-Shot and Zero-Shot Learning: Definitions and use cases- Techniques for providing minimal context. Prompt Chaining and Modular Prompts: Combining multiple prompts for complex tasks- Benefits and challenges. Case Studies and Practical Applications: Real-World Examples- Applications in various industries (e.g., customer support, content creation).		
	TOTAL HOURS	**45**

REFERENCES LINK :

1. **https://en.m.wikipedia.org/wiki/Prompt_engineering(prompt).**
2. **https://www.promptingduide.ai/**
3. **https**://en.m.wikipedia.org/wiki/prompt_engineering**.**

.

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	2	2	3	2	3	2	-
CO2	3	1	2	-	-	-	-	-	1	1	3	1	3	2	-
CO3	3	1	1	-	-	-	-	-	1	1	3	2	2	2	-
CO4	2	2	1	-	-	-	-	-	2	2	2	1	2	3	-
CO5	3	2	-	-	-	-	-	-	1	1	1	1	2	2	-
Average	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**3**	**1**	**2**	**2**	**-**

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

Regulation 2024

NETWORKING

Course code	Course Title	L	T	P	C	Category
24AI15001	Information Storage and Management	3	0	0	3	PE
24AI15002	Social Network Analysis	3	0	0	3	PE
24AI15003	Software Defined Networks	3	0	0	3	PE
24AI15004	Network Management	3	0	0	3	PE
24AI15005	Artificial Neural Networks	3	0	0	3	PE
24AI15006	5G Networks	3	0	0	3	PE
24AI15007	Satellite Communication					
24AI15008	Wireless Sensor Networks					
COMPUTING TECHNIQUES						
24AI15009	Introduction To IOT	3	0	0	3	PE
24AI15010	Cloud Computing	3	0	0	3	PE
24AI15011	Multi-Core Computing	3	0	0	3	PE
24AI15012	Distributed Computing	3	0	0	3	PE
24AI15013	Virtualization Techniques	3	0	0	3	PE
24AI15014	Graph Theory And Applications	3	0	0	3	PE
24AI15015	Computer Vision	3	0	0	3	PE
24AI15016	Soft Computing	3	0	0	3	PE
24AI15017	Optimization Techniques	3	0	0	3	PE
APPLICATION DEVELOPMENT						
24AI15018	Open Source Software	3	0	0	3	PE
24AI15019	Healthcare Informatics	3	0	0	3	PE
24AI15020	Block Chain Technology	3	0	0	3	PE

24AI15021	Object Oriented Analysis and Design	3	0	0	3	PE
24AI15022	Software Testing	3	0	0	3	PE
24AI15023	Software Engineering	3	0	0	3	PE
24AI15024	Distributed Databases	3	0	0	3	PE
24AI15025	R Programming	3	0	0	3	PE
24AI15026	AI for Robotics	3	0	0	3	PE
DATA ANALYTICS & DEEP LEARNING						
24AI15027	Data Warehousing and Data Mining	3	0	0	3	PE
24AI15028	Prompt Engineering	3	0	0	3	PE
24AI15029	Biometric Technologies	3	0	0	3	PE
24AI15030	Predictive Analysis	3	0	0	3	PE
24AI15031	Large Language Model	3	0	0	3	PE
24AI15032	Social Media Analysis	3	0	0	3	PE
24AI15033	Image & Video Analytics	3	0	0	3	PE
24AI15034	Reinforcement Learning	3	0	0	3	PE
24AI15035	Healthcare Analytics	3	0	0	3	PE
CYBER SECURITY						
24AI15036	Introduction To Cyber Security	3	0	0	3	PE
24AI15037	Cryptography and Network Security	3	0	0	3	PE
24AI15038	Information Retrieval Techniques	3	0	0	3	PE
24AI15039	Cyber Forensics	3	0	0	3	PE
24AI15040	Ethical Hacking	3	0	0	3	PE
24AI15041	Information Security	3	0	0	3	PE
24AI15042	Swarm Intelligence	3	0	0	3	PE
24AI15043	Data Security	3	0	0	3	PE

<table>
<tr><td colspan="7">MAHENDRA ENGINEERING COLLEGE
(Autonomous)</td></tr>
<tr><td colspan="7">Syllabus</td></tr>
<tr><td>Department</td><td colspan="2">Artificial Intelligence& Data Science</td><td colspan="2">Programme Code</td><td colspan="2">1161</td></tr>
<tr><td colspan="7">Program Elective</td></tr>
<tr><td>Course code</td><td>Course Name</td><td colspan="3">Hours/week</td><td>Credit</td><td>Maximum marks</td></tr>
<tr><td rowspan="2">24AI15001</td><td rowspan="2">INFORMATION STORAGE AND MANAGEMENT</td><td>L</td><td>T</td><td>P</td><td>C</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Objective(s)</td><td colspan="6">The student should be made to:
Gain the basic components of Storage System Environment.
Familiarize the Storage Area Network Characteristics and Components.
Examine emerging technologies including IP-SAN.
Describe the different backup and recovery topologies and their role in providing disaster recovery and business continuity capabilities.
To learn different techniques of recommender system.</td></tr>
<tr><td>Outcome(s)</td><td colspan="6">Upon completion of the course, the students should be able to:
Illustrate the logical and physical components of a Storage infrastructure.
Evaluate storage architectures, including storage subsystems, DAS, SAN, NAS, and CAS.
Explain the various forms and types of Storage Virtualization.
Describe the different role in providing disaster recovery and business continuity capabilities.
Design and implement a recommender system.</td></tr>
<tr><td>UNIT-I</td><td colspan="5">STORAGE SYSTEMS</td><td>9</td></tr>
<tr><td colspan="7">Introduction to Information Storage and Management: Information Storage, Evolution of Storage Technology and Architecture, Data Center Infrastructure, Key Challenges in Managing Information, Information Life-cycle. Storage System Environment: Components of the Host. RAID: Implementation of RAID, RAID Array Components, RAID Levels, RAID Comparison, RAID Impact on Disk Performance, Hot Spares. Intelligent Storage System: Components, Intelligent Storage Array. Third Platform Technologies: Cloud computing and its essential characteristics, Cloud services and cloud deployment models</td></tr>
<tr><td>UNIT-II</td><td colspan="5">STORAGE NETWORKING TECHNOLOGIES</td><td>9</td></tr>
<tr><td colspan="7">Direct-Attached Storage and Introduction to SCSI: Types of DAS, DAS Benefits and Limitations, Disk Drive Interfaces, Introduction to Parallel SCSI, SCSI Command Model. Storage Area Networks: Fiber Channel, SAN Evolution, SAN Components, Fiber Channel Connectivity, Fiber Channel Ports, Fiber Channel Architecture, Zoning, Fiber Channel Login Types, Fiber Channel Typologies. Network Attached Storage: Benefits of NAS, NAS File I/Components of NAS, NAS Implementations, NAS-Implementations, NAS File Sharing Protocols, NAS I/O Operations.</td></tr>
<tr><td>UNIT-III</td><td colspan="5">ADVANCED STORAGE NETWORKING AND VIRTUALIZATION</td><td>9</td></tr>
</table>

IP SAN: i SCSI, FCIP.Content-Addressed Storage: Fixed Content and Archives, Types of Archives, Features and Benefits of CAS, CAS Architecture, Object Storage and Retrieval in CAS, CAS Examples. Storage Virtualization: Forms of Virtualization, NIA Storage Virtualization Taxonomy, Storage Virtualization Configurations, Storage Virtualization Challenges, Types of Storage Virtualization. Data Center Environment-Building blocks of a data center- Software-defined data center		
UNIT-IV	**BUSINESS CONTINUITY**	**9**
Introduction to Business Continuity: Information Availability, BC Terminology, BC Planning Life-cycle, Failure Analysis, Business Impact Analysis, BC Technology Solutions. Backup and Recovery: Backup Purpose, Considerations, Backup architecture, Backup targets, Data deduplication.Granularity, Recovery Considerations, Backup Methods and Process, Backup and Restore Operations, Backup Typologies, Backup in NAS Environments, Backup Technologies.		
UNIT-V	**RECOMMENDER SYSTEM 9**	**9**
Recommender Systems Functions – Data and Knowledge Sources – Recommendation Techniques – Basics of Content-based Recommender Systems – High Level Architecture – Advantages and Drawbacks of Content-based Filtering – Collaborative Filtering – Matrix factorization models – Neighbourhood models.		
TOTAL HOURS		**45**

TEXT BOOK:	
1	EMC Corporation-Second edition, Information Storage and Management, Wiley, India,2012
2	Ricardo Baeza-Yates and Berthier Ribeiro-Neto, ―Modern Information Retrieval: The Concepts and Technology behind Search, Second Edition, ACM Press Books, 2011.
REFERENCES:	
1	Robert Spalding, ―Storage Networks: The Complete Reference ―, Tata McGraw Hill, Osborne, 2003.
2	Marc Farley, ―Building Storage Networks, Tata McGraw Hill, Osborne, 2001.
3	Meeta Gupta, Storage Area Networks Fundamentals, Pearson Education Limited, 2002.

COs Vs POs and PSOs Mapping

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	1	1	1	1	-	-	-	2	1	3	2	2	1	-
CO2	3	3	3	2	3	-	-	-	2	1	2	2	3	1	-
CO3	3	3	2	2	3	-	-	-	1	1	2	2	3	2	-
CO4	2	3	3	2	3	-	-	-	2	1	2	3	2	2	-
CO5	2	3	2	3	2	-	-	-	3	2	1	3	3	3	-
Average	3	3	3	2	2	-	-	-	2	1	2	2	2	2	-

1 - Low, 2 - Medium, 3 - High, '- "- No Correlation

MAHENDRA ENGINEERING COLLEGE (Autonomous)							
Syllabus							
Department	**Artificial Intelligence &Data Science**		**Programme Code**			**1161**	
Program Elective							
Course code	**Course Name**	**Hours/week**				**Credit**	**Maximum marks**
		L	**T**	**P**		**C**	
24AI15002	**SOCIAL NETWORK ANALYSIS**	**3**	**0**	**0**		**3**	**100**
Objective(s)	**The student should be made to:** • Gain the concept of semantic web and related applications. • Learn knowledge representation using ontology. • Familiar with the human behavior in social web and related communities. • Provide knowledge of predicting human behavior for social communities • Learn visualization of social networks.						
Outcome(s)	**Upon completion of the course, the students should be able to:** • Develop semantic web related applications. • Represent knowledge using ontology. • Predict human behaviours in social web and related communities. • Describe the knowledge of predicting human behaviour for social communities • Create models to simulate and interpret information diffusion,influence propagation, and recommendation systems in socialmedia environments.						
UNIT-I	**INTRODUCTION**						**9**
Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web - Emergence of the Social Web Social Network Analysis: Social Networks Perspective - Analysis of Network Data - Interpertation of Network Data - Social Network Analysis in the Social and Behavioral Sciences - Metrics in social network analysis							
UNIT-II	**SOCIAL NETWORK ANALYSIS SOFTWARE, TOOLS AND LIBRARIES**						**9**
Modelling and aggregating social network data: Ontological representation of social individuals – Ontological representation of social relationships - Aggregating and reasoning with social network data – Advanced representations. Social network analysis software - Tools - Libraries .							
UNIT-III	**CLIQUES, CLUSTERS AND COMPONENTS**						**9**
Components and Subgraphs: Sub graphs - Ego Networks, Triads, Cliques, Hierarchical Clustering, Triads, Network Density and conflict. Density: Egocentric and Sociocentric - Digression on Absolute Density – Community structure and Density, Centrality: Local and Global - Centralization and Graph Centres, Cliques and their intersections, Components and Citation Circles - Positions, Sets and Clusters.							
UNIT-IV	**PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES**						**9**
Understanding and predicting human behaviour for social communities - User data management -							

Inference and Distribution - Enabling new human experiences - Reality mining - Context -Awareness - Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust network analysis		
UNIT-V	**INFORMATION DIFFUSION IN SOCIAL MEDIA**	**9**
Herd Behavior –Information cascades – Diffusion of innovations – Epidemics –Influence and Homophily – Recommendation in Social media – Behavior analytics.		
TOTAL HOURS		**45**

TEXT BOOKS:	
1	PeterMika,―Social Network sand the Semantic Web‖,FirstEdition,Springer2007.
2	Borko Furht,―Handbook of Social Network Technologies andApplications,1st Edition ,Springer, 2010.
3	Reza Zafarani, Mohammad Ali Abbasi, Huan Liu, "Social Media Mining: AnIntroduction",Cambridge University Press, 2014.
REFERENCES:	
1	GuandongXu,Yanchun Zhangand LinLi, ―Web Mining and Social Networking–Techniques and applications, First Edition, Springer,2011.
2	Dion Gohand SchubertFoo,― Socialinformation Retrieval Systems: Emerging Technologiesand Applications for Searching the Web Effectively,IGI Global Snippet,2008.
3	MaxChevalier, Christine Julienand Chantal Soulé-Dupuy,―Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling,IGI Global Snippet,2009.
4	John G. Breslin, Alexander Passant and Stefan Decker, ―The Social Semantic Web, Springer, 2009.

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	2	3	-	-	-	-	1	1	3	1	3	1	-
CO2	3	2	2	3	2	-	-	-	2	2	2	1	3	2	-
CO3	3	3	3	3	1	2	-	-	3	2	2	2	1	1	-
CO4	2	3	2	2	1	-	-	-	2	2	1	2	1	3	-
CO5	3	3	1	1	2	-	-	-	2	2	2	2	2	2	-
Average	3	3	2	2	2	-	-	-	2	2	2	1	2	2	-

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

MAHENDRA ENGINEERING COLLEGE (Autonomous)							
Syllabus							
Department	**Artificial Intelligence and Data Science**		**Programme Code**			**1161**	
Program Elective							
Course code	**Course Name**	**Hours/week**				**Credit**	**Maximum marks**
		L	**T**	**P**		**C**	
24AI15003	**SOFTWARE DEFINED NETWORKS**	**3**	**0**	**0**		**3**	**100**
Objective(s)	**The student should be made to:** • Learn the fundamentals of software defined networks. • Gain the separation of the data plane and the control plane. • Awzare of data centres in software defined networks • Learn about the SDN Programming. • Observe the various protocols of SDN						
Outcome(s)	**Upon completion of this course, students will be able to:** • Analyze the evolution of software defined networks. • Express the various components of SDN and their uses. • Explain the use of SDN in the current networking scenario. • Develop the SDN programming using current language and tools • Design and develop various protocols of SDN.						
UNIT-I	**INTRODUCTION**						**9**
History of Software Defined Networking (SDN) – Modern Data Center – Traditional Switch Architecture – Why SDN – Evolution of SDN – How SDN Works – Centralized and Distributed Control and Date Planes							
UNIT-II	**OPEN FLOW & SDN CONTROLLERS**						**9**
Open Flow Specification – Drawbacks of Open SDN, SDN via APIs, SDN via Hypervisor- Based Overlays – SDN via Opening up the Device – SDN Controllers – General Concepts.							
UNIT-III	**DATA CENTERS**						**9**
Multitenant and Virtualized Multitenant Data Center – SDN Solutions for the Data Center Network – VLANs – EVPN – VxLAN – NVGRE							
UNIT-IV	**SDN PROGRAMMING**						**9**
Programming SDNs: Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs – Network Functions Virtualization (NFV) and Software Defined Networks: Concepts, Implementation and Applications							
UNIT-V	**PROTOCOLS**						**9**
Languages and functions available for programming SDNs, northbound API. Mininet. Software vs. Hardware SDN switches implementations - Open vSwitch, WhiteBox, ONL. Controller implementations - POX, NOX, Beacon, Floodlight. Special Purpose controllers - Flowvisor, RouteFlow.							

TOTAL HOURS	45

TEXT BOOKS:	
1	Thomas D. Nadeau, Ken Gray, “SDN: Software Defined Networks”, O'Reilly Media, August 2013.
2	Paul Goransson and Chuck Black, “Software Defined Networks: A Comprehensive Approach”, First Edition, Morgan Kaufmann, June 2014.
REFERENCES:	
1	Siamak Azodolmolky, “Software Defined Networking with Open Flow”, Packet Publishing, 2013.
2	Vivek Tiwari, “SDN and Open Flow for Beginners”, Amazon Digital Services, Inc., 2013.
3	Fei Hu, Editor, “Network Innovation through Open Flow and SDN: Principles and Design”, CRC Press, 2014

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	1	3	-	-	-	2	3	1	3	1	2	-
CO2	2	1	2	2	3	-	-	-	2	2	2	2	1	3	-
CO3	2	2	2	3	3	-	-	-	3	1	1	2	1	3	-
CO4	2	2	2	3	1	-	-	-	1	3	1	2	2	2	-
CO5	1	3	3	1	3	-	-	-	2	1	1	2	2	1	-
Average	2	2	2	2	2.6	-	-	-	1.8	2.2	1.2	2.2	1.4	2.2	-

1 - Low, 2 - Medium, 3 - High, ‘-“- No Correlation

MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus						
Department	**Artificial Intelligence and Data Science**	**Programme Code**			**1161**	
Program Elective						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum Marks**
		L	**T**	**P**	**C**	
24AI15004	**NETWORK MANAGEMENT**	**3**	**0**	**0**	**3**	**100**
Objective(s)	**The student should be made to:** • Explore difference between SNMPV1, V2, V3 & ASN • Study about remote monitoring and its application. • Discuss the basic terminologies and application 22 of telecommunication management system. • Expose the application of network management • Examine the importance of web based managemenrt.					
Outcome(s)	**. Upon completion of this course, students will be able to:** • IllustratethestandardsandmodelsofSNMPV1.V2, V3&ASN • Analyze the challenges faced by remote monitoring and suggest suitable solutions. • Recommend telecommunication management network standards for real time scenarios. • Evaluate the various applications of network management system. • Interface the concepts of web based management.					
UNIT-I	**BASIC TERMINOLOGIES**					**9**
Network Management Goals, organization and Functions, Network Management Architecture and Organization, Network Management Perspective, NMS platform, Future ofNetworkManagement-ASN.1-Terminology, Symbols and Conventions, Objects and Data Types						
UNIT-II	**SIMPLE NETWROK MANAGEMENT PROTOCOL**					**9**
SNMP- operations, SNMP V1 Network Management, Basic Foundation Standards, Models and languages, Organization and information Models, Communication and functional Models. SNMP V2 - Changes , System Architecture, Structure of Management Information, MIB, Protocol, Compatibility. SNMP V3 – Key Features, Architecture, Application, MIB, Security.						
UNIT-III	**REMOTE MONITORING&TELECOMMUNICATION MANAGEMENT**					**9**
RMON SBI MIB, RMON1, RMON2, ATM ROM- TMN conceptual Model, Standards,RMON1 Groups and Functions, Relationship between control and tables-Token Ring Extension Groups, RMON2-Management Information Base, Conformation specification-Architecture, Implementation-CaseStudy.						
UNIT-IV	**NETWORK MANAGEMENT APPLICATION**					**9**

NetworkManagementApplication–ConfigurationManagement,FaultManagement,Performance Management, Event Correlation techniques, Security Management, Cryptography, Authentication and Authorization, Policy- based Management, Service level Management.		
UNIT-V	**WEB-BASED MANAGEMENT**	**9**
NMS with Web Interface and Web-Based Management, Web Interface to SNMP Management, Embedded Web-Based Management, Desktop management Interface, Web-Based Enterprise Management, WBEM: Windows Management Instrumentation, Java management Extensions, Management of a Storage Area Network , Future Directions.Case Studies		
TOTAL HOURS		**45**

TEXTBOOKS:	
1	Mani Subramanian "Network Management : Principles and Practice Pearson Edition"2nd Edition, ISBN:978-8131734049,2010.
2.	Adrian Farrel,"Network Management–Knowitall",Morgan Kaufmann Publishers,1st Edition ISBN: 9780080923420, 2008.
REFERENCES:	
1	Deborah E.Bouchoux, "Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets", Cengage Learning, Third Edition, 2012.
2	Prabuddha Ganguli, "Intellectual Property Rights: Unleashing the Knowledge Economy", McGraw Hill Education, 2011.
3	Edited by Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property, Edward Elgar Publishing Ltd, 2013.

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	2	-	-	-	-	-	-	-	3	3	3	2	-
CO2	3	2	1	-	-	-	-	-	-	1	3	3	1	2	-
CO3	3	2	1	-	-	-	-	-	-	1	2	3	2	2	-
CO4	3	2	2		-	-	-	-	-	2	3	3	2	1	-
CO5	3	2	1	-	-	-	-	-	-	2	2	3	2	2	-
Average	3	2	1.4	-	-	-	-	-	-	1.2	2.6	3	2	1.8	-

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

MAHENDRAENGINEERING COLLEGE (Autonomous)							
Syllabus							
Department	**Artificial Intelligence &Data Science**		**Programme Code**			**1161**	
Program Elective							
Course code	**Course Name**	**Hours/week**				**Credit**	**Maximum marks**
24AI15005	**ARTIFICIAL NEURAL NETWORKS**	**L**	**T**	**P**		**C**	**100**
		3	**0**	**0**		**3**	
Objective(s)	**The student should be made to:** • Impart knowledge about the basic principles, techniques, and applications of neural network. • Provide the mathematical background for carrying out the optimization associated with neural network learning. • Develop the skills to gain basic understanding of the areas of Artificial Neural Networks and Fuzzy Logic. • Gain the biological neural network and to model equivalent neuron models. • Learn the associative model and genetic algorithms						
Outcome(s)	**Upon completion of th is course, students will be able to:** • Develop applications of neural network. • Create different neural networks of various architectures both feed forward and feed backward. • Perform the training of neural networks using various learning rules. • Perform the testing of neural networks and do the perform analysis of these networks for various pattern recognition applications. • Develop Hopfield Networks for-TSP						
UNIT-I	**Introduction**						**9**
Introduction: A Neural Network, Human Brain, Models of a Neuron, Neural Networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks Learning Process: Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive, Boltzmann Learning, Credit Assignment Problem, Memory, Adaption, Statistical Nature of the Learning Process							
UNIT-II	**Single Layer Perceptrons and Multilayer Perceptrons**						**9**
Single Layer Perceptrons: Adaptive Filtering Problem, Unconstrained Organization Techniques, Linear Least Square Filters, Least Mean Square Algorithm, Learning Curves, Learning Rate Annealing Techniques, Perceptron –Convergence Theorem, Relation Between Perceptron and Bayes Classifier for a Gaussian Environment ,Multilayer Perceptron.							
UNIT-III	**Back Propagation**						**9**

Back Propagation: Back Propagation and Differentiation, Hessian Matrix, Generalization, Cross Validation, Network Pruning Techniques, Virtues and Limitations of Back Propagation Learning, Accelerated Convergence, Supervised Learning		
UNIT-IV	**Self-Organization Maps (SOM)**	**9**
Self-Organization Maps (SOM): Two Basic Feature Mapping Models, Self-Organization Map, SOM Algorithm, Properties of Feature Map, Computer Simulations, Learning Vector Quantization, Adaptive Patter Classification.		
UNIT-V	Associated Models	**9**
Hopfield Networks, Brain-in-a-Box network; Boltzmann machine; Optimization Methods: Hopfield Networks for-TSP, Solution of simultaneous linear equations; Iterated Gradient Descent; Simulated Annealing; Genetic Algorithm.		
TOTAL HOURS		**45**

TEXT BOOKS:	
1	Neural Network Design, Second Edition, Martin T. Hagan, Howard B. Demuth, Mark Hudson Beale, and Orlando De Jesús, 2014.
2	Computational Intelligence: An Introduction, Second Edition, Andries P. Engelbrecht, 2007, Wiley. .
REFERENCES:	
1	Artificial Neural Networks - B. Vegnanarayana Prentice Hall of India P Ltd 2005
2	Neural Networks in Computer Inteligance, Li Min Fu MC GRAW HILL EDUCATION 2003
3	Neural Networks -James A Freeman David M S Kapura Pearson Education 2004.
4	Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House Ed. 2006.

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	2	-	-	-	-	-	2	-	3	3	3	2	-
CO2	3	2	2	-	-	-	-	-	1	1	3	3	3	2	-
CO3	3	2	1	-	-	-	-	-	1	1	3	3	2	2	-
CO4	3	2	2		-	-	-	-	2	-	3	3	2	3	-
CO5	3	2	-	-	-	-	-	-	2	-	3	3	2	2	-
Average	3	2	2	-	-	-	-	-	2	-	3	3	2	2	-

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

MAHENDRA ENGINEERING COLLEGE (Autonomous)							
Syllabus							
Department	**Artificial Intelligence and Data Science**	**Programme Code**			**1161**		
Program Elective							
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum Marks**	
24AI15006	**5G NETWORKS**	**L**	**T**	**P**	**C**	**100**	
		3	0	0	3		
Objective(s)	**The student should be made to:** • Learn the evolution of wireless networks. • Get acquainted with the fundamentals of 5G networks. • Study the processes associated with 5G architecture. • Study spectrum sharing and spectrum trading. • Learn the security features in 5G networks.						
Outcome(s)	**Upon completion of this course, students will be able to** • Explain the evolution of wireless networks. • Summarize the concepts of 5G networks. • Comprehend the 5G architecture and protocols. • Explain the dynamic spectrum management. • Describe the security aspects in 5G networks.						
UNIT-I	**EVOLUTION OF WIRELESS NETWORKS**						**9**
Networks evolution: 2G, 3G, 4G, evolution of radio access networks, need for 5G. 4G versus 5G, Next Generation core (NG-core), visualized Evolved Packet core (VEPC).							
UNIT-II	**5G CONCEPTS AND CHALLENGES**						**9**
Fundamentals of 5G technologies, overview of 5G core network architecture,5G new radio and cloud technologies, Radio Access Technologies (RATs), EPC for 5G.							
UNIT-III	**NETWORK ARCHITECTURE AND THE PROCESSES**						**9**
5G architecture and core, network slicing, multi access edge computing(MEC)visualization of 5G components, end-to-end system architecture, service continuity, relation to EPC, and edge computing. 5G protocols: 5G NAS,NGAP, GTP-U, IPSec and GRE.							
UNIT-IV	**DYNAMIC SPECTRUM MANAGEMENT AND MM-WAVES**						**9**
Mobility management, Command and control, spectrum sharing and spectrum trading, cognitive radio based on 5G, millimeter waves.							
UNIT-V	**MOBILITY AND HANDOFF MANAGEMENT IN 5G**						**9**
MOBILITY AND HANDOFF MANAGEMENT IN 5G: Network deployment types, Interference management in 5G, Mobility management in 5G, Dynamic network reconfiguration in 5G.							
						TOTAL HOURS	**45**

TEXT BOOKS:	
1	5G Core networks: Powering Digitalization , Stephen Rommer, Academic Press,2019
2	An Introduction to 5G Wireless Networks : Technology, Concepts and Use cases, Saro Velrajan,First Edition, 2020.
REFERENCES:	
1	5G Simplified: ABCs of Advanced Mobile Communications Jyrki. T.J.Penttinen ,Copyrighted Material
2	5G system Design: An end to end Perspective , Wan Lee Anthony, Springer Publications,2019

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	2	2	2	-	-	-	-	-	2	2	2	2	1	2	-
CO2	2	1	2	-	-	-	-	-	1	1	1	2	2	2	-
CO3	2	2	-	-	-	-	-	-	1	1	2	1	1	1	-
CO4	2	1	1		-	-	-	-	2	2	1	2	1	2	-
CO5	3	-	-	-	-	-	-	-	2	-	1	2	1	1	-
Average	**2.2**	**1.2**	**1**	**-**	**-**	**-**	**-**	**-**	**1.6**	**1.2**	**1**	**1.8**	**1.2**	**1.6**	**-**

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

MAHENDRA ENGINEERING COLLEGE (Autonomous)							
Syllabus							
Department	**Artificial Intelligence and Data Science**	**Programme Code**			**1161**		
Program Elective							
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum Marks**	
24AI15007	**SATELLITE COMMUNICATION**	**L**	**T**	**P**	**C**	**100**	
		3	0	0	3		
Objective(s)	**The student should be made to:** • Understand the basics of satellite orbits • Study the space and link design • Study the earth segment • Compute the various methods of satellite access • Understand the applications of satellites						
Outcome(s)	**Upon completion of this course, students will be able to** • Explain the concepts of various satellite orbits • Interpret the space segment and link design used in satellites • Describe the various components of earth segments • Apply the knowledge of multiple access techniques in satellite communication systems • Summarize the role of satellite in various applications						
UNIT-I	**SATELLITE ORBITS**						**9**
Kepler's Laws, Newton's law, orbital parameters, orbital perturbations, station keeping, geo stationary and non Geo-stationary orbits – Look Angle Determination- Limits of visibility –eclipse- Sub satellite point –Sun transit outage-launch vehicles and propulsion- Layers of atmosphere.							
UNIT-II	**SPACE SEGMENT AND LINK DESIGN**						**9**
Spacecraft Technology- Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and command- Transponders- Satellite uplink and downlink Analysis and Design, link budget, E/N calculation							
UNIT-III	**EARTH SEGMENT**						**9**
Introduction – Receive – Only home TV systems – Outdoor unit – Indoor unit for analog (FM) TV – Master antenna TV system – Community antenna TV system – Transmit – Receive earth stations – Equivalent isotropic radiated power – Transmission losses – Free-space transmission – Feeder losses – Antenna misalignment losses – Fixed atmospheric and ionospheric losses							
UNIT-IV	**SATELLITE ACCESS AND CODING METHODS**						**9**
Modulation and Multiplexing: Voice, Data, Video, Analog – digital transmission system, Digital video Broadcast, Multiple access Schemes-TDMA-FDMA-CDMA- Compression – encryption- Coding Schemes							
UNIT-V	**SATELLITE PACKET COMMUNICATIONS**						**9**
Message Transmission by FDMA: M/G/1 Queue, Message Transmission by TDMA, PURE ALOHA- Satellite Packet Switching, Slotted Aloha, Packet Reservation, Tree Algorithm.							
						TOTAL HOURS	**45**

TEXT BOOK:	
1	Dennis Roddy, “Satellite Communication”, 4th Edition, McGraw Hill International, 2006
REFERENCES:	
1	Wilbur L.Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, “Satellite Communication Systems Engineering”, Prentice Hall/Pearson, 2007
2	N.Agarwal, “Design of Geosynchronous Space Craft”, Prentice Hall, 1986
3	Bruce R. Elbert, “The Satellite Communication Applications”, Hand Book, Artech House Bostan London, 1997

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	2	2	2	-	-	-	-	-	2	2	2	2	2	1	-
CO2	2	2	2	-	-	-	-	-	1	1	1	2	1	1	-
CO3	3	2	-	-	-	-	-	-	1	1	2	2	-	1	-
CO4	2	1	2		-	-	-	-	2	2	1	2	1	2	-
CO5	2	2	-	-	-	-	-	-	2	1	2	2	2	1	-
Average	**2.2**	**1.8**	**1.2**	**-**	**-**	**-**	**-**	**-**	**1.6**	**1.4**	**1.6**	**2**	**1.4**	**1.2**	**-**

1 - Low, 2 - Medium, 3 - High, ‘-“- No Correlation

MAHENDRA ENGINEERING COLLEGE (Autonomous)							
Syllabus							
Department	**Artificial Intelligence and Data Science**	**Programme Code**			**1161**		
Program Elective							
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum Marks**	
24AI15008	**WIRELESS SENSOR NETWORKS**	**L**	**T**	**P**	**C**	**100**	
		3	0	0	3		
Objective(s)	**The student should be made to:** • Understand the basics of wireless sensor networks • Study the principles of WSN architectures • Study the concepts for assignment of MAC addresses Compute the various methods of satellite access • Understand the sensor network platform and tools state-centric programming						
Outcome(s)	**Upon completion of this course, students will be able to** • Describe the overview of wireless sensor networks and enabling technologies for wireless sensor networks • Apply the design principles of WSN architectures and operating systems for simulating environment situations. • Apply various concepts for assignment of MAC addresses • Select the appropriate infrastructure, topology, joint routing and information aggregation for wireless sensor networks • Analyse the sensor network platform and tools state-centric programming.						
UNIT-I	OVERVIEW OF WIRELESS SENSOR NETWORKS						**9**
Architecture - Hardware Components- Network Characteristics- unique constraints and challenges, Enabling Technologies for Wireless Sensor Networks- Types of wireless sensor networks.							
UNIT-II	NETWORKING SENSORS						**9**
MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - SMAC, - B-MAC Protocol, IEEE 802.15.4 standard and ZigBee, the Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols EnergyEfficient Routing, Geographic Routing							
UNIT-III	ARCHITECTURES:						**9**
Network Architecture- Sensor NetworksScenarios- Design Principle, Physical Layer and Transceiver Design CO1,CO2 98 Considerations, Optimization Goals and Figures of Merit, Gateway Concepts, Operating Systems and Execution Environments- Introduction to TinyOS and nesC- Internet to WSN Communication							
UNIT-IV	INFRASTRUCTURE ESTABLISHMENT						**9**
Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control							
UNIT-V	SENSOR NETWORK PLATFORMS AND TOOLS						**9**
Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node level Simulators, State-centric programming							
						TOTAL HOURS	**45**

TEXT BOOK:	
1	Holger Karl & Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley, 2005
	Feng Zhao & Leonidas J.Guibas, "Wireless Sensor Networks-An Information Processing Approach", Elsevier, 2007
	Waltenegus Dargie , Christian Poellabauer, "Fundamentals Of Wireless Sensor Networks - Theory And Practice", John Wiley & Sons Publications, 2011
REFERENCES:	
1	KazemSohraby, Daniel Minoli, & TaiebZnati, "Wireless Sensor Networks-Technology, Protocols, and Applications", John Wiley, 2007. 2. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003

COs Vs POs and PSOs Mapping

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO 8	PO 9	PO 10	PO11	PO 12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	2	-	-	-	2	-	2	-		-
CO2	3	-	3	-	-	3	3	-	-	3	-	-	-		3
CO3	2	-	-	-	2	-	-	-	-	2	-	-	-		-
CO4	2	-	-	-	-	-	-	-	-	2	-	-	2		-
CO5	-	-	-	-	2	-	-	2	-	2	-	-	2		-
Average	**2**	**2**	**3**	**-**	**2**	**3**	**3**	**2**	**-**	**2**	**-**	**2**	**2**		**3**

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

<table>
<tr><td colspan="7">MAHENDRA ENGINEERING COLLEGE
(Autonomous)</td></tr>
<tr><td colspan="7">Syllabus</td></tr>
<tr><td>Department</td><td colspan="2">Artificial Intelligence and Data Science</td><td colspan="2">Programme Code</td><td colspan="2">1161</td></tr>
<tr><td colspan="7">Program Elective</td></tr>
<tr><td>Course code</td><td colspan="2">Course Name</td><td colspan="3">Hours /week</td><td>Credit</td><td>Maximum marks</td></tr>
<tr><td rowspan="2">24AI15009</td><td colspan="2" rowspan="2">INTRODUCTION TO IOT</td><td>L</td><td>T</td><td>P</td><td>C</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Objective(s)</td><td colspan="6">The student should be made to:
• Familiarize Smart Objects and IoT Architectures.
• Learn about various IoT-related protocols.
• Build simple IoT Systems using Arduino and Raspberry Pi.
• Gain the Knowledge about the data analytics and cloud in the context of IoT.
• Be exposed with IoT infrastructure for popular applications</td></tr>
<tr><td>Outcome(s)</td><td colspan="6">Upon completion of this course , students will be able to:
• Explain the concept of IoT.
• Examine various protocols for IoT.
• Apply the IoT System using Raspberry Pi/Arduino.
• Demonstrate and explore the concepts behind Connected Motions.Summarize applications of IoT in real time scenario.</td></tr>
<tr><td>UNIT-I</td><td colspan="5">INTRODUCTION TO INTERNET OF THINGS</td><td>9</td></tr>
<tr><td colspan="7">Definition & Characteristics of IoT - Challenges and Issues - Physical Design of IoT, Logical Design of IoT - IoT Functional Blocks, Security.</td></tr>
<tr><td>UNIT-II</td><td colspan="5">IOT PROTOCOLS</td><td>9</td></tr>
<tr><td colspan="7">IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT.</td></tr>
<tr><td>UNIT-III</td><td colspan="5">DESIGN AND DEVELOPMENT</td><td>9</td></tr>
<tr><td colspan="7">Design Methodology - Embedded computing logic - Microcontroller, System on Chips - IoT system building blocks - Arduino - Board details, IDE programming - Raspberry Pi - Interfaces and Raspberry Pi with Python Programming.</td></tr>
<tr><td>UNIT-IV</td><td colspan="5">DATA ANALYTICS AND SUPPORTING SERVICES</td><td>9</td></tr>
<tr><td colspan="7">Structured Vs Unstructured Data and Data in Motion Vs Data in Rest – Role of Machine Learning – No SQL Databases – Hadoop Ecosystem – Apache Kafka, Apache Spark – Edge Streaming Analytics and Network Analytics – Xively Cloud for IoT, Python Web Application Framework – Django –</td></tr>
</table>

AWS for IoT – System Management with NETCONF-YANG.		
UNIT-V	**CASE STUDIES/INDUSTRIAL APPLICATIONS**	**9**
Cisco IoT system - IBM Watson IoT platform – Manufacturing - Converged Plantwide Ethernet Model (CPwE) – Power Utility Industry – GridBlocks Reference Model - Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control		
	TOTAL HOURS	**45**

TEXT BOOKS :	
1	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017.
REFERENCES:	
1	Arshdeep Bahga, Vijay Madisetti, ―Internet of Things – A hands-on approach, Universities Press, 2015.
2	Olivier Hersent, David Boswarthick, Omar Elloumi , ―The Internet of Things – Key applications and Protocols, Wiley, 2012 (for Unit 2).
3	Jan Ho¨ ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
4	Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), ―Architecting the Internet of Things‖, Springer, 2011.

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	1	-	-	-	-	-	-	-	3	3	3	2	-
CO2	3	2	2	-	-	-	-	-	-	-	3	3	3	1	-
CO3	3	2	1	-	-	-	-	-	-	-	3	3	3	2	-
CO4	3	2	1	-	-	-	-	-	-	-	3	3	3	1	-
CO5	3	2	2	-	-	-	-	-	-	-	3	3	3	1	-
Average	3	2	1.4	-	-	-	-	-	-	-	3	3	3	1.4	-

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

<table>
<tr><td colspan="7">MAHENDRA ENGINEERING COLLEGE
(Autonomous)</td></tr>
<tr><td colspan="7">Syllabus</td></tr>
<tr><td>Department</td><td colspan="2">Artificial Intelligence and Data Science</td><td colspan="2">Programme Code</td><td colspan="2">1161</td></tr>
<tr><td colspan="7">Program Elective</td></tr>
<tr><td>Course code</td><td colspan="2">Course Name</td><td colspan="3">Hours/week</td><td>Credit</td><td>Maximum marks</td></tr>
<tr><td rowspan="2">24AI15010</td><td colspan="2" rowspan="2">CLOUD COMPUTING</td><td>L</td><td>T</td><td>P</td><td>C</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Objective(s)</td><td colspan="6">The student should be made to:
Familiarize with the fundamentals of cloud computing
Gain expertise in server, network and storage virtualization.
Learn fundamental concepts in cloud architecture, storage and services
Understand the cloud resource management and security issues
Expose to advanced topics I cloud computing and applications</td></tr>
<tr><td>Outcome(s)</td><td colspan="6">Upon completion of this course , students will be able to
Explain the main concepts, key technologies, strengths and limitations of cloud computing.
Describe various technologies in server, network and storage virtualization
Interpret the architecture of compute and storage cloud, service and delivery models
Identify the main security and privacy issues in cloud computing
Choose appropriate technologies for implementation and application of cloud</td></tr>
<tr><td>UNIT-I</td><td colspan="5">INTRODUCTION</td><td>9</td></tr>
<tr><td colspan="7">Introduction to Cloud Computing-Definition of Cloud – Evolution of Cloud Computing – Underlying principles of parallel and distributed computing – Cloud characteristics – Multi tenancy challenges in storage-Cloud cube model – Elasticity in Cloud – On-demand Provisioning-Cloud computing scalability</td></tr>
<tr><td>UNIT-II</td><td colspan="5">VIRTUALIZATION INFRASTRUCTURE</td><td>9</td></tr>
<tr><td colspan="7">Virtual Machine Basics–Taxonomy of Virtual machines– Process and System Virtual Machines – Server Virtualization –Virtual Workloads – Provision Virtual Machines – Desktop Virtualization – Application Virtualization - Implementation levels of virtualization – virtualization structure – virtualization of CPU, Memory and I/O devices – virtual clusters and Resource Management – Virtualization for data center automation.</td></tr>
<tr><td>UNIT-III</td><td colspan="5">CLOUD ARCHITECTURE, SERVICES AND STORAGE</td><td>9</td></tr>
<tr><td colspan="7">Layered Cloud Architecture Design – NIST Cloud computing Reference architecture – Public, private and hybrid clouds – IaaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3.</td></tr>
<tr><td>UNIT-IV</td><td colspan="5">RESOURCE MANAGEMENT AND SECURITY IN CLOUD</td><td>9</td></tr>
</table>

Inter Cloud Resource Management- Resource bundling: Combinatorial auctions for cloud resources – Resource Provisioning and Resource Provisioning methods – Global Exchange of Cloud resources – Networking support - Cloud Security Overview and Challenges – Software-as-a-service Security – Security governance – Virtual Machine security – IAM – Security Standards		
UNIT-V	**CLOUD ENABLING TECHNOLOGIES**	**9**
Service Oriented Architecture – REST and Systems of Systems – Web Services – Publish- Subscribe Model – Basicsof Virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures –Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices – Virtualization Support and DisasterRecovery		
TOTAL HOURS		**45**

TEXT BOOKS:	
1	Kai Hwang, Geoffrey C.Fox, Jack G.Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2	Rajkumar Buyya, Christian Vecchiola, S.Thamarai Sel "Mastering Cloud Computing: Foundations and Applications Programming", Morgan Kaufmann Publications, 2016.
REFERENCES:	
1	Rittinghouse, John W., and James F.Ransome, "Cloud Computing: Implementation, Management and Security", CRC Press, 2017.
2	Anthony Velte, Robert Elsenpeter, Toby Velte, "Cloud Computing, A Practical Approach", Tata Mc Graw Hill, 2009.
3	George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for Ec2 and Beyond", O'Reilly, 2009.
4	Nptel course, Cloud Computing, https://onlinecourses.nptel.ac.in/noc18_cs16/preview
5	Dan C. Marinescu "Cloud Computing Theory and Practice", Morgan Kaufmann Publications, 2013.

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	-	-	-	-	-	-	-	-	3	3	2	2	-
CO2	3	2	2	-	-	-	-	-	-	-	3	3	2	1	-
CO3	3	2	2	-	-	-	-	-	-	-	2	3	1	2	-
CO4	3	2	2	-	-	-	-	-	-	-	3	2	2	1	-
CO5	3	2	-	-	-	-	-	-	-	-	3	3	1	1	-
Average	3	2	1.2	-	-	-	-	-	-	-	2.8	2.8	1.6	1.4	-

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

MAHENDRA ENGINEERING COLLEGE (Autonomous)							
Syllabus							
Department	**Computer Science and Engineering**		**Programme Code**			**1161**	
B.Tech – Artificial Intelligence & Data Science							
Program Elective							
Course code	**Course Name**	**Hours/week**				**Credit**	**Maximum marks**
24AI15011	**MULTI CORE COMPUTING**	**L**	**T**	**P**		**C**	**100**
		3	**0**	**0**		**3**	
Objective(s)	**The student should be made to:** • Define technologies of multicore computing and performance measures • Demonstrate problems related to multiprocessing • Illustrate Concurrency and Correctness programming • Analyze the common problems in multicore programming • Gain the knowledge in shared memory						
Outcome(s)	**Upon completion of this course, students will be able to:** • Identify the limitations Lower Bounds on the Number of Locations • Define fundamental concepts of parallel programming and its design issues • Solve the issues related to multiprocessing and Hierarchical Locks • Apply the salient features of different multicore architectures and how they exploit parallelism • Demonstrate the concepts of Optimistic Synchronization.						
UNIT-I	**INTRODUCTION TO MULTI CORE COMPUTING**						**9**
Shared Objects and Synchronization - A Fable - Mutual Exclusion – Time - Critical Sections – 2 Thread Solutions - Lamport's Bakery Algorithm - Bounded Timestamps - Lower Bounds on the Number of Locations - Concurrent Objects - Concurrency and Correctness - Quiescent Consistency – Linearizability - The Java Memory Model.							
UNIT-II	**FOUNDATIONS OF SHARED MEMORY**						**10**
The Space of Registers - Register Constructions - Atomic Snapshots - The Relative Power of Primitive Synchronization Operations: Consensus Numbers - Consensus Protocols - FIFO Queues - Multiple Assignment Objects - Common2 RMW Operations - The compare And Set() Operation							
UNIT-III	**UNIVERSALITY OF CONSENSUS**						**9**
A Lock-Free Universal Construction - A Wait-Free Universal Construction - Spin Locks and Contention: Test-And-Set Locks - TAS-Based Spin Locks Revisited - Exponential Back off - Queue Locks - A Queue Lock with Timeouts - Hierarchical Locks.							
UNIT-IV	**MONITORS AND BLOCKING SYNCHRONIZATION**						**10**
Monitor Locks and Conditions - Readers–Writers Locks - Our Own Re-entrant Lock – Semaphores - Linked Lists: The Role of Locking,List-Based Sets - Concurrent Reasoning - Coarse-Grained Synchronization - Fine-Grained Synchronization - Optimistic Synchronization - Lazy Synchronization - Non-Blocking Synchronization.							
UNIT-V	**PARALLEL PROGRAM DEVELOPMENT**						**7**

Case studies – n-Body solvers – Tree Search – Open MP and MPI implementations and comparison.	
TOTAL HOURS	**45**

TEXT BOOKS:	
1	The Art of Multiprocessor Programming Revised - First Edition Maurice Herlihy, Nir Shavit.
2	Multicore Computing algorithms, Architectures, And Applications Edited By Sanguthevar Rajasekaran, Lance Fiondella, Mohamed Ahmed, Reda A. Ammar copyright 2014
REFERENCES:	
1	Programming Multi-Core And Many-Core Computing Systems Sabri Pllana, Fatos Xhafa 2017.
2	Multicore and GPU Programming An Integrated Approach 2nd Edition -2022,Gerassimos Barlas.

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	1	2	3	1	3	-	-	-	2	3	1	3	1	2	-
CO2	2	1	2	2	3	-	-	-	2	2	2	2	1	3	-
CO3	2	2	2	3	3	-	-	-	3	1	1	2	1	3	-
CO4	2	2	2	3	1	-	-	-	1	3	1	2	2	2	-
CO5	3	3	1	1	3	-	-	-	1	2	1	2	2	1	-
Average	2	2	2	2	2.6	-	-	-	1.8	2.2	1.2	2.2	1.4	2.2	-

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

MAHENDRA ENGINEERING COLLEGE (Autonomous)							
Syllabus							
Department	**Artificial Intelligence & Data Science**		**Programme Code**			**1161**	
Program Elective							
Course code	**Course Name**	**Hours/week**				**Credit**	**Maximum Marks**
24AI15012	**DISTRIBUTED COMPUTING**	**L**	**T**	**P**		**C**	**100**
		3	**0**	**0**		**3**	
Objective(s)	**The student should be made to:** • Provide students with contemporary knowledge in distributed systems • Equip students with skills to analyze and design distributed applications. • Provide master skills to measure the performance of distributed synchronization algorithms • Familiarize hardware and software issues in modern distributed systems. • Gain the knowledge in Fault Tolerance Reliable client-server & recovery						
Outcome(s)	**Upon completion of this course, students will be able to:** • Demonstrate knowledge of the basic elements and concepts related to distributed system technologies; • Illustrate the middleware technologies that support distributed applications such as RPC, RMI and Object based middleware. • Analyze the various techniques used for clock synchronization and mutual exclusion • Demonstrate the concepts of Resource and Process management and synchronization algorithms • Analyze the big data using Map-reduce programming in Both Hadoopand Spark framework.						
UNIT-I	**INTRODUCTION TO DISTRIBUTED SYSTEMS**						**9**
Characterization of Distributed Systems: Issues Goals and Types of distributed systems - Distributed System Models - Hardware concepts - Software Concept - Middleware: Models of Middleware - Services offered by middleware - Client Server model.							
UNIT-II	**COMMUNICATION**						**9**
Layered Protocols – Inter process communication (IPC): MPI - Remote Procedure Call (RPC) - Remote Object Invocation - Remote Method Invocation (RMI) - Message Oriented Communication, Stream Oriented Communication - Group Communication							
UNIT-III	**SYNCHRONIZATION**						**9**
Clock Synchronization - Logical Clocks - Election Algorithms - Mutual Exclusion - Distributed Mutual Exclusion - Classification of mutual Exclusion Algorithm - Requirements of Mutual Exclusion Algorithms - Performance measure.							
UNIT-IV	**RESOURCE AND PROCESS MANAGEMENT**						**9**
Desirable Features of global Scheduling algorithm - Task assignment approach - Load balancing approach - load sharing approach -Introduction to process management - process migration – Threads							

– Virtualization – Clients – Servers - Code Migration		
UNIT-V	**BIG DATA ANALYTICS TOOLS**	**9**
Apache Spark, Spark's Role in Big Data Analytics, PySpark,Overview of PySpark, Data Processing with PySpark, Data Lakehouse ConceptsPerformance Considerations		
TOTAL HOURS		**45**

TEXT BOOKS	
1	Andrew S. Tanenbaum and Maarten Van Steen, ―Distributed Systems: Principles and Paradigms, 2nd edition, Pearson Education
2	George Coulouris, Jean Dollimore, Tim Kindberg, , "Distributed Systems: Concepts and Design", 4th Edition, Pearson Education, 2005.
3	David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", 2013.
REFERENCES	
1	A. S. Tanenbaum and M. V. Steen, "Distributed Systems: Principles and Paradigms", Second Edition, Prentice Hall, 2006.
2	M. L. Liu, ―Distributed Computing Principles and Applications‖, Pearson Addison Wesley, 2004.

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**2**	**2**	**-**
CO2	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**2**	**1**	**-**
CO3	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**1**	**2**	**-**
CO4	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**	**2**	**1**	**-**
CO5	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**1**	**3**	**1**	**-**
Average	**3**	**2**	**1.2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.8**	**2.8**	**1.6**	**1.4**	**-**

1 - Low, 2 - Medium, 3 - High, ‘-“- No Correlation

MAHENDRAENGINEERINGCOLLEGE (Autonomous)							
Syllabus							
Department	**Artificial Intelligence & Data Science**		**Programme Code**			**1161**	
Program Elective							
Course code	**Course Name**	**Hours/week**				**Credit**	**Maximum marks**
		L	**T**	**P**		**C**	
24AI15013	**VIRTUALIZATIN TECHNIQUES**	**3**	**0**	**0**		**3**	**100**
Objective(s)	**The student should be made to:** • Familiarize the concept of Virtualization concepts • Gain the Virtualized Operating system. • Learn the concept of virtualization storage • Gain the Knowledge about the technologies of network virtualization • Learn virtual machine products						
Outcome(s)	**Upon completion of the course, the students should be able to:** • Identify the need of virtualization infrastructure. • Create OS level virtualization. • Identify storage level virtualization. • Analyze network level virtualization. • To compare and analyze various virtual machines products						
UNIT-I	**INTRODUCTION**						**9**
Architect for virtualization-virtualization–five step process–Discovery–Hardware maximization–Architectures–Manage virtualization-Build there source pool–planning and preparation–network layer–storage–host servers–testing-levels.							
UNIT-II	**OSVIRTUALIZATION**						**9**
Hardware level virtualization–OS level Virtualization–Interception Technique on windows–Featherweight Virtual Machine-FVMstates-operations–Design of virtualization layer Implementation–System call analysis–Limitations of FVM.							
UNIT-III	**STORAGEVIRTUALIZATION**						**9**
Storage virtualization–Enhanced Storage and Data Services–Implementation–High Availability –Performance–Capacity–SNIA storage management–Policy based service level management–Future of storage virtualization.							
UNIT-IV	**NETWORKVIRTUALIZATION**						**9**
Key Concepts-Architecture–Virtualized network Components-Logical Networks-Logical Network Design-Naming Conventions-Port profiles-uplink port profiles network adapter port pro files– Logical switches-planning logical switch design-deployment–Operations.							
UNIT-V	**VIRTUAL MACHINESPRODUCTS**						**9**
XenVirtual machine monitors-Xen API–VMware–VM ware products-Vm ware Features–Microsoft Virtual Server–Features of Microsoft Virtual Server.							
TOTAL HOURS							**45**

TEXTBOOKS:	
1	Matthewportnoy,“VirtualizationEssentials”,SYBEX(WileyBrand)2ndEdition,2016.
2	YangYu,“OS-levelVirtualizationandItsApplications”,ProQuestLLC,2009.
3	FrankBunn,NikSimpson,RobertPeglar,GeneNagle,“TechnicalTutorial–Storage Virtualization”,StorageNetworkingAssociation(SNIA),2004.
REFERENCES:	
1	DanielleRuest,NelsonRuest,“Virtualization: ABeginner’sGuide”,McGraw-Hill,2009.
2	Nigel Cain,Alvin Morales, Michel Luescher,Damian Flynn Mitch Tulloch,“Microsoft System Center-Building a virtualized Network Solution”,Microsoft press,2004.
3	MatthewPortney,“Virtualization Essentials”,JohnWiley&Sons,2012.
4	Timcerfing,Jeffbuller,Chuck Enstall, Richard Ruiz,“Mastering Microsoft Virtualization”,Wiley Publication,2010.

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	**1**	**3**	**1**	**3**	**2**	**-**	**-**	**-**	**1**	**1**	**3**	**3**	**2**	**2**	**-**
CO2	**3**	**2**	**2**	**1**	**2**	**-**	**-**	**-**	**1**	**2**	**3**	**3**	**2**	**1**	**-**
CO3	**3**	**2**	**1**	**3**	**1**	**-**	**-**	**-**	**2**	**2**	**2**	**3**	**1**	**2**	**-**
CO4	**1**	**1**	**2**	**3**	**3**	**-**	**-**	**-**	**3**	**3**	**3**	**2**	**2**	**1**	**-**
CO5	**1**	**3**	**2**	**3**	**1**	**-**	**-**	**-**	**2**	**1**	**3**	**3**	**1**	**1**	**-**
Average	**2**	**2**	**2**	**3**	**2**	**-**	**-**	**-**	**2**	**2**	**2.8**	**2.8**	**1.6**	**1.4**	**-**

1 - Low, 2 - Medium, 3 - High, ‘-“- No Correlation

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

Syllabus

Department	**Artificial Intelligence & Data Science**	**Programme Code**	**1161**

Program Elective

Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum Marks**
		L	**T**	**P**	**C**	
24AI15014	**GRAPH THEORY AND APPLICATIONS**	**3**	**0**	**0**	**3**	**100**

Objective(s)	**The student should be made to:** • Learn fundamentals of graph theory. • Gain the basic properties of Trees. • Familiarize the basic types of graph. • Gain the proof techniques related to various concepts in graphs. • Be exposed to the techniques of proofs and analysis.
Outcome(s)	**Upon completion of this course, students will be able to:** • Illustrate the basic concepts of graphs. • Describe the Tree terminologies. • Discuss the properties, theorems and be able to prove theorems. • Apply suitable graph model and algorithm for solving applications. • Use a combination of theoretical knowledge and independent mathematical thinking in creative investigation of questions in graph theory.

UNIT-I	**BASIC CONCEPTS**	**9**

Introduction- Graph Terminologies- Types of Graphs-Sub Graph-Multi Graph- Regular Graph-Isomorphism- Isomorphic Graphs- Sub-graph- Euler graph-Operation on Graph- Hamiltonian Graph-Travelling Salesman Problem-Related Theorems.

UNIT-II	**TREE TERMINOLOGIES**	**9**

Trees-Properties-Distance and Centers-Types-Rooted Tree—Tree Enumeration-Labeled Tree-Unlabeled Tree-Spanning Tree-Fundamental Circuits-Cut Sets-Properties-Fundamental Circuit and Cut-set-Connectivity Separability-Network Flows- RelatedTheorems.

UNIT-III	**TYPES OF GRAPH**	**9**

Network Flows-Planar Graph- Representation-Detection- Dual Graph- Geometric and Combinatorial Dual-Related Theorems-Digraph- Properties-Euler Digraph-Vector spaces of Graph.

UNIT-IV	**VARIOUS REPRESENTATION AND CORRELATIONS**	**9**

Matrix Representation- Adjacency matrix-Incidence matrix-Circuit matrix- Cut-set matrix-Path Matrix-Properties-Related Theorems-Correlations. Graph Coloring- Chromatic Polynomial- Chromatic Partitioning- Matching- Covering-Related Theorems.

UNIT-V	**ALGORITHMS**	**9**

Graph Algorithms-Some Basic Algorithms-Connectedness and Components-Spanning Tree-Fundamental Circuits-Cut Vertices-Directed Circuits-Shortest Path Algorithms-Depth First Search on a

graph -Isomorphism- Operational Research -Miscellaneous Applications-.	
TOTAL HOURS	**45**

TEXTBOOKS:	
1	Narsingh Deo,"Graph Theory with Application to Engineering and ComputerScience",Prentice-HallofIndiaPvt.Ltd,2003.
2	L.R.Foulds,"Graph Theory Applications", Springer, 2016.
REFERENCES:	
1	Bondy,J.A.and Murty, U.S.R., "Graph Theory with Applications", North Holland Publication,2008.
2	West, D.B.,—Introduction to Graph Theory,Pearson Education,2011.
3	John Clark, Derek Allan Holton,—A First Look at Graph Theory, World Scientific Publishing Company,1991
4	Diestel,R,"Graph Theory",Springer,3rdEdition,2006.
5	Kenneth H.Rosen,"Discrete Mathematics and Its Applications", Mc Graw Hill,2007.

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	2	2	2	-	-	-	-	-	-	-	3	2	2	1	-
CO2	3	2	2	-	-	-	-	-	-	2	3	2	1	1	-
CO3	2	3	1	-	-	-	-	-	-	2	3	3	2	2	-
CO4	2	1	2		-	-	-	-	-	-	3	2	1	1	-
CO5	1	2	2	-	-	-	-	-	-	2	3	2	1	1	-
Average	2.2	2	1.6	-	-	-	-	-	-	1.2	3	2	1	1	-

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

MAHENDRA ENGINEERING COLLEGE (Autonomous)							
Syllabus							
Department	**Artificial Intelligence & Data Science**		**Programme Code**			**1161**	
Program Elective							
Course code	**Course Name**	**Hours/week**				**Credit**	**Maximum Marks**
		L	**T**	**P**		**C**	
24AI15015	**COMPUTER VISION**	3	0	0		3	**100**
Objective(s)	**The student should be made to:** • Understand the fundamental concepts related to Image formation and processing. • Learn feature detection, matching and detection • Familiar with feature based alignment and motion estimation • Develop skills on 3D reconstruction • Understand the image based rendering and recognition						
Outcome(s)	**Upon completion of this course , students will be able to** • Explain the basic knowledge, theories and methods in image processing and computer vision. • Implement basic and some advanced image processing techniques • Apply 2D a feature-based based image alignment, segmentation and motion estimations. • apply 3D image reconstruction techniques • Design and develop innovative image processing and computer vision applications.						
UNIT-I	**INTRODUCTION TO IMAGE FORMATION AND PROCESSING**						**9**
Computer Vision - Geometric primitives and transformations - Photometric image formation - The digital camera - Point operators - Linear filtering - More neighborhood operators - Fourier transforms - Pyramids and wavelets - Geometric transformations - Global optimization							
UNIT-II	**FEATURE DETECTION, MATCHING AND SEGMENTATION**						**9**
Points and patches - Edges - Lines - Segmentation - Active contours - Split and merge – Mean - shift and mode finding - Normalized cuts - Graph cuts and energy-based methods.							
UNIT-III	**FEATURE-BASED ALIGNMENT & MOTION ESTIMATION**						**9**
2D and 3D feature-based alignment - Pose estimation - Geometric intrinsic calibration - Triangulation - Two-frame structure from motion - Factorization - Bundle adjustment - Constrained structure and motion - Translational alignment - Parametric motion - Spline-based motion - Optical flow - Layered motion.							
UNIT-IV	**3D RECONSTRUCTION**						**9**
Shape from X - Active range finding - Surface representations - Point-based representations- Volumetric representations - Model-based reconstruction - Recovering texture maps and albedosos.							

UNIT-V	OBJECT RECOGNITION TECHNIQUES &APPLICATIONS OF IMAGE	9
Object Recognition techniques: Viola-Jones, Yolo, Deep learning algorithms for Object Recognition. Optical Flow, Gaussian Mixture Model (GMM), Structure of Motion, Motion Estimation. Face Recognition, Facial Expression Recognition, Optical Character Recognition, Automated Video Surveillance		
	TOTAL HOURS	**45**

TEXT BOOKS :	
1	Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer- Texts in Computer Science, Second Edition, 2022.
2	Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, Second Edition, 2015.
REFERENCES:	
1	Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
2	Christopher M. Bishop; Pattern Recognition and Machine Learning, Springer, 2006
3	E. R. Davies, Computer and Machine Vision, Fourth Edition, Academic Press, 2012.

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	2	2	2	-	-	-	-	-	-	2	2	2	3	2	-
CO2	2	1	2	-	-	-	-	-	-	1	1	2	2	2	-
CO3	2	2	-	-	-	-	-	-	-	1	2	1	3	2	-
CO4	2	1	-		-	-	-	-	-	2	1	1	2	2	-
CO5	2	1	2	-	-	-	-	-	-	-	2	1	3	2	-
Average	**2**	**1.4**	**1.2**	**-**	**-**	**-**	**-**	**-**	**-**	**1.2**	**1.2**	**1.4**	**2.6**	**2**	**-**

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus						
Department	**Artificial Intelligence & Data Science**	**Programme Code**			**1161**	
Program Elective						
Course code	**Course Name**	**Hours /week**			**Credit**	**Maximum Marks**
		L	**T**	**P**	**C**	
24AI15016	**SOFT COMPUTING**	**3**	**0**	**0**	**3**	**100**
Objective(s)	**The student should be made to:** • Acquire knowledge of soft computing theories fundamentals • Learn the fundamentals of non-traditional technologies and approaches to solving hard real-world problems. • Learn and apply artificial neural networks, fuzzy sets and fuzzy logic, and genetic algorithms in problem solving and use of heuristics based on human experience • Gain the ideas of fuzzy sets, fuzzy logic. To become familiar with neural • Familiarize with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations.					
Outcome(s)	**Upon completion of this course , students will be able to:** • Awake the importance of tolerance of imprecision and uncertainty for design of robust and low-cost intelligent machines. • Acquire knowledge of soft computing theories fundamentals and so they will be able to design program systems using approaches of these theories for solving various real world problems. • Try and integrate the knowledge of neural networks, fuzzy logic, genetic algorithms, probabilistic reasoning, rough sets, chaos, hybrid approaches • Apply suitable soft computing techniques for various applications. • Analyze the learning behavior and convergence of supervisedneural networks for different activation functions.					
UNIT-I	**INTRODUCTION**					**9**
Introduction- Artificial Intelligence - Artificial Neural Networks - biological neurons - Basic models of artificial neural networks - Fuzzy Systems - Genetic Algorithm and Evolutionary Programming- Swarm Intelligent Systems - Learning Rules: Hebbian and Delta- Perceptron Network-Adaline Network- Madaline Network.						
UNIT-II	**ARTIFICIAL NEURAL NETWORKS**					**9**
Fundamental of neural networks - Characteristic of Neural networks - Back propagation Neural Networks – Kohonen Neural Network -Learning Vector Quantization - Hamming Neural Network – Hopfield Neural Network- Bi-directional Associative Memory - Adaptive Resonance Theory Neural Networks.						
UNIT-III	**FUZZY SYSTEMS**					**9**

Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets – Classical Relations and Fuzzy Relations - Fuzzy sets -Defuzzification – Applications		
UNIT-IV	**GENETIC ALGORITHMS**	**9**
Fundamental of genetic algorithms - Basic Concepts- Working Principles -Encoding- Fitness Function – Reproduction -Inheritance - Operators – Cross Over – Inversion and Deletion - Mutation Operator – Bit-wise Operators - Generation cycle - Convergence of Genetic Algorithm		
UNIT-V	**SUPERVISED LEARNING NETWORKS**	**9**
Evolution of computing – soft computing constituents –Biological neural networks – Artificial neurons – Applications. Supervised LearningNetworks: Activation functions - Learning rules - Perceptron networks – Adaline – Madaline- Back propagation networks		
TOTAL HOURS		**45**

TEXT BOOKS	
1	N.P.Padhy, S.P.Simon, "Soft Computing with MATLAB Programming", Oxford UniversityPress, 2015
2	S.Rajasekaran, G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and GeneticAlgorithm, Synthesis and Applications ", PHI Learning Pvt. Ltd., 2017.
3	S.N. Sivanandam, S.N. Deepa, "Principles of Soft Computing", 3rd Edition,John Wiley & Sons, New Delhi, 2019
REFERENCES	
1	James A. Freeman and David M. Skapura, ―Neural Networks Algorithms, Applications, and Programming Techniques, Addison Wesley, 2003.
2	Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, ―Neuro-Fuzzy and Soft Computing,Prentice-Hall of India, 2002
3	Kwang H.Lee, ―First course on Fuzzy Theory and Applications, Springer, 2005.
4	George J. Klir and Bo Yuan, ―Fuzzy Sets and Fuzzy Logic-Theory and Applications, Prentice Hall, 1996.
5	James A. Freeman and David M. Skapura, ―Neural Networks Algorithms, Applications, and Programming Techniques, Addison Wesley, 2003.

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	-	-	-	-	-	-	-	-	3	3	2	2	-
CO2	3	2	2	-	-	-	-	-	-	-	3	3	2	1	-
CO3	3	2	2	-	-	-	-	-	-	-	2	3	1	2	-
CO4	3	2	2	-	-	-	-	-	-	-	3	2	2	1	-
CO5	2	3	-	-	-	-	-	-	-	-	3	3	1	1	-
Average	3	2	1.2	-	-	-	-	-	-	-	2.8	2.8	1.6	1.4	-

1 - Low, 2 - Medium, 3 - High, ‘-“- No Correlation

MAHENDRA ENGINEERING COLLEGE (Autonomous)							
Syllabus							
Department	**Artificial Intelligence & Data Science**		**Programme Code**			**1161**	
Program Elective							
Course code	**Course Name**	**Hours/week**				**Credit**	**Maximum marks**
24AI15017	**OPTIMIZATION TECHNIQUES**	**L**	**T**	**P**		**C**	**100**
		3	**0**	**0**		**3**	
Objective(s)	**The student should be made to:** • Operation research models using optimization techniques based upon the fundamentals of engineering mathematics (minimization and Maximization of objective function). • The problem formulation by using linear, dynamic programming, game theory and queuing models. • The problem formulation by using non-linear programming model to solve the constrained optimization problems • The stochastic models for discrete and continuous variables to control inventory and simulation of manufacturing models for the production decision making. • The course is intended to impart knowledge on how to produce optimized solutions usinglinear and non-linear programming, and compute critical paths for project management						
Outcome(s)	**On completion of the course, the students will be able to:** • Investigate the optimization problem and the classical optimization techniques • Apply the linear programming model as a solution to various problems with linear functions • Make use of non-linear programming model to solve the constrained optimization problems • Develop optimal solutions for multistage decision problems using dynamic programming • Apply modern optimization techniques to solve decision problems						
UNIT-I	**OPTIMIZATION PROBLEM**						**9**
Statement Of An Optimization Problem: Design Vector – Design Constraints – Constraint Surface – Objective Function – Classification Of Optimization Problems Classification Based On The Existence Of Constraints – Nature Of The Design Variables – Physical Structure Of The Problem – Nature Of The Equations Involved – Classical Optimization Techniques.							
UNIT-II	**LINEAR PROGRAMMING**						**9**

Standard Form Of A Linear Programming Problem – Geometry Of Linear Programming Problems – Definitions And Theorems – Solution Of A System Of Linear Simultaneous Equations – Pivotal Reduction Of A General System Of Equations.		
UNIT-III	**NONLINEAR PROGRAMMING**	**9**
Constrained Optimization Techniques – Random Search Methods – Complex Method – Sequential Linear Programming – Transformation Techniques – Basic Approach Of The Penalty Function Method – Interior Penalty Function Method – Convex Programming Problem – Exterior Penalty Function Method – Extrapolation Techniques In The Interior Penalty Function Method – Extended Interior Penalty Function Methods.		
UNIT-IV	**DYNAMIC PROGRAMMING**	**9**
Multistage Decision Processes – Types Of Multistage Decision Problems – Concept Of Sub Optimization And Principle Of Optimality – Computational Procedure In Dynamic Programming – Illustrating The Calculus Method Of Solution – Illustrating The Tabular Method Of Solution .		
UNIT-V	**CLASSICAL OPTIMIZATION**	**9**
Unconstrained Problem: Necessary and Sufficient Conditions- Newton-Raphson Method – Constrained Problems: Equality Constraints – InequalityConstraints -– Nonlinear Programming Algorithms: Constrained and Unconstrained Algorithms– Markov Chains : Definition of a Markov Chain – Classification of the states in a Markov Chain		
	TOTAL HOURS	**45**

TEXTBOOKS	
1	Singiresu S. Rao, “Engineering Optimization: Theory and Practice”, John Wiley and Sons, 5th edition, 2019 (Units 1-5)
2	George Bernard Dantzig, MukundNarain Thapa, “Linear programming”, Springer series in operations research 3rd edition, 2003.
3	Analyze optimization algorithms like gradient methods,heuristics, and constraint techniques to solve complex AIproblems.
REFERENCES	
1	H.A. Taha, “Operations Research: An Introduction”, 8th Edition, Pearson/Prentice Hall, 2007
2	Rao S.S,”Optimization – Theory and applications”, Wiley Easter Ltd., 1979.
3	David G.Luerbeggan, “Introduction to Linear and Non Linear Programming”, Addison Wesley Publishing Co. 1973..
4	Cordan C.C. Beveridge and Robert S. Schedther, “Optimization, Theory and Practice” McGraw Hill Co.1970.
5	Hadley G. “Nonlinear and – dynamic programming” Addison Wesley Publishing Co. 1964

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	2	-	-	-	-	-	2	-	3	2	3	2	-
CO2	2	1	-	-	-	-	-	-	-	1	3	3	1	1	-
CO3	3	1	1	-	-	-	-	-	1	1	2	2	2	2	-
CO4	3	2	2		-	-	-	-	2	2	3	3	2	3	-
CO5	1	2	-	-	-	-	-	-	3	2	2	2	2	2	-
Average	2.6	1.4	1	-	-	-	-	-	1.4	1.2	2.6	2.6	2	2	-

1 - Low, 2 - Medium, 3 - High, ‘-“- No Correlation

<table>
<tr><td colspan="7">MAHENDRA ENGINEERING COLLEGE
(Autonomous)</td></tr>
<tr><td colspan="7">Syllabus</td></tr>
<tr><td>Department</td><td colspan="2">Artificial Intelligence & Data Science</td><td colspan="2">Programme Code</td><td colspan="2">1161</td></tr>
<tr><td colspan="7">Program Elective</td></tr>
<tr><td>Course code</td><td colspan="2">Course Name</td><td colspan="3">Periods/week</td><td>Credit</td><td>Maximum marks</td></tr>
<tr><td rowspan="2">24AI15018</td><td colspan="2" rowspan="2">OPEN SOURCE SOFTWARE</td><td>L</td><td>T</td><td>P</td><td>C</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Objective(s)</td><td colspan="6">The student should be made to:
• Understand the overview of open source software and platforms.
• Know about the Pearl language overview.
• Know about the PHP Programming in web environment.
• Learn about R Programming.
• Learn about Building Pagination using PHP and AJAX Hosting Open Source Projects using Github</td></tr>
<tr><td>Outcome(s)</td><td colspan="6">The students will be able to:
• Explain the importance of open source software and platforms.
• Apply the Pearl parsing rules in open source software.
• Demonstrate the PHP programming in web environment.
• Apply R programming concepts in open source software.
• Implement Building Pagination using PHP and AJAX Hosting Open Source Projects using Github.</td></tr>
<tr><td>UNIT-I</td><td colspan="5">INTRODUCTION</td><td>9</td></tr>
<tr><td colspan="7">Introduction to Open Sources: Need of Open SourcesAdvantages of Open Sources-Applications of Open sources. Open Source Operating System: LINUX: Introduction General Overview-Kernel Mode and user mode-Process. Advanced Concepts: Scheduling-Personalities-Cloning Signals-Development with Linux.</td></tr>
<tr><td>UNIT-II</td><td colspan="5">OPENSOURCE PROGRAMMINGLANGUAGES-I</td><td>9</td></tr>
<tr><td colspan="7">Perl back ground–Perl overview –Perl parsing rules–Variables and Data–Statements and Control structures–Subroutines,Packages ,and Modules-Working with Files–Data Manipulation.</td></tr>
<tr><td>UNIT-III</td><td colspan="5">PROGRAMMINGLANGUAGES-II</td><td>9</td></tr>
<tr><td colspan="7">PHP: Introduction – Programming in web environment – variables –constants – data type - operators– Statements–Functions–Arrays–OOP–String Manipulation and regular expression– File handling and data storage– PHP and SQL database– PHP and LDAP– PHP Connectivity– Sending and receiving E-mails–Debugging and error handling– Security–Templates. .</td></tr>
<tr><td>UNIT-IV</td><td colspan="5">PROGRAMMINGLANGUAGES-III</td><td>9</td></tr>
<tr><td colspan="7">R programming: History and Overview of R: Basic Features of R-Free Software-Design of the RSystem.R Nuts and Bolts: Entering Input – Evaluation- RObjects- Numbers- Creating Vectors-Matrices-Factors-Data Frames-Names.Getting Data In and Out of R-File Connections- Vectorized Operations-Control Structures-Functions.</td></tr>
</table>

UNIT-V	AJAX AND GITHUB HOSTING SERVICE	9
JavaScript and AJAX Client – JavaScript and DOM – XML Http Request Object – AJAX form validation – Uploading a file using AJAX – Displaying a table in AJAX – Building Pagination using PHP and AJAX Hosting Open Source Projects using Github: Introduction – Viewing Github Graphs Editing Files – Collaborating on Pull Requests – Creating a Repository – Configuring a Repository		
	TOTAL HOURS	**45**

TEXT BOOKS:	
1	Ellen Siever,Stephen Figgins,Robert Love,Arnold Robbins,"Linux in a Nutshell",Sixth Edition,Oreilly Media,2009.
2	Roger P D eng,"R programming for DataScience",First Edition,2015.
REFERENCES:	
1	Steven Holzner,"PHP:The Complete Reference",2nd Edition,Tata McGraw-Hill Publishing Company Limited, Indian Reprint 2009.
2	Philosophy of GNU URL:http://www.gnu.org/philosophy/.
3	Linux Administration URL:http://www.tldp.org/LDP/lame/LAME/linux-admin-made-easy/.
4	The Python Tutorial available at http://docs.python.org/2/tutorial/.Elsevier,Second Edition.
5	Perl Programming book at http://www.perl.org/books/beginning-perl/.
6	R programming book at http://leanpub.com/rprogramming
7	Version control system URL:http://git-scm.com/. Samba:URL:http://www.samba.org/.and Libre office:http://www.libreoffice.org/.

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	2	2	2	-	-	-	-	-	2	2	2	2	3	2	-
CO2	2	1	2	-	-	-	-	-	1	1	2	2	3	1	-
CO3	2	2	1	-	-	-	-	-	1	1	2	2	3	2	-
CO4	2	1	1		-	-	-	-	2	2	2	2	3	1	-
CO5	2	2	2	-	-	-	-	-	2	-	2	2	3	2	-
Average	**2**	**1.6**	**1.6**	**-**	**-**	**-**	**-**	**-**	**1.6**	**1.2**	**2**	**2**	**3**	**1.6**	**-**

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus						
Department	**Artificial Intelligence & Data Science**	**Programme Code**			**1161**	
Program Elective						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum Marks**
24AI15019	**HEALTH CARE INFORMATICS**	**L** **3**	**T** **0**	**P** **0**	**C** **3**	**100**
Objective(s)	**The student should be made to** : • Learn machine learning and deep learning algorithms for health data analysis • Learn the significance and need of data analysis and data visualization • Understand the health data management frameworks • Learn the use of machine learning and deep learning algorithms in healthcare • Apply healthcare Analytics for critical care applications					
Outcome(s)	**Upon completion of this course, students will be able to:** • Use machine learning and deep learning algorithms for health data analysis • Apply the data management techniques for healthcare data • Evaluate the need of healthcare data analysis in e-healthcare, telemedicine and other critical care applications • Design health data analytics for real time applications • Design emergency care system using health data analysis					
UNIT-I	**INTRODUCTION TO HEALTH CARE ANALYSIS**					**9**
Overview - History of Healthcare Analysis Parameters on medical care systems- Health care policy- Standardized code sets – Data Formats – Machine Learning Foundations: Tree Like reasoning , Probabilistic reasoning and Bayes Theorem, Weighted sum approach.						
UNIT-II	**ANALYTICS ON MACHINE LEARNING**					**9**
Machine Learning Pipeline – Pre-processing –Visualization – Feature Selection – Training model parameter – Evaluation model : Sensitivity , Specificity , PPV ,NPV, FPR ,Accuracy , ROC , Precision Recall Curves , Valued target variables –Python: Variables and types, Data Structures and containers , Pandas Data Frame :Operations – Scikit –Learn : Pre-processing , Feature Selection.						
UNIT-III	**HEALTH CARE MANAGEMENT**					**9**
IOT- Smart Sensors – Migration of Health care Relational database to NoSQL Cloud Database – Decision Support System – Matrix block Cipher System – Semantic Framework Analysis –Histogram bin Shifting and Rc6 Encryption – Clinical Prediction Models – Visual Analytics for Healthcare.						
UNIT-IV	**HEALTH CARE AND DEEP LEARNING**					**9**

Introduction on Deep Learning – DFF network CNN- RNN for Sequences – Biomedical Image and Signal Analysis – Natural Language Processing and Data Mining for Clinical Data – Mobile Imaging and Analytics – Clinical Decision Support System.		
UNIT-V	**CASE STUDIES**	**9**
Predicting Mortality for cardiology Practice –Smart Ambulance System using IOT –Hospital Acquired Conditions (HAC) program- Healthcare and Emerging Technologies – ECG Data Analysis.		
TOTAL HOURS		**45**

TEXT BOOKS:	
1	ChandanK.Reddy, Charu C. Aggarwal, "Health Care data Analysis", First edition, CRC, 2015.
2	Vikas Kumar, "Health Care Analysis Made Simple", Packt Publishing, 2018.
REFERENCES:	
1	Nilanjan Dey, Amira As hour , Simon James Fong, Chintan Bhatl, "Health Care Data Analysis and Management, First Edition, Academic Press, 2018.
2	Hui Jang, Eva K. Lee, "HealthCare Analysis : From Data to Knowledge to Healthcare Improvement", First Edition, Wiley, 2016.
3	Kulkarni , Siarry, Singh ,Abraham, Zhang, Zomaya , Baki, "Big Data Analytics in HealthCare",

COsVsPOsandPSOsMapping

CourseOutcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO1	3	2	-	-	-	-	-	-	-	-	3	3	2	2	-
CO2	3	2	2	-	-	-	-	-	-	-	3	3	2	1	-
CO3	3	2	2	-	-	-	-	-	-	-	2	3	1	2	-
CO4	3	2	2	-	-	-	-	-	-	-	3	2	2	1	-
CO5	3	2	-	-	-	-	-	-	-	-	3	3	1	1	-
Average	**3**	**2**	**1.2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.8**	**2.8**	**1.6**	**1.4**	-

1-Low,2-Medium,3-High,'-"-No Correlation

MAHENDRA ENGINEERING COLLEGE (Autonomous)							
Syllabus							
Department	**Artificial Intelligence & Data Science**		**Programme Code**			**1161**	
Program Elective							
Course code	**Course Name**	**Hours/week**				**Credit**	**Maximum Marks**
		L	**T**	**P**		**C**	
24AI15020	**BLOCK CHAIN TECHNOLOGY**	**3**	**0**	**0**		**3**	**100**
Objective(s)	**The student should be made to :** • Familiarize the Blockchain's fundamental components, and examine decentralization using block chain. • To explain how crypto currency works, from when a transaction is created to when it is considered part of the Blockchain. • To explain the components of Ethereum and Programming Languages for Ethereum. • To study the basics of Hyperledger and Web3. • To know about alternative Blockchains and Blockchain projects in different domains.						
Outcome(s)	**On completion of the course, the students will be able to:** • Explain the technology components of Blockchain and how it works behind the scenes. • Identify different approaches to developing decentralized applications. • Discuss Bitcoin and its limitations by comparing with other alternative coins. • Devise solution using the Ethereum model. • Understand the fundamental concepts and architecture ofblockchain technology, including its history, types, consensusmechanisms, and methods of decentralization, as well as exploredecentralized platforms and organization						
UNIT-I	**INTRODUCTION TO BLOCKCHAIN**						**9**
History of Blockchain – Types of Blockchain – Consensus –Transactions and Blocks, P2P Systems, Keys as Identity, Digital Signatures, Hashing, and public key cryptosystems, private vs. public Blockchain. Decentralization using Blockchain – Blockchain and Full Ecosystem Decentralization – Platforms for Decentralization.							
UNIT-II	**BITCOIN AND CRYPTOCURRENCY**						**9**
Bitcoin – Digital Keys and Addresses – Transactions – Mining – Bitcoin Networks and Payments – Wallets –Decentralization and Hard Forks, Ethereum Virtual Machine (EVM), Merkle Tree, Double-Spend Problem, Blockchain and Digital Currency, Transactional Blocks, Impact of Blockchain Technology on Cryptocurrency-Smart Contracts – Ricardian Contracts.							
UNIT-III	**ETHEREUM**						**9**

The Ethereum Network – Components of Ethereum Ecosystem –Metamask Setup, Ethereum Accounts, Transactions, Receiving Ethers- Ethereum Programming Languages: Runtime Byte Code, Blocks and Blockchain, Fee Schedule – Supporting Protocols – Solidity Language.		
UNIT-IV	**WEB3 AND HYPERLEDGER**	**9**
Introduction to Web3 – Contract Deployment – POST Requests – Development Frameworks – Hyperledger as a Protocol – The Reference Architecture – Hyperledger Fabric – Distributed Ledger – Corda.		
UNIT-V	**BLOCK CHAIN AND DECENTRALIZATION**	**9**
History of Blockchain – Types of Blockchain –Consensus – Decentralization using Block chain – Methods of Decentralization-Blockchain and Full Ecosystem Decentralization – Platforms for Decentralization-Decentralized Autonomous organization.		
TOTAL HOURS		**45**

TEXT BOOK:	
1.	Imran Bashir, “Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained”, Second Edition, Packt Publishing, 2018.
2.	Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, “Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction” Princeton University Press, 2016
3	Kang – Imran Bashir, “Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained”, 2nd Edition, Packt Publishing, 2018.
REFERENCES:	
1	Arshdeep Bahga, Vijay Madisetti, “Blockchain Applications: A Hands On Approach”, VPT, 2017.
2	Andreas Antonopoulos, Satoshi Nakamoto, “Mastering Bitcoin”, O’Reilly, 2014.
3	Roger Wattenhofer, “The Science of the Blockchain” CreateSpace Independent Publishing, 2016.
4	A. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, “Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction”, Princeton University Press, 2016.
5	Alex Leverington, “Ethereum Programming” Packt Publishing, 2017.

CO's Vs PO's and PSO's Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	2	-	-	-	-	-	-	-	3	3	3	2	-
CO2	3	2	1	-	-	-	-	-	-	1	3	3	1	2	-
CO3	3	2	1	-	-	-	-	-	-	1	2	3	2	2	-
CO4	3	2	2		-	-	-	-	-	2	3	3	2	1	-
CO5	1	2	3	-	-	-	-	-	-	2	3	2	2	2	-
Average	3	2	1.4	-	-	-	-	-	-	1.2	2.6	3	2	1.8	-

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

MAHENDRA ENGINEERING COLLEGE (Autonomous)							
Syllabus							
Department	**Artificial Intelligence and Data Science**		**Programme Code**			**1161**	
Program Elective							
Course code	**Course Name**	**Hours/Week**				**Credit**	**Maximum marks**
		L	**T**	**P**		**C**	
24AI15021	**OBJECT ORIENTED ANALYSIS AND DESIGN**	**3**	**0**	**0**		**3**	**100**
Objective(s)	**The student should be made to :** • Learn the fundamentals of object modeling • Familiarize differentiate Unified Process from other approaches. • Design with the UML dynamic and implementation diagrams. • Improve the software design with design patterns. • Know the advance software against its requirements specification						
Outcome(s)	**Upon completion of this course , students will be able to :** • Express software design with UML diagrams • Design software applications using OO concepts. • Identify various scenarios based on software requirements • Transform UML based software design into pattern based design using design patterns. • Describe the various advance modelling methodologies for OO software						
UNIT-I	**UNIFIED PROCESS AND USE CASE DIAGRAMS**						**9**
Introduction to OOAD with OO Basics - Unified Process – UML diagrams – Use Case –Case study – the Next Gen POS system, Inception -Use case Modeling – Relating Use cases – include, extend and generalization – When to use Use-casesuse Class Diagrams.							
UNIT-II	**STATIC UML DIAGRAMS**						**9**
Class Diagram – Elaboration - Domain Model –Finding conceptual and description classes – Associations - Attributes – Domain model refinement – finding conceptual class hierarchies – Aggregation and composition – Relationship between sequence diagrams and use cases – when use class diagrams.							
UNIT-III	**DYNAMIC AND IMPLEMENTATION UML DIAGRAMS**						**9**
UML interaction diagrams - System sequence diagram–Collaboration diagram– When to use Communication Diagrams - State machine diagram and Modeling –When to use S a Diagrams - Activity diagram – When to use activity diagrams- Implementation Diagrams- UML package diagram - When to use package diagrams - ComponentandDeploymentDiagrams– WhentouseComponentandDeploymentdiagrams.							
UNIT-IV	**DESIGNPATTERNS**						**9**
GRASP: Designing objects with responsibilities – Creator – Information expert – Low Coupling – High Cohesion – Controller - Design Patterns – creational – factory method – structural – Bridge – Adapter – behavioral – Strategy – observer –Applying GoF design patterns – Mapping design to code.							

UNIT-V	ADVANCED BEHAVIORAL MODELING & ARCHITECTURAL MODELING	9
Events and signals, state machines, processes and Threads, time and space, state chart diagrams. Component, Deployment, Component diagrams and Deployment diagrams.		
TOTAL HOURS		45

TEXT BOOKS:	
1	Craig Larman, Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development, Third Edition, Pearson Education, 2005.
2	Ali Bahrami - Object Oriented Systems Development - McGraw Hill International, Edition – 1999.
REFERENCES:	
1	Erich Gamma, and Richard Helm, Ralph Johnson, John Vlissides, ―Design patterns: Elements of Reusable Object-Oriented Software, Addison-Wesley, 1995
2	Martin Fouler, ―UML Distilled: A Brief Guide to the Standard Object Modeling Language,Third edition, Addison Wesley, 2003.

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	-	-	-	-	-	-	-	-	3	3	2	2	-
CO2	3	2	2	-	-	-	-	-	-	-	3	3	2	1	-
CO3	3	1	-	-	-	-	-	-	-	-	2	3	1	2	-
CO4	3	2	2	-	-	-	-	-	-	-	3	3	2	1	-
CO5	3	1	2	-	-	-	-	-	-	-	3	3	1	1	-
Average	3	1.6	1.2	-	-	-	-	-	-	-	2.8	3	1.6	1.4	-

1 - Low, 2 - Medium, 3 - High, ‘-“- No Correlation

MAHENDRA ENGINEERING COLLEGE (Autonomous)							
Syllabus							
Department	**Artificial Intelligence & Data Science**	**Programme Code**			**1161**		
Program Elective							
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum Marks**	
24AI15022	**SOFTWARE TESTING**	**L**	**T**	**P**	**C**	**100**	
		3	0	0	3		
Objective(s)	**The student should be made to:** • Study the fundamentals of software testing based on activity. • Gain knowledge about the test case design strategies based on different test methods. • Understand the different levels of testing. • Be familiar with test management and test automation techniques. • Be exposed to test metrics and measurements						
Outcome(s)	**Upon completion of this course , students will be able to** • Design test cases suitable for a software development for different domains. • Identify suitable tests to be carried out. • Prepare test planning based on the document. • Document test plans and test cases designed. • Use of automatic testing tools. Develop and validate a test plan.						
UNIT-I	**INTRODUCTION**						**9**
Testing as an Engineering Activity- Testing as Process - Testing axioms - Basic definitions - Software Testing Principles - The Testers Role in a Software Development Organization - Origins of Defects - Cost of defects - Defect Classes - The Defect Repository and Test Design - Defect Prevention strategies.							
UNIT-II	**TEST CASE DESIGN**						**10**
Test case Design Strategies – Using Black Box Approach to Test Case Design – Random Testing – Requirements based testing – Boundary Value Analysis – Equivalence Class Partitioning – State-based testing – Cause-effect graphing – Compatibility testing – user documentation testing – domain testing – Using White Box Approach to Test design – static testing vs. structural testing- code functional and complexity testing – Coverage and Control Flow Graphs – Covering Code Logic – Paths complexity testing – Evaluating Test Adequacy Criteria.							
UNIT-III	**LEVELS OF TESTING**						**9**
The need for Levers of Testing – Unit Test – Unit Test Planning – Designing the Unit Tests – Running the Unit tests and Recording results – Integration tests – Designing and Planning the Integration Test – Scenario testing –System Testing – Acceptance testing – Performance testing – Regression Testing – Internationalization testing – Ad-hoc testing – Alpha, Beta Tests- Configuration testing – Compatibility testing.							

UNIT-IV	TEST MANAGEMENT	10
People and organizational issues in testing – Organization structures for testing teams – testing services – Test Planning – Test Plan Components – Test Plan Attachments – Locating Test Items – test management – Test Process – Reporting Test Results – The role of three groups in Test Planning and Policy Development - Introducing the test specialist – Skills needed by a test specialist –Building a Testing Group.		
UNIT-V	**DEFECT MANAGEMENT**	**7**
Defect /Bug, Causes For Defect, Defect Reporting, Defect Attributes, Severity And Priority, Defect Life Cycle, Advantages Of Defect Tracking		
	TOTAL HOURS	**45**

TEXT BOOKS :	
1.	Srinivasan Desikan and Gopalaswamy Ramesh, "Software Testing – Principles and Practices", Pearson Education, 2013.
2.	Ron Patton, "Software Testing", Second Edition, Sams Publishing, Pearson Education, 2007.
REFERENCES:	
1	Ilene Burnstein, " Practical Software Testing", Springer International Edition, 2003.
2	Edward Kit," Software Testing in the Real World – Improving the Process", Pearson Education, 2001.
3	Boris Beizer," Software Testing Techniques" – 2nd Edition, Van Nostrand Reinhold, New York, 1990.
4	Aditya P. Mathur, "Foundations of Software Testing _ Fundamental Algorithms and Techniques", Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	2	2	2	-	-	-	-	-	2	2	2	1	1	2	-
CO2	2	2	2	-	-	-	-	-	1	1	1	1	1	2	-
CO3	2	2	-	-	-	-	-	-	1	1	2	2	1	2	-
CO4	2	1	2		-	-	-	-	2	2	1	1	1	2	-
CO5	2	2	-	-	-	-	-	-	2	-	1	1	1	2	-
Average	**2**	**1.8**	**1.2**	**-**	**-**	**-**	**-**	**-**	**1.6**	**1.2**	**1.4**	**1.2**	**1**	**2**	**-**

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

<table>
<tr><td colspan="7">AHENDRA ENGINEERING COLLEGE
(Autonomous)</td></tr>
<tr><td colspan="7">Syllabus</td></tr>
<tr><td>Department</td><td colspan="2">Artificial Intelligence and Data Science</td><td colspan="2">Programme Code</td><td colspan="2">1161</td></tr>
<tr><td colspan="7">Program Elective</td></tr>
<tr><td>Course code</td><td colspan="2">Course Name</td><td colspan="3">Hours/Week</td><td>Credit</td><td>Maximum marks</td></tr>
<tr><td rowspan="2">24AI15023</td><td colspan="2" rowspan="2">SOFTWARE ENGINEERING</td><td>L</td><td>T</td><td>P</td><td>C</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Objective(s)</td><td colspan="6">The student should be made to:
• Learn the phases in a software project
• Familiarize the fundamental concepts of requirements engineering and Analysis Modeling.
• Gain the major considerations for enterprise integration and deployment.
• The course is intended to impart knowledge on Software Life cycle models for Softwaredevelopment process.</td></tr>
<tr><td>Outcome(s)</td><td colspan="6">Upon completion of this course, students will be able to:
• Identify the key activities in managing a software project.
• Compare different process models.
• Concepts of requirements engineering and Analysis Modeling.
• Apply systematic procedure for software design and deployment.
• Impart the knowledge on Software Life cycle models forSoftware development process</td></tr>
<tr><td>UNIT-I</td><td colspan="5">SOFTWARE PROCESS AND AGILE DEVELOPMENT</td><td>9</td></tr>
<tr><td colspan="7">Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models –-Classical Evolutionary models-Introduction to Agility-Agile process-Extreme programming-XP Process-Over view of System Engineering</td></tr>
<tr><td>UNIT-II</td><td colspan="5">REQUIREMENTS ANALYSIS AND SPECIFICATION</td><td>9</td></tr>
<tr><td colspan="7">Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management-Structured system Analysis, Petri Nets-Data Dictionary</td></tr>
<tr><td>UNIT-III</td><td colspan="5">SOFTWARE DESIGN</td><td>9</td></tr>
<tr><td colspan="7">Design process – Design Concepts-Design Model– Refinement-Modularity Cohesion coupling– Architectural Design - Architectural styles, Architectural Design, Architectural Mapping using Data Flow- User Interface Design: Interface analysis, Interface Design –Component level Design: Designing Class based components, traditional Components.</td></tr>
<tr><td>UNIT-IV</td><td colspan="5">SOFTWARE IMPLEMENTATION AND MAINTENANCE</td><td>9</td></tr>
<tr><td colspan="7">Structured coding Techniques-Coding Styles-Standards and Guidelines- Documentation Guidelines-Modern Programming Language Features: Type checking-User defined data types-Data Abstraction-Maintenance and Reengineering-BPR model-Reengineering process model-Reverse and Forward</td></tr>
</table>

Engineering		
UNIT-V	**SOFTWARE ENGINEERING PROCESS, REQUIREMENTS**	**9**
Software Process: Software Process Structure – Software Development Process Models –Agile Development – Understanding Requirements.**Requirements Modeling:** Unified Modeling Language – Architecture – Unified Process –Requirements Workflow – Defining Requirements – Use Case Modeling – Actor and Use CaseGeneralization – Use Case Relationships.		
TOTAL HOURS		**45**

TEXT BOOK :	
1	Roger S. Pressman, "Software Engineering – A Practitioner‟s Approach", Seventh Edition, McGraw-Hill International Edition, 2010
2	Jim Arlow, Ila Neustadt, "UML2 and The Unified Process: Practical Object Oriented Analysis and Design", Pearson Education, 2015
REFERENCES:	
1	Ian Sommerville, "Software Engineering", 9th Edition, Pearson Education Asia, 2011
2	Rajib Mall, "Fundamentals of Software Engineering", Third Edition, PHI Learning Private Limited ,2009
3	PankajJalote, "Software Engineering, A Precise Approach", Wiley India, 2010
4	Kelkar S.A., "Software Engineering", Prentice Hall of India Pvt Ltd, 2007
5	Stephen R.Schach, "Software Engineering", Tata McGraw-Hill Publishing Company Limited, 2007.
6	Craig Larman, "Applying UML and Patterns: An Introduction to Object Oriented Analysis and Design and Iterative Development", 3rd Edition, Addison Wesley Professional, 2015.

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	2	-	-	-	-	-	-	-	3	3	3	2	-
CO2	3	2	-	-	-	-	-	-	-	1	3	3	1	2	-
CO3	3	2	2	-	-	-	-	-	-	1	2	2	2	2	-
CO4	3	2	2		-	-	-	-	-	2	3	3	2	1	-
CO5	2	3	1	-	-	-	-	-	-	2	3	2	2	2	-
Average	3	2	1.4	-	-	-	-	-	-	1.2	2.6	2.8	2	1.8	-

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

MAHENDRA ENGINEERING COLLEGE (Autonomous)							
Syllabus							
Department	**Artificial Intelligence & Data Science**		**Programme Code**			**1161**	
Program Elective							
Course code	**Course Name**	**Hours /Week**				**Credit**	**Maximum marks**
		L	**T**	**P**		**C**	
24AI15024	**DISTRIBUTED DATABASE**	**3**	**0**	**0**		**3**	**100**
Objective(s)	**The student should be made to:** • Learn the design of databases • Acquire knowledge distributed databases and its applications • Familiarize advanced concepts in databases in large scale analytics • Learn reasoning and query processing • Learn the challenges in distributed databases						
Outcome(s)	**Upon completion of this course , students will be able to:** • Explain theoretical and practical aspects of distributed database systems • Identify various issues related to the development of distributed database system. • Discuss the design aspects of object-oriented database system and related development. • Critically analyze the state-of-the-art in advanced databases distributed systems. • Apply problem solving (analysis, design, and development) skills to distributed Applications						
UNIT-I	**INTRODUCTION**						**9**
Introduction: Distributed Data Processing - Distributed Database System - Promises of DDBSs - Problem areas. Distributed DBMS Architecture: Architectural Models for Distributed DBMS - DMBS Architecture. Distributed Database Design: Alternative Design Strategies - Distribution Design issues – Fragmentation - Allocation.							
UNIT-II	**QUERY PROCESSING AND DECOMPOSITION**						**9**
Query processing and decomposition: Query processing objectives - characterization of query processors - layers of query processing - query decomposition - localization of distributed data. Distributed query Optimization: Query optimization - centralized query optimization - distributed query optimization algorithms.							
UNIT-III	**TRANSACTION MANAGEMENT**						**9**
Transaction Management: Definition - properties of transaction - types of transactions - distributed concurrency control: Serializability - concurrency control mechanisms & algorithms - time - stamped & optimistic concurrency control Algorithms - deadlock Management.							
UNIT-IV	**DISTRIBUTED DBMS RELIABILITY**						**9**

Distributed DBMS Reliability: Reliability concepts and measures - fault-tolerance in distributed systems - failures in Distributed DBMS - local & distributed reliability protocols - site failures and network partitioning. Parallel Database Systems: Parallel database system architectures - parallel data placement - parallel query processing - load balancing - database clusters.		
UNIT-V	**DISTRIBUTED OBJECT DATABASE MANAGEMENT SYSTEMS**	**9**
Distributed object Database Management Systems: Fundamental object concepts and models - object distributed design - architectural issues - object management - distributed object storage - object query Processing. Object Oriented Data Model: Inheritance - object identity - persistent programming languages - persistence of objects - comparison OODBMS and ORDBMS.		
TOTAL HOURS		**45**

TEXT BOOKS :	
1	M. Tamer OZSU and Patuck Valduriez: Principles of Distributed Database Systems, Pearson Edn. Asia, 2001.
2	Stefano Ceri and Giuseppe Pelagatti: Distributed Databases, McGraw Hill.
REFERENCES:	
1	Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom: “Database Systems: The Complete Book”, Second Edition, Pearson International Edition

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	-	-	-	-	-	-	-	-	3	3	2	2	-
CO2	3	2	-	-	-	-	-	-	-	-	3	3	2	1	-
CO3	3	2	-	-	-	-	-	-	-	-	3	3	2	2	-
CO4	3	2	-	-	-	-	-	-	-	-	3	3	2	1	-
CO5	3	2	-	-	-	-	-	-	-	-	3	3	2	1	-
Average	3	2	-	-	-	-	-	-	-	-	3	3	2	1.4	-

1 - Low, 2 - Medium, 3 - High, ‘-“- No Correlation

MAHENDRA ENGINEERING COLLEGE
(Autonomous)

Syllabus

Department	**Artificial Intelligence & Data Science**	**Programme Code**	**1161**

Program Elective

Course code	**Course Name**	**Hours/Week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
24AI15025	**R Programming**	**3**	**0**	**0**	**3**	**100**

Objective(s)	**The student should be made to:** • Establish an efficient scientific computing environment • Identify the available R packages as open source software • Gain the Data visualization in R programming • Design an efficient programs using R for data manipulation • Collaborate on code development using a suite of Open Source standards and tools
Outcome(s)	**Upon completion of this course , students will be able to :** • Explain critical R programming concepts • Demonstrate how to install and configure data frame in R Studio • Apply OOP concepts in R programming • Explain the use of data structure and loop functions • Gain proficiency in utilizing R programming to uncover valuable patterns andinsights from large datasets, enabling informed decision-making

UNIT-I	**R INTRODUCTION**	**9**
Overview of R Programming - Downloading and installing - Help of Function - Viewing documentation - General issues in R - Package Management		
UNIT-II	**DATA INPUTTING IN R**	**9**
Data Types - Subsetting - Writing data - Reading from csv files - Creating a vector and vector operation - Initializing data frame - Control structure - Re-directing R Output		
UNIT-III	**DATA VISUALIZATION AND BASIC STATICS**	**9**
Creating bar chart and dot plot - Creating histogram and box plot - Plotting with base graphics - Plotting and coloring in R - Computing Basic Statistics - Comparing means of two samples - Testing a proportion - Data Munging Basics		
UNIT-IV	**FUNCTIONS AND DATA MANIPULATION IN R**	**9**
Flow control: For loop - If condition - Debugging tools - List Management - Data Transformation - Merging Data Frames - Outlier Detection - Combining multiple vectors		
UNIT-V	**R PROGRAMMING FOR DATA SCIENCE**	**9**
Explore – Data Visualization with ggplot2 – Data Transformation with dplyr – ExploratoryData Analysis, Wrangle – Tibble with tibble – Data Import with readr – Tidy Data withtidyr – Relational Data with dplyr – Strings with stringr – Factors with forcats – Dates andTimes with lubridate, Program – Pipes with magrittr – Functions – Vectors – Iteration		

with purr, Model – Model basics with modelr – Model Building – Many Models with Purrr and broom, Communicate – R Markdown – Graphics for Communication with ggplot2 – R Markdown Formats	
TOTAL HOURS	**45**

TEXT BOOKS:	
1	R for Data Science: Import, Tidy, Transform, Visualize, and Model Databy Hadley Wickham, publisher O′Reilly; 1st edition (20 January 2017).
2	R Programming for Data SciencebyRoger D. Peng,2020-09-03
3	Hadley Wickham and Garrett Grolemund, "R for Data Science", First Edition, 2017, O'Reilly Media.
REFERENCES:	
1	Advanced R by Hadley Wickham
2	An Introduction to Statistical and Data Sciences via R, Chester Ismay and Albert Y. Kim
3	Joshua N. Milligan, "Tableau Desktop: A Practical Guide for Business Users", First Edition, 2019, Packt Publishing

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	-	-	-	2	2	3	3	-
CO2	3	3	3	3	2	-	-	-	-	-	2	2	3	-	-
CO3	3	3	3	3	2	-	-	-	-	-	2	-	3	2	-
CO4	2	2	-	2	2	-	-	-	-	-	1	1	3	-	-
CO5	2	2	-	-	1	-	-	-	-	-	1	-	2	2	-
Average	2.4	2.6	1.8	1.8	1.8	-	-	-	-	-	1.6	1	2.8	1.4	-

1 - Low, 2 - Medium, 3 - High, ‘-“- No Correlation

<table>
<tr><td colspan="7">MAHENDRA ENGINEERING COLLEGE
(Autonomous)</td></tr>
<tr><td colspan="7">Syllabus</td></tr>
<tr><td>Department</td><td colspan="2">Artificial Intelligence & Data Science</td><td colspan="2">Programme Code</td><td colspan="2">1161</td></tr>
<tr><td colspan="7">Program Elective</td></tr>
<tr><td>Course code</td><td colspan="2">Course Name</td><td colspan="3">Hours/week</td><td>Credit</td><td>Maximum marks</td></tr>
<tr><td rowspan="2">24AI15026</td><td colspan="2" rowspan="2">AI FOR ROBOTICS</td><td>L</td><td>T</td><td>P</td><td>C</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Objective(s)</td><td colspan="6">The student should be made to:
• Gain the fundamental concepts of AI in robotics
• Major paradigms for achieving
• Explain reactive paradigm
• Learn the knowledge about Robot Kinematics,
• Demonstrate the working of computer vision applications.</td></tr>
<tr><td>Outcome(s)</td><td colspan="6">Upon completion of this course , students will be able to :
• Interpret the features of an industrial robots with end effectors
• Identify the characteristics of Autonomy Robot and use Hierarchical Paradigm for organizing intelligence in Robots.
• Apply reactive paradigm for AI Robots
• Perform kinematic and dynamic analyses with simulation
• Understand the process of facial and emotion recognition.</td></tr>
<tr><td>UNIT-I</td><td colspan="5">INTRODUCTION TO ROBOTICS</td><td>9</td></tr>
<tr><td colspan="7">Types and components of a robot- Classification of robots - Closed loop and open loop control systems. Kinematics systems: Definition of mechanisms and manipulators- Social issues and safety</td></tr>
<tr><td>UNIT-II</td><td colspan="5">AUTONOMY ROBOT AND HIERARCHICAL PARADIGM</td><td>9</td></tr>
<tr><td colspan="7">Overview –Use of Robots – Tele-operation - Areas of AI. Hierarchical Paradigm: Attributes of the Hierarchical Paradigm - Closed World Assumption - Representative Architectures - Advantages and Disadvantages</td></tr>
<tr><td>UNIT-III</td><td colspan="5">REACTIVE PARADIGM</td><td>9</td></tr>
<tr><td colspan="7">Overview - Reflexive behaviours - Coordination and Control of Behaviors - Perception in Behaviors - Schema Theory - Principles and Issues in Transferring Insights to Robots - Attributes of Reactive Paradigm - Subsumption Architecture - Potential Fields Methodologies - Evaluation of Reactive Architectures.</td></tr>
<tr><td>UNIT-IV</td><td colspan="5">ROBOT KINEMATICS AND DYNAMICS</td><td>9</td></tr>
<tr><td colspan="7">Kinematic Modelling: Translation and rotation representation- Coordinate transformation- DH parameters- Jacobian-Singularity and Statics. Dynamic Modelling: Equations of motion- Euler-Lagrange formulation.</td></tr>
<tr><td>UNIT-V</td><td colspan="5">COMPUTER VISION APPLICATIONS</td><td>9</td></tr>
</table>

Face and Facial recognition application: personal photo collections – Instance recognition application: Object recognition, Object Tracking, Biometric Authentication, Emotion Recognition, Intelligent Surveillance.	
TOTAL HOURS	**45**

TEXT BOOKS:	
1	Ronald C. Arkin, Robin R. Murphy, “An Introduction to AI Robotics”, 1st edition, MIT Press, USA, 2001, for Units 1, 2
2	Saha S.K., "Introduction to Robotics", 2nd Edition, McGraw-Hill Higher Education, New Delhi, 2014, for Units 3, 4, 5
REFERENCES:	
1	Niku Saeed B., "Introduction to Robotics: Analysis", PHI Learning, New Delhi, 2011.
2	Ghosal A., "Robotics", Oxford, New Delhi, 2006

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	1	1	-	-	-	-	2	-	3	1	3	2	-
CO2	3	2	1	1	-	-	-	-	2	-	3	1	3	2	-
CO3	3	2	1	1	-	-	-	-	1	-	3	1	3	-	-
CO4	3	2	1	1	-	-	-	-	2	-	3	1	3	2	-
CO5	3	2	1	1	-	-	-	-	1	-	3	1	3	2	-
Average	3	2	1	1	-	-	-	-	2	-	3	1	3	2	-

1 - Low, 2 - Medium, 3 - High, ‘-“- No Correlation

MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus						
Department	**Artificial Intelligence & Data Science**		**Programme Code**			**1161**
Program Elective						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum Marks**
24AI15027	**DATA WAREHOUSING AND DATAMINING**	**L**	**T**	**P**	**C**	**100**
		3	**0**	**0**	**3**	
Objective(s)	**The student should be made to:** • **T**o understand data warehouse concepts, architecture, business analysis and tools • To understand data pre-processing and data visualization techniques. • To study algorithms for finding hidden and interesting patterns in data. • To understand and apply various classification and clustering techniques using tools. • Study about heuristic search techniques.					
Outcome(s)	**Upon completion of this course, students will be able to** • Design a Data warehouse system and perform business analysis with OLAP tools. • Apply suitable pre-processing and visualization techniques for data analysis • Apply frequent pattern and association rule mining techniques for data analysis • Apply appropriate classification and clustering techniques for data analysis. • Use appropriate search algorithms for problem solving**.**					
UNIT-I	**DATA WAREHOUSING, BUSINESS ANALYSIS AND ON-LINEAR ANALYTICAL PROCESSING**					**9**
Basic Concepts–Data Warehousing Components–Building a Data Warehouse–Database Architectures for Parallel Processing – Parallel DBMS Vendors – Multidimensional Data Model – Data warehouse Schemas for Decision Support, Concept Hierarchies-Characteristics of OLAP Systems–OLAP and OLTP.						
UNIT-II	**DATAMINING–INTRODUCTION**					**9**
Introduction to Data Mining Systems–Knowledge Discovery Process–Data Mining Techniques–Issues–Applications-Data Objects and Attribute types, Statistical description of data, Data Preprocessing–Cleaning-Integration-Reduction-Transformation and discretization – Data Visualization- Data similarity and dissimilarity measures.						
UNIT-III	**DATAMINING–FREQUENT PATTERN ANALYSIS**					**9**
Mining Frequent Patterns, Associations and Correlations–Mining Methods-Pattern Evaluation Method–Pattern Mining in Multilevel-Multi Dimensional Space–Constraint Based Frequent Pattern Mining-Classification using Frequent Patterns.						
UNIT-IV	**CLASSIFICATION AND CLUSTERING**					**9**

Decision Tree Induction – Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Support Vector Machines–Model Evaluation and Selection-Techniques to improve Classification Accuracy-Clustering Techniques – Cluster analysis-Partitioning Methods–Hierarchical Methods–Density Based Methods–Grid Based Methods.		
UNIT-V	**OUTLIER ANALYSIS**	**9**
Why outlier analysis, Identifying and handling of outliers, Distribution Based Outlier Detection: A Statistics-Based Approach, Classification-Based Outlier Detection, Clustering-Based Outlier Detection, Deviation-Based Outlier Detection, Isolation-Based Method: From Isolation Tree to Isolation Forest		
	TOTAL HOURS	**45**

TEXT BOOKS:	
1	JiaweiHanandMichelineKamber,—DataMiningConceptsandTechniques,Third Edition, Elsevier, 2012.
2	Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", Fourth Edition, Pearson Education, 2021.
REFERENCES:	
1	AlexBersonandStephenJ.Smith,—DataWarehousing,DataMining&OLAP,Tata McGraw–Hill Edition,35th Reprint2016.
2	K.P.Soman,Shyam Diwakar and V.Ajay,—Insight into DataMining Theory and Practice,Eastern Economy Edition,Prentice Hall of India,2006.
3	IanH.Wittenand Eibe Frank,—DataMining:Practical Machine Learning Tools and Techniques, Elsevier, Second Edition.
4	https://nptel.ac.in/courses/106105174/data mining

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	2	-	-	-	-	-	2	-	3	3	3	2	-
CO2	3	2	2	-	-	-	-	-	2	1	3	3	3	2	-
CO3	3	2	-	-	-	-	-	-	1	1	3	3	3	-	-
CO4	3	1	2		-	-	-	-	2	-	3	2	3	2	-
CO5	3	2	-	-	-	-	-	-	1	-	3	3	3	2	-
Average	3	2	2	-	-	-	-	-	2	-	3	2.8	3	2	-

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

MAHENDRA ENGINEERING COLLEGE (Autonomous)							
Syllabus							
Department	**Artificial Intelligence And Data Science**		**Programme Code**			**1161**	
Program Elective							
Course code	**Course Name**	**Hours/week**				**Credit**	**Maximum marks**
		L	**T**	**P**		**C**	
24AI15028	**TEXT AND SPEECH ANALYTICS**	3	0	0		3	**100**
Objective(s)	**The student should be made to:** • Learn the fundamentals of natural language processing • Gain knowledge in current methods for Text Processing • Understand the use of Text Classification • Know the role of Text Summarization • Be exposed with the Speech Analytics						
Outcome(s)	**Upon completion of the course, the students should be able to:** • Explore various text extraction techniques • Apply various text processing techniques • Build text classification model • Perform automatic text summarization • Discuss about speech processing techniques						
UNIT-I	**INTRODUCTION TO NLP**						9
Introduction- Natural Language - Language Acquisition and usage - Language Syntax and Structure - Language Semantics - Lexical Semantic Relations - SemanticsRepresentation - Text Corpora - Accessing Text Corpora - Natural Language Processing – Text Analytics							
UNIT-II	**TEXT PROCESSING**						9
Processing and Understanding Text - Text Tokenization - Text Normalization- Correcting Words – Stemming – Lemmatization- Text Syntax and Structure - POS Tagging - Shallow Parsing – Dependency-based Parsing- Constituency based Phrasing							
UNIT-III	**TEXT CLASSIFICATION**						9
Introduction – Automated Text classification - Text classification Blue Print- Text Normalization – Feature Extraction -Classification Algorithm - Application and uses							
UNIT-IV	**TEXT SUMMARIZATION**						9
Text Summarization -Key Phrase Extraction - Topic Modeling - Automated Document Summarization - Text Similarity and Clustering - Analyzing Term Similarity - Analyzing Document Similarity							
UNIT-V	**SPEECH ANALYTICS**						9

Introduction-Python Speech Recognition Package-Installing Speech Recognition- The Recognizer Class-Working with Audio Files - Working with Microphones	
TOTAL HOURS	**45**

TEXT BOOKS:	
1	DipanjanSarkar,"Text Analytics with Python: A Practical Real-World Approach to Gaining Actionable Insights from your Data", 1st Edition, APress publication, 2016 for Units 1,2,3 and 4.
2	https://realpython.com/python-speech-recognition/#supported-file-types for Unit 5.
REFERENCES:	
1	Michael W. Berry & Jacob Kogan,"Text Mining Applications and Theory", Wiley publications, 2010
2	Jurafsky and Martin, "Speech and Language Processing", 2nd Edition, Pearson Prentice Hall, 2008

COs Vs POs and PSOs Mapping

Course Outcomes	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	3	1	3	-	-	-	1	2	1	2	1	1	-
CO2	3	1	2	1	3	-	-	-	2	2	1	3	3	2	-
CO3	2	2	1	3	1	-	-	-	2	2	1	3	2	2	-
CO4	2	1	1	1	2	-	-	-	2	1	2	2	3	1	-
CO5	1	3	2	2	1	-	-	-	3	2	1	1	2	3	-
Average	**2**	2	**2**	**2**	**2**	**-**	**-**	**-**	**2**	**1**	**2**	**2**	**2**	**2**	**-**

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

MAHENDRA ENGINEERING COLLEGE (Autonomous)							
Syllabus							
Department	**Artificial Intelligence & Data Science**		**Programme Code**			**1161**	
Program Elective							
Course code	**Course Name**	**Hours /Week**				**Credit**	**Maximum marks**
		L	**T**	**P**		**C**	
24AI15029	**BIOMETRICS TECHNOLOGIES**	**3**	**0**	**0**		**3**	**100**
Objective(s)	**The student should be made to:** • Learn the behavioural and physical biometric modalities. • Knowledge of data acquisition techniques on mobile platforms. • Abilities to build and evaluate a biometric system. • Awareness of challenges in commercial systems. • Know the difference between physiological and behavioral biometrics..						
Outcome(s)	**Upon completion of this course , students will be able to :** • Describe principles of the selected physical and behavioral biometric methods, and know how to deploy them in authentication scenarios. • Organize and conduct biometric data collection processes, and understand how to use biometric databases in system evaluation. • Calculate distributions of within- and between-class matching scores, and calculate various error estimates based on these distributions. • Understand the biometrics security issues, and know how to deploy selected liveness detection techniques to make a system spoof-resistant. • Determine security mechanisms in Biometrics						
UNIT-I	**INTRODUCTION**						**9**
Introduction-Biometric Authentication-Biometric Technologies-Benefits of biometrics, Verification and identification: Basic working of biometric matching, Accuracy, False match rate, False non-match rate, Failure to enroll rate, Active and passive biometric, Parameters of a good biometrics.							
UNIT-II	**FINGER BIOMETRIC TECHNOLOGY**						**9**
Fingerprint Sensors-Comparing Fingerprint Sensor Technologies-Fingerprint Extraction and Matching-Micro and Macro Features, Types of algorithms used for interpretation, Components and Operations: Strength and weakness.							
UNIT-III	**IRIS RECOGNITION**						**9**
Eye and iris morphogenesis, genetic penetrance. Principles of iris image capture, iris sensors. Iris image preprocessing, segmentation, formatting and filtering. Daugman's method, iris code, statistical properties of the iris code. Other iris coding methods, wavelet analysis							
UNIT-IV	**FACE RECOGNITION**						**9**
Face detection in still images and sequences. Face features. Face space, principal component analysis and its application, Eigen faces, linear discriminant analysis and its application, Fisher faces. Face recognition methods.							

UNIT-V	RECOMMENDED BIOMETRIC FOR NETWORK SECURITY	9
Finger Biometrics, Face Biometrics, Voice Biometrics, Iris Biometrics, the Choice of a Biometric for Network Access An Introduction to Statistical Measures of Biometrics – FAR, FRR, FTE, EER, and What Measure is Most Important? The Biometric Transaction – Securing and Trusting a Biometric Transaction, Trusted Biometric Devices, and non-trusted biometric devices, Matching Location.		
TOTAL HOURS		**45**

TEXT BOOKS :	
1	Jain, A.K., Ross, A., Nandakumar, K. Introduction to Biometrics. Edition 2011
2	https://www.fingerprints.com/uploads/2019/10/fpc_white_paper_digital.pdf
REFERENCES:	
1	Marcel, S., Nixon, M.S., Li, S.Z., Handbook of Biometric Anti-Spoofing: Trusted Biometrics under Spoofing Attacks (Advances in Computer Vision and Pattern Recognition). Edition 2014
2	Maltoni, D., Maio, D., Jain, A.K., Prabhakar, S., Handbook of Fingerprint Recognition. Second edition 2009
3	Burge, M.J., Bowyer, K., Handbook of Iris Recognition. Edition 2013
4	Biometrics: Concepts and Applications By G.R. Sinha, Sandeep Patil, Wiley,2011

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	-	-	-	-	-	-	-	-	3	3	2	2	-
CO2	3	2	-	-	-	-	-	-	-	-	3	3	2	1	-
CO3	3	2	-	-	-	-	-	-	-	-	3	3	2	2	-
CO4	3	2	-	-	-	-	-	-	-	-	3	3	2	1	-
CO5	3	2	-	-	-	-	-	-	-	-	3	3	2	1	-
Average	3	2	-	-	-	-	-	-	-	-	3	3	2	1.4	-

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus						
Department	**Artificial Intelligence & Data Science**	**Programme Code**			**1161**	
Program Elective						
Course code	**Course Name**	**Hours /week**			**Credit**	**Maximum marks**
24AI15030	**PREDICTIVE ANALYSIS**	**L**	**T**	**P**	**C**	**100**
		3	**0**	**0**	**3**	
Objective(s)	**The student should be made to:** • Gain the terminology, technology and applications of predictive analysis • Learn the data preparation techniques and generate appropriate association rules • Gain various descriptive models, their merits, demerits and application. • Learn various predictive modeling methods. • Familiarize the text mining tools, technologies and case study which is used in day-today analytics cycle					
Outcome(s)	**Upon completion of this course , students will be able to** • Explain terminology, technology and applications of predictive analysis • Apply data preparation techniques to effectively interpret big data • Discuss various descriptive models, their merits, demerits and application. • Describe principles of predictive analytics and apply them to achieve real, pragmatic solutions. • Apply predictive analytics for business fore-casting.					
UNIT-I	**INTRODUCTION**					**9**
Introduction to predictive analytics – Business analytics: types, applications- Models: predictive models – descriptive models – decision models - applications - analytical techniques						
UNIT-II	**DATA UNDERSTANDING PREPARATION**					**9**
Data Understanding: Single Variable Summaries – Data Visualization in One Dimension – Histograms – Multiple Variable Summaries – Data Visualization Data Preparation: Variable Cleaning – Feature Creation						
UNIT-III	**DESCRIPTIVE MODELLING**					**9**
Descriptive Modeling- Data Preparation Issues with Descriptive Modeling- Principal Component Analysis- Clustering Algorithms- Interpreting Descriptive Models- Standard Cluster Model Interpretation						
UNIT-IV	**PREDICTIVE MODELLING**					**9**
Decision Trees- Logistic Regression -Neural Network Model – K-Nearest Neighbours – Naive Bayes – Regression Models - Linear Regression - Other Regression Algorithms						
UNIT-V	**BUSINESS FORECASTING AND COMPETITIVE ANALYSIS**					**9**
Introduction to Business Forecasting and Predictive analytics - Logic and Data Driven Models – Data Mining and Predictive Analysis Modelling –Machine Learning for Predictive analytics-Industry analysis- Profit Frontier, Risk vs Return, Competition Positioning- Enterprise Diagnosis						

TOTAL HOURS	45

TEXT BOOKS :	
1	Dean Abbott, “Applied Predictive Analytics-Principles and Techniques for the Professional Data Analyst”, Wiley, 2014
2	Jiawei Han and Micheline Kamber, Data Mining Concepts and Techniques, Third Edition, Elsevier, 2012.
3	Jeffrey Strickland, Predictive analytics using R, Simulation educators, Colorado Springs, 2015
4	Mahadevan B, “Operations Management -Theory and Practice”,3rd Edition, Pearson Education,2018
REFERENCES:	
1	Conrad Carlberg, “Predictive Analytics: Microsoft Excel”, 1st Edition, Que Publishing, 2012.
2	Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani. An Introduction to Statistical Learning with Applications in R Springer 2013
3	Alberto Cordoba, “Understanding the Predictive Analytics Lifecycle”, Wiley, 2014
4	Anasse Bari, Mohammad Chaouchi, Tommy Jung, Predictive Analytics for Dummies, 2nd Edition, 2017.

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	2	-	-	-	-	-	2	-	3	2	3	2	-
CO2	2	1	-	-	-	-	-	-	-	1	3	3	1	1	-
CO3	3	1	1	-	-	-	-	-	1	1	2	2	2	2	-
CO4	3	2	2		-	-	-	-	2	2	3	3	2	3	-
CO5	1	2	-	-	-	-	-	-	2	2	3	2	2	2	-
Average	2.6	1.4	1	-	-	-	-	-	1.4	1.2	2.6	2.6	2	2	-

1 - Low, 2 - Medium, 3 - High, ‘-“- No Correlation

MAHENDRA ENGINEERING COLLEGE

(Autonomous)

Syllabus

Department	**Artificial Intelligence & Data Science**	**Programme Code**	**1161**

B.Tech – Artificial Intelligence & Data Science

Program Elective

Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
		L	**T**	**P**	**C**	
24AI15031	**LARGE LANGUAGE MODELS (LLMs)**	3	0	0	3	**100**

Objective(s)	**Upon completion of this course, the student should be able to get an idea on :** • Understand the Basics of LLMs. • Develop Skills in Crafting LLMs. • Analyze and Evaluate LLMs Performance. • Apply LLMs Engineering in Real-World Scenarios. • Understand Ethical Considerations and Best Practices.
Outcome(s)	**Upon completion of this course, students will be able to:** • Proficiency in LLMs Creation. • Ability to Evaluate and Refine LLMs • Apply Real-World Application Skills • Apply Ethical Awareness • Develop Hands-On Experience with Language Models

UNIT-I	**INTRODUCTION TO LARGE LANGUAGE MODELS**	9

Overview of LLMs: Definition and significance- Historical development and milestones. Basic Concepts in Natural Language Processing (NLP): Overview of NLP tasks- Key terminology and techniques.

UNIT-II	**FOUNDATIONS OF LLMS**	9

Machine Learning Basics: Supervised, unsupervised, and reinforcement learning. Neural Networks and Deep Learning: Introduction to neural networks-Deep learning techniques and architectures.

UNIT-III	**TRANSFORMER ARCHITECTURE**	9

Introduction to Transformers: Basic concepts: Attention mechanisms, self-attention.Key Components of Transformers: Encoder-decoder structure-Positional encoding and multi-head attention. Popular Transformer Models: BERT, GPT, T5, and their variations.

UNIT-IV	**TRAINING AND FINE-TUNING LLMS**	9
Training Large Models: Data collection and preprocessing-Training techniques and challenges. Fine-Tuning for Specific Tasks: Transfer learning and domain adaptation-Fine-tuning strategies and best practices.		
UNIT-V	**APPLICATIONS AND EVALUATING OF LLMS**	9
Common Use Cases: Text generation, summarization, translation-Question answering, chatbots, and conversational agents. Industry-Specific Applications: Applications in healthcare, finance, legal, and more.		
	TOTAL HOURS	**45**

REFERENCES LINK:

1. **https://luxananda.medium.com/4-llm-prompt-engineering-f44bc63963af.**

2. https://docs.tecon.ai/docs/introduction/llm-prompt-engineering.

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	2	2	3	2	3	2	-
CO2	3	1	2	-	-	-	-	-	1	1	3	1	3	2	-
CO3	3	1	1	-	-	-	-	-	1	1	3	2	2	2	-
CO4	2	2	1	-	-	-	-	-	2	2	2	1	2	3	-
CO5	3	2	-	-	-	-	-	-	1	1	1	1	2	2	-
Average	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**3**	**1**	**2**	**2**	**-**

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

MAHENDRA ENGINEERING COLLEGE (Autonomous)							
Syllabus							
Department	**Artificial Intelligence & Data Science**	**Programme Code**			**1161**		
Program Elective							
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**	
24AI15032	**SOCIAL MEDIA ANALYSIS**	**L**	**T**	**P**	**C**	**100**	
		3	**0**	**0**	**3**		
Objective(s)	**The student should be made to:** • Gain knowledge about the theoretical structure of social network data sources. • Understand the ethics in media and its emerging technology. • Familiar with the concept of filtering technique in recommender systems. • Have to know about social structurally with the variety of business intelligence applications. • Understand human behavior in social Media and related communities.						
Outcome(s)	**Upon completion of this course , students will be able to:** • Elaborate the structure of social network data sources. • Interpret the role of social media strategy in various fields. • Apply the concept of filtering technique in recommender systems. • Use extraction and mining tools for analyzing Social networks. • How to effectively use the resulting insights to support website design decisions, campaign optimisation, search analytics, etc.						
UNIT-I	**INTRODUCTION**						**9**
Analyzing the social web- history of the social web- online Social networks, Basics Network Structure and Properties - Defining Trust - Measuring trust - Network-based inference - Trust in social media – Defining nodes and edges.							
UNIT-II	**MEDIA AND EMERGING TECHNOLOGY**						**9**
Introduction to Social Media - Law & Ethics in Social Media - Building a Social Media Strategy - Social Monitoring, Listening and Analysis - Social Media Platforms & Best Practices - Creating Engaging Content - Writing for Social Media - Social Media Crises & Tragedies - Social Media & Emerging Technology.							
UNIT-III	**FILTERING AND MINING COMMUNITIES**						**9**
Social Sharing and Filtering - Social recommender systems - Collaborative Filtering on LinkedIn and Netflix - Aggregating and reasoning with social network data, Detecting Communities in Social Networks, Core Methods for Community Detection & Mining, Applications of Community Mining Algorithms.							
UNIT-IV	**PUBLIC SECTOR**						**9**
Analyzing Public- Sector Social Media – Privacy: Privacy policies and settings - Aggregation and data mining - Data ownership and maintaining privacy online - privacy in social media analysis -							

Case study: Congressional use of twitter.		
UNIT-V	**SEARCH ANALYTICS**	**9**
Search engine optimization (SEO), non-linear media consumption, user engagement, User generated content, web traffic analysis, navigation, usability, eye tracking, online security, online ethics, content management system, data visualization, RSS feeds, Mobile platforms, User centered design, Understanding search behaviors.		
TOTAL HOURS		**45**

TEXT BOOKS:	
1	Analyzing the Social Web 1st Edition, Kindle Edition by Jennifer Golbeck
2	Borko Furht, "Handbook of Social Network Technologies and Applications", Springer, 2010
REFERENCES:	
1	A Handbook of Statistical Analyses using SPSS, Sabine Landau and Brian S. Everitt
2	Roger DWimmer &Joseph R. Dominick, Mass Media Research- An Introduction, Wads worth, New York, 1991
3	Guandong Xu , Yanchun Zhang and Lin Li, ―Web Mining and Social Networking – Techniques and applications‖, Springer, 1st edition, 2012

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	2	-	-	-	-	-	2	-	3	3	3	2	-
CO2	3	2	2	-	-	-	-	-	1	1	3	3	3	2	-
CO3	3	2	1	-	-	-	-	-	1	1	3	3	2	2	-
CO4	3	2	2		-	-	-	-	2	-	3	3	2	3	-
CO5	3	2	-	-	-	-	-	-	2	-	3	3	2	2	-
Average	3	2	2	-	-	-	-	-	2	-	3	3	2	2	-

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

MAHENDRA ENGINEERING COLLEGE (Autonomous)							
Syllabus							
Department	**Artificial Intelligence And Data Science**			**Programme Code**		**1161**	
Program Elective							
Course code	**Course Name**	**Hours/week**				**Credit**	**Maximum marks**
24AI15033	**IMAGE AND VIDEO ANALYTICS**	**L**	**T**	**P**		**C**	**100**
		3	0	0		3	
Objective(s)	**The student should be made to:** • To understanding image representation, • Provide knowledge on analyzing image properties, • Applying image pre-processing techniques.						
Outcome(s)	**Upon completion of this course, students will be able to:** • Apply various image representation techniques, data structures, and pre-processing methods to enhance image quality and prepare visual data for analysis. • Evaluate object detection models and deep learning frameworks using metrics like Intersection over Union (IoU) to assess performance and accuracy. • Design face recognition and gesture recognition systems using state-of-the-art models such as FaceNet and DeepFace, applying them to real-world scenarios. • Develop deep learning-based video analytics applications using advanced architectures like ResNet, Inception, and GoogleNet, addressing challenges like vanishing gradients.						
UNIT-I	Image Preprocessing						9
Local pre-processing - Image smoothing - Edge detectors – Zero crossings of the second derivative - Scale in image processing - Canny edge detection - Parametric edge models – Edges in multi-speralct images - Local pre-processing in the frequency domain - Line detection by local pre-processing operators - Image restoration.							
UNIT-II	Computer Vision and Machine Learning method						11
Computer Vision – Image representation and image analysis tasks - Image representations - digitization – properties – color images – Data structures for Image Analysis - Levels of image data representation - Traditional and Hierarchical image data structures. Object detection – Object detection methods – Deep Learning framework for Object detection – bounding box approach Intersection over Union (IoU) –Deep Learning Architectures – R – CNN – Attention Mechanism.							
UNIT-III	Face Recognition and Gesture Recognition						9
Face Recognition – Introduction - Applications of Face Recognition - Process of Face Recognition – Deep Face solution by Face book – Face Net for Face Recognition - Implementation using Face Net - Gesture Recognition.							
UNIT-IV	Video Analytics						9

Video Processing – use cases of video analytics - Vanishing Gradient and exploding gradient Problem – Rest Net architecture – Rest Net and skip connections - Inception Network- Google Net Architecture		
UNIT-V	Deep Learning Methods	7
Faster R – CNN - You Only Look Once(YOLO) - Salient features - Loss Functions - YOLO architectures.		
	TOTAL HOURS	**45**

TEXT BOOKS :	
1	Milan Sonka, Vaclav Hlavac, Roger Boyle, "Image Processing, Analysis, and Machine Vision", 4th Edition, Thomson Learning, 2013.
2	Vaibhav Verdhan," Computer Vision Using Deep Learning Neural Network Architectures with Python and Keras", Apress, 2021.
REFERENCES:	
1	Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer Verlag London, Limited,2011.
2	Caifeng Shan, FatihPorikli, Tao Xiang, Shaogang Gong, "Video Analytics for Business intelligence", Springer, 2012.
3	D. A. Forsyth, J. Ponce, "Computer Vision: A Modern Approach", Pearson Education,2003.

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	1	1	-	-
CO2	-	3	-	-	3	-	-	-	-	-	1	2	1	-	-
CO3	-	-	3	-	-	-	-	-	-	-	1	2	1	-	-
CO4	-	-	3	-	-	3	2	-	-	-	-	-	-	-	-
Average	**3**	3	**3**	-	**3**	**3**	**2**	-	-	-	-	-	-	-	-

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

MAHENDRA ENGINEERING COLLEGE

(Autonomous)

Syllabus

Department	Artificial Intelligence And Data Science	Programme Code	1161

Program Elective

Course code	Course Name	Hours/week			Credit	Maximum marks
		L	T	P	C	
24AI15034	REINFORCEMENT LEARNING	3	0	0	3	100

Objective(s)	**Thestudentshouldbemadeto:** ● Investigate the key concepts of knowledge representation(KR) techniques and different notations. ● Integrate the KR view as a knowledge eengineering approach to model organizational knowledge. ● Introduce the study of ontologies as a K R paradigm and applications of ontologies. ● Learn various KR techniques. ● Gain process,knowledge acquisition and sharing of ontology..
Outcome(s)	**Upon completion of this course , students will be able to:** ● Illustrate RL tasks and the core principles behind the RL ● Apply tabular methods to solve classical control problems ● Utilize Markov decision process in optimization of complex problems ● Solve problems using dynamic programming and Monte-Carlo methods ● Evaluate the effect of different exploration and planning, learning strategies.

UNIT-I	INTRODUCTION AND BASICS OF RL	9

Reinforcement Learning- Examples- Elements of Reinforcement Learning- Limitations and Scope- An Extended Example: Tic-tac-toe History of Reinforcement Learning.

UNIT-II	TABULAR SOLUTION METHODS	9

Multi-arm Bandits - An n-Armed Bandit Problem- Action-Value Methods- Incremental Implementation- Tracking a Non-stationary Problem- Optimistic Initial Values- Upper-Confidence-Bound Action Selection- Gradient Bandit- Associative Search.

UNIT-III	FINITE MARKOV DECISION PROCESSES	9

The Agent–Environment Interface- Goals and Rewards- Returns- Unified Notation for Episodic and Continuing Tasks- The Markov Property- Markov Decision Processes- Value Functions- Optimal Value Functions- Optimality and Approximation.

UNIT-IV	DYNAMIC PROGRAMMING AND MONTE CARLO METHODS	9

Dynamic Programming - Policy Evaluation- Policy Improvement- Policy Iteration- Value Iteration- Generalized Policy Iteration. Monte Carlo Methods: Monte Carlo Prediction- Monte Carlo Estimation of Action Values- Monte Carlo Control- Monte Carlo Control without Exploring Starts.

UNIT-V	Advanced Reinforcement Learning Techniques	9
Monte Carlo Methods – Monte Carloprediction – Monte Carlo control – Incremental Implementation – Temporal DifferenceLearning: TD prediction, Advantages. Optimality of TD–Q-Learning: Games, Afterstates,and Other Special Cases -n-step Bootstrapping.		
	TOTAL HOURS	**45**

TEXT BOOKS :	
1	Richard S. Sutton and Andrew G. Barto, "Reinforcement Learning: An Introduction", 2nd Edition, MIT Press, London, 2018.
2	Richard.S.Sutton and Andrew G.Barto, Reinforcement Learning, MIT Press, 2nd Edition,2018

REFERENCES:	
1.	Phill winder, "Reinforcement Learning: Industrial applications of intelligent agents", 1st Edition, O'Reilly Media, 2020.
2	Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, 2020.

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	1	1	1	1	-	-	-	2	1	3	2	2	1	-
CO2	3	3	3	2	3	-	-	-	2	1	2	2	3	1	-
CO3	3	3	2	2	3	-	-	-	1	1	2	2	3	2	-
CO4	2	3	3	2	3	-	-	-	2	1	2	3	2	2	-
CO5	3	2	3	2	2	-	-	-	3	1	3	3	3	2	-
Average	**3**	3	**3**	**2**	**2**	**-**	**-**	**-**	**2**	**1**	**2**	**2**	**2**	**2**	**-**

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

MAHENDRA ENGINEERING COLLEGE

(Autonomous)

Syllabus

Department	Artificial Intelligence And Data Science	Programme Code	1161

Program Elective

Course code	Course Name	Hours/week			Credit	Maximum marks
		L	T	P	C	
24AI15035	HEALTHCARE ANALYTICS	3	0	0	3	100

Objective(s)	**The student should be made to:** • Learn the fundamentals of Healthcare Analytics • Gain knowledge in current methods For Healthcare Image And Text Data Analytics • Understand the Concepts of Biomedical image and Text Data Analytics • Know the role of Clinical Prediction Models • To learn the Health IoT data analytics
Outcome(s)	**Upon completion of the course, the students should be able to:** • Discuss about the various healthcare data sources and the analytical techniques. • Perform medical image and text data analysis. • Enumerate the concept of biomedical text mining and social media healthcare analytics • Apply prediction models for healthcare data and perform evaluation. • Express the Health IoT data analytics.

UNIT-I	HEALTHCARE ANALYTICS AND DATA SOURCES	9

Introduction to Healthcare Data Analytics:Introduction– Healthcare Data Sources and Basic Analytics– Advanced Data Analytics for Healthcare-Applications and practical systems for Healthcare – Resources for healthcare data analytics. Electronic Health Records: Introduction– History-Components– Coding Systems – Benefits- Barrier– Challenges– Phenotyping Algorithms.

UNIT-II	HEALTHCARE IMAGE AND TEXT DATA ANALYTICS	9

Biomedical Image Analysis: Introduction– Modalities– Object Detection– Image Segmentation– Image Registration– Feature Extraction. Natural Language Processing:Introduction– Natural Language Processing– Mining Information from Clinical Text– Challenges of Processing Clinical Reports– Clinical Applications.

UNIT-III	BIOMEDICAL AND SOCIAL MEDIA DATA ANALYTICS	9

Mining the Biomedical Literature: Introduction-Resources– Terminology Acquisition and Management– Information Extraction-Discourse Interpretation– Text Mining Environments– Applications– Integration with Clinical Text Mining. Social Media Analytics for Healthcare:Introduction– Detection and Tracking of Infectious Disease– Public Health Research–Use in Healthcare.

UNIT-IV	CLINICAL PREDICTION MODELS	9
Review of Clinical Prediction Models: Introduction– Basic Statistical Prediction Models: Linear Regression– Generative Additive Model- Logistic Regression– Bayesian Models- Markov Random Fields– Alternative Clinical Prediction Models– Survival Models- Evaluation and Validation: Evaluation Metrics– Validation.		
UNIT-V	**HEALTH IOT DATA ANALYTICS**	9
Internet of things in the healthcare industry- IoT healthcare architecture- Characteristics of IoT health data- Health data analytics using Internet of things- Computational intelligence in Internet of things for future healthcare applications.		
	TOTAL HOURS	**45**

TEXT BOOKS:	
1	Chandan K.Reddy, Charu C. Aggarwal, "HealthCare Data Analytics", CRC, 2015.
2.	Sanjay Kumar Singh Ravi Shankar Singh Anil Kumar Pandey Udmale S.S. Ankit Chaudhary , IoT-Based Data Analytics for the Healthcare Industry Techniques and Applications 1st Edition, Elsevier, Academic Press
REFERENCES:	
1	Vikas Kumar, "Health Care Analysis Made Simple", Packt Publishing, 2018.
2	Nilanjan Dey, Amira Ashour , Simon James Fong, Chintan Bhatl, "Health Care Data Analysis and management, Academic Press, 2018.
3	Hui Jang, Eva K.Lee, "HealthCare Analysis, From Data to Knowledge to Healthcare Improvement", Wiley, 2016.
4	Kulkarni ,Siarry, Singh ,Abraham, Zhang, Zomaya , Baki, "Big Data Analytics in HealthCare", Springer, 2020.

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	1	-	-	-	-	-	2	3	3	3	2	-
CO2	2	1	1	3	2	-	-	-	-	2	3	2	3	1	-
CO3	2	2	1	1	2	-	-	-	-	1	1	1	2	3	-
CO4	2	2	3	3	2	-	-	-	-	2	1	1	1	1	-
CO5	2	2	3	1	2	-	-	-	-	2	1	1	2	2	-
Average	**2**	2	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**2**	**2**	**2**	**2**	**2**	**-**

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

<table>
<tr><td colspan="7">MAHENDRA ENGINEERING COLLEGE
(Autonomous)</td></tr>
<tr><td colspan="7">Syllabus</td></tr>
<tr><td>Department</td><td colspan="4">Artificial Intelligence & Data Science</td><td>Programme Code</td><td>1161</td></tr>
<tr><td colspan="7">Program Elective</td></tr>
<tr><td>Course code</td><td>Course Name</td><td colspan="3">Hours/Week</td><td>Credit</td><td>Maximum marks</td></tr>
<tr><td rowspan="2">24AI15036</td><td rowspan="2">INTRODUCTION TO CYBER SECURITY</td><td>L</td><td>T</td><td>P</td><td>C</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Objective(s)</td><td colspan="6">The student should be made to:
• Learn the basics of Cyber Security Standards and Policies.
• Know the legal, ethical and professional issues in Cyber security.
• Learn Cyber Frauds and Abuse and its Security Measures.
• Know the technological aspects of Cyber Security.
• Learn security policies in cyber forensics.</td></tr>
<tr><td>Outcome(s)</td><td colspan="6">Upon completion of this course , students will be able to:
• Identify basics of computer forensics.
• Outline the strategies adopted in computer forensics.
• Outline the occurrence of Cybercrime in mobile and wireless environment.
• Use relevant tools and methods in cybercrime.
• Apply security policies in cyber forensics.</td></tr>
<tr><td>UNIT-I</td><td colspan="5">FUNDAMENTALS OF CYBER SECURITY</td><td>9</td></tr>
<tr><td colspan="7">Cyber Security – History of Internet – Impact of Internet – CIA Triad; Reason for Cyber Crime – Need for Cyber Security – History of Cyber Crime– A Global Perspective on Cyber Crimes; Cyber Laws – The Indian IT Act – Cybercrime and Punishment.</td></tr>
<tr><td>UNIT-II</td><td colspan="5">CYBERCRIME AND CYBEROFFENSES</td><td>9</td></tr>
<tr><td colspan="7">Cybercrime and Information Security – Cybercriminals – Classifications of Cybercrimes – Email Spoofing – Spamming – Cyber defamation – Internet Time Theft – Forgery – Web jacking – Hacking – Online Frauds – Software Piracy – Mail Bombs – Password Sniffing – Cyberoffenses – Categories – Planning the attacks – Cyber stalking – Cybercafé and Cybercrimes – Botnets.</td></tr>
<tr><td>UNIT-III</td><td colspan="5">CYBERCRIME: MOBILE AND WIRELESS DEVICES</td><td>9</td></tr>
<tr><td colspan="7">Proliferation of Mobile and Wireless Devices – Trends in Mobility – Credit card frauds in Mobile and Wireless Computing – Security Challenges – Authentication Service Security – Attacks on Mobile Phones.</td></tr>
<tr><td>UNIT-IV</td><td colspan="5">TOOLS AND METHODS USED IN CYBERCRIME</td><td>9</td></tr>
<tr><td colspan="7">Proxy Servers and Anonymizers – Phishing – Password Cracking – Keyloggers and Spywares – Virus and Worms – Trojan Horses and Backdoors – Steganography – DoS and DDoS Attacks.</td></tr>
<tr><td>UNIT-V</td><td colspan="5">SECURITY POLICIES</td><td>9</td></tr>
<tr><td colspan="7">Introduction - Defining User Policies – Passwords – Internet Use – Email Usage – Installing/ Uninstalling Software – Instant Messaging – Defining System Administrative Policies – Defining</td></tr>
</table>

Access Control Developmental Policies Standards, Guidelines and Procedures – Basics of assessing a system	
TOTAL HOURS	**45**

TEXT BOOKS :	
1	Anand Shinde, "Introduction to Cyber Security Guide to the World of Cyber Security", Notion Press, 2021 (Unit 1)
2	Nina Godbole, SunitBelapure, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley, 2011.
3	Chuck Easttom, "Computer Security Fundamentals", 2nd Edition, Pearson Education, 2012.
REFERENCES:	
1	John R.Vacca,Computer Forensics, Cengage Learning, 2005.
2	Richard E.Smith, Internet Cryptography, 3rd Edition Pearson Education, 2008.
3	MarjieT.Britz, Computer Forensics and Cyber Crime: An Introduction, 3rd Edition, Prentice Hall, 2013.

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	2	-	-	-	-	-	2	-	3	2	3	2	-
CO2	3	2	-	-	-	-	-	-	-	1	2	1	1	2	-
CO3	3	1	1	-	-	-	-	-	1	1	2	2	2	2	-
CO4	3	2	2		-	-	-	-	2	2	3	1	2	1	-
CO5	3	2	1	-	-	-	-	-	2	2	1	2	2	2	-
Average	3	1.8	1.2	-	-	-	-	-	1.4	1.2	2.2	1.6	2	1.8	-

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

MAHENDRA ENGINEERING COLLEGE (Autonomous)							
Syllabus							
Department	**Artificial Intelligence & Data Science**		**Programme Code**			**1161**	
Artificial Intelligence & Data Science							
Program Elective							
Course code	**Course Name**	**Hours/week**				**Credit**	**Maximum marks**
24AI15037	**CRYPTOGRAPHY AND NETWORK SECURITY**	**L**	**T**	**P**		**C**	**100**
		3	**0**	**0**		**3**	
Objective(s)	**The student should be made to:** • To understand the fundamentals of cryptography and number theory. • To use the standard security algorithms to provide confidentiality, integrity andauthentication for any applications. • To make use of application protocols to design and manage a secure system. • To learn the configuration and manage Firewall and WLAN Security. • To understand the importance of system security and its vulnerabilities.						
Outcome(s)	**Upon completion of this course , students will be able to:** • Apply the basic security algorithms and policies required for a computing system. • Predict the vulnerabilities across any computing system and hence be able to design security solution for any computing system. • To identify any network security issues and resolves the issues. • To manage the firewall and WLAN security. • Evaluate the system related vulnerabilities and mitigation. • Design comprehensive cloud security strategies that addressrisks related to confidentiality, integrity, availability, compliance,and access control in cloud environments.						
UNIT-I	**INTRODUCTION TO SECURITY AND NUMBER THEORY**						**9**
Basics of Security – CIA Triad – Threats, Attacks and Services – Classical Cryptography – Substitution – Transposition – One-time Pad – Cryptanalysis – Number Theory – ModularArithmetic – Euclidean Theorem – Extended Euclidean Theorem – Algebraic Structures –Galois Field – Prime Numbers – Fermat's Theorem – Euler's Phi function – Euler's Theorem– Chinese Remainder theorem – Modular Exponentiation –Logarithms – Elliptic Curve Arithmetic.							
UNIT-II	**SYMMETRIC CRYPTOGRAPHY**						**9**
Modern Cryptography – Symmetric Cipher – Block and Stream Cipher – Feistel Ciphers –Data Encryption Standard (DES) – DES Structure – Key Generation – Simplified DES –Linear and Differential crypt analysis –Triple DES – Advanced Encryption Standard (AES) –Basic Structure – Transformations – Key Expansions Process – Analysis of AES – Modes of operation – RC4.							
UNIT-III	**ASYMMETRIC KEY CRYPTOGRAPHY**						**9**
Public Key Cryptosystems – RSA Algorithm – ElGamal Cryptosystems – Diff-Hellman key exchange – Elliptic curve cryptography – Hash functions – Hash algorithms – Secure Hash Algorithm SHA –							

MD5 – Message Authentication Codes – Quantum Cryptography –Quantum Key Distribution – Threshold Cryptography.		
UNIT-IV	**SECURITY APPLICATIONS**	**9**
Digital Signatures Schemes– Digital Certificate – Key Management – Kerberos – KeyAgreement and Distribution – PKI – X.509 Certificate – E-Mail Security – PGP – S/MIME –IP security – Virtual Private Network (VPN) – Web Security – Secure Socket Layer (SSL) –Transport Layer Security – Secure Electronic Transaction (SET) – Blockchain.		
UNIT-V	**Network Security and Email security**	**9**
Threats in networks - Network security controls –Intruders - Intrusion detection - Password management - Malicious software - Firewalls:Characteristics – Types - Firewall basing - Firewall location and configurations. Store andforward - Security services - Source authentication - Message integrity - Non- Repudiation -Proof of submission and delivery - Pretty Good Privacy (PGP) - Secure/Multipurpose InternetMail Extension (S/MIME). IP and Web Security: IP security: IP security policy - EncapsulatingSecurity Payload - Web security: Secure Socket Layer - Transport Layer Security – HTTPS -Secure Shell (SSH).		
TOTAL HOURS		**45**

TEXT BOOKS:	
1	William Stallings, “Cryptography and Network security Principles and Practices”, Pearson/PHI, Seventh Edition, 2017.
2	Behourz Forouzan, DebdeepMukhopadyay, “Cryptography and Network Security”, Tata McGraw Hill Education Pvt. Ltd, New Delhi, 2010.
3	Ronald L Krutz and Russell Dean Vines, “Cloud Security- A Comprehensive Guide to Secure Cloud Computing”, Wiley, 2016
REFERENCES:	
1	Wenbo Mao, “Modern Cryptography Theory and Practice”, Pearson Education, 2004.
2	Pfleeger and Pfleeger, “Security in computing”, Third Edition , PHI/Pearson, 2003.
3	Bruce Schneier, “Applied Cryptography: Protocols, Algorithms and Source Code in C”, John Wiley and Sons, 2013

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**3**	**2**	**-**
CO2	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**3**	**1**	**-**
CO3	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**3**	**2**	**-**
CO4	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**3**	**1**	**-**
CO5	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**3**	**1**	**-**
Average	**3**	**2**	**1.4**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**3**	**1.4**	**-**

1 - Low, 2 - Medium, 3 - High, ‘-“- No Correlation

MAHENDRA ENGINEERING COLLEGE (Autonomous)						
Syllabus						
Department	**Artificial Intelligence & Data Science**	**Programme Code**			**1161**	
Program Elective						
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum marks**
24AI15038	**INFORMATION RETRIEVAL TECHNIQUES**	**L**	**T**	**P**	**C**	**100**
		3	**0**	**0**	**3**	
Objective(s)	**The student should be made to:** • Discusses the basics of information retrieval • Search engine operations • Multimedia information retrieval techniques • Learn about web information retrieval and web crawling • Discusses about audio, music and video information retrieval techniques					
Outcome(s)	**Upon completion of this course , students will be able to:** • Describe the basic concepts of information retrieval • Apply the various modeling techniques • Discuss the concepts of text operations, indexing and searching • Describe about web information retrieval and web crawling • Explore audio, music and video information retrieval techniques					
UNIT-I	**INFORMATION RETRIEVAL TECHNIQUES**					**9**
Information Retrieval - The IR Problem - The users task - Information versus data retrieval - The IR System - Software architecture of IR system - Retrieval and ranking processes - The web - Web changed search - Practical issues on the web - How people search - Search interfaces today - Visualization in Search Interfaces.						
UNIT-II	**MODELING AND RETRIEVAL EVALUATION**					**9**
Basic IR Models – Boolean Model – TF-IDF (Term Frequency/Inverse Document Frequency) Weighting – Vector Model – Probabilistic Model – Latent Semantic Indexing Model – Neural Network Model – Retrieval Evaluation – Retrieval Metrics – Precision and Recall – Reference Collection – User-based Evaluation.						
UNIT-III	**TEXT OPERATIONS, INDEXING AND SEARCHING**					**9**
Text Properties - Document Preprocessing - Text Compression – Text Classification – Characterization of Text Classification – Unsupervised Algorithms – Supervised Algorithms – Decision Tree – K-NN Classifier – SVM Classifier – Feature Selection or Dimensionality Reduction – Evaluation Metrics – Accuracy and Error – Indexing and Searching – Inverted Indexes – Sequential Searching – Multidimensional Indexing.						
UNIT-IV	**WEB RETRIEVAL AND WEB CRAWLING**					**9**
The Web – Search Engine Architectures – Cluster Based Architecture – Distributed Architectures – Search Engine Ranking – User Interaction –Browsing – Web Crawling – Applications of a Web Crawler – Taxonomy – Architecture and Implementation – Scheduling Algorithms – Evaluation.						

UNIT-V	MULTIMEDIA INFORMATION RETRIEVAL	9
Content-based image retrieval – Audio and music retrieval – Retrieving and browsing video – Fusion models – Segmentation – Compression and MPEG standards –Case study.		
	TOTAL HOURS	**45**

TEXT BOOKS:	
1.	Ricardo Baeza-Yate, BerthierRibeiro-Neto, “Modern Information Retrieval”, 2nd Edition,Pearson Education Asia, 2011.
REFERENCES:	
1.	Chowdhury G.G., “Introduction to Modern Information Retrieval”, 2nd Edition, Neal-schuman Publishers, 2003.

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	2	-	-	-	-	-	2	2	3	3	3	2	-
CO2	3	1	2	-	-	-	-	-	1	1	3	3	3	2	-
CO3	3	2	1	-	-	-	-	-	1	1	3	3	2	2	-
CO4	2	2	2		-	-	-	-	2	2	2	3	2	3	-
CO5	3	2	-	-	-	-	-	-	1	-	3	3	2	2	-
Average	2.8	1.8	1.4	-	-	-	-	-	1.4	1.2	2.8	3	2	2	-

1 - Low, 2 - Medium, 3 - High, ‘-“- No Correlation

<table>
<tr><td colspan="7">MAHENDRA ENGINEERING COLLEGE
(Autonomous)</td></tr>
<tr><td colspan="7">Syllabus</td></tr>
<tr><td>Department</td><td colspan="2">Artificial Intelligence & Data Science</td><td colspan="2">Programme Code</td><td colspan="2">1161</td></tr>
<tr><td colspan="7">Program Elective</td></tr>
<tr><td>Course code</td><td colspan="2">Course Name</td><td colspan="3">Hours/week</td><td>Credit</td><td>Maximum marks</td></tr>
<tr><td rowspan="2">24AI15039</td><td colspan="2" rowspan="2">CYBER FORENSICS</td><td>L</td><td>T</td><td>P</td><td>C</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Objective(s)</td><td colspan="6">The student should be made to:
• Learn computer forensics
• Become familiar with forensics tools
• Learn to analyze and validate forensics data
• Gain the ethical hacking and Sniffing
• Familiarize about cyber crimes and related offences and penalties</td></tr>
<tr><td>Outcome(s)</td><td colspan="6">Upon completion of this course, students will be able to :
• Summarize the basic concepts of Computer forensics & its principles.
• Learn the basics of forensics tools
• Analyze and validate forensic data.
• Learn the ethical hacking and sniffing concepts.
• Learn the cyber crimes and related offences and penalties</td></tr>
<tr><td>UNIT-I</td><td colspan="5">INTRODUCTION TO COMPUTER FORENSICS</td><td>9</td></tr>
<tr><td colspan="7">Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Introduction to Identity Theft & Identity Fraud. Types of CF techniques - Incident and incident response methodology - Forensic duplication and investigation. Preparation for IR: Creating response tool kit and IR team. - Forensics Technology and Systems - Understanding Computer Investigation - Data Acquisition.</td></tr>
<tr><td>UNIT-II</td><td colspan="5">EVIDENCE COLLECTION AND FORENSICS TOOLS</td><td>9</td></tr>
<tr><td colspan="7">Processing Crime and Incident Scenes - Working with Windows and DOS Systems. Current Computer Forensics Tools: Software/ Hardware Tools.</td></tr>
<tr><td>UNIT-III</td><td colspan="5">ANALYSIS AND VALIDATION</td><td>9</td></tr>
<tr><td colspan="7">Validating Forensics Data - Data Hiding Techniques Performing Remote Acquisition Network Forensics - Email Investigations - Cell Phone and Mobile Devices Forensics</td></tr>
<tr><td>UNIT-IV</td><td colspan="5">ETHICAL HACKING</td><td>9</td></tr>
<tr><td colspan="7">Introduction to Ethical Hacking – Foot printing and Reconnaissance - Scanning Networks Enumeration - System Hacking - Malware Threats - Sniffing</td></tr>
<tr><td>UNIT-V</td><td colspan="5">CYBER CRIMES AND RELATED OFFENCES AND PENALTIES</td><td>9</td></tr>
</table>

Introduction to Cybercrimes, Classification of cybercrimes, Distinction between cyber crime and conventional crimes, Reasons for commission of cyber crime, Kinds of cyber crimes – cyber stalking; cyber pornography; forgery and fraud; crime related to IPRs; Cyber terrorism; Spamming, Phishing, Privacy and National Security in Cyberspace, Cyber Defamation and hate speech, computer vandalism etc.	
TOTAL HOURS	**45**

TEXT BOOKS:	
1	Bill Nelson, Amelia Phillips, Frank Enfinger, Christopher Steuart, ―ComputerForensics and Investigations, Cengage Learning, India Edition, 2016.
2	CEH official Certfied Ethical Hacking Review Guide, Wiley India Edition, 2015.
REFERENCES:	
1	MarjieT.Britz, ―Computer Forensics and Cyber Crime: An Introduction, 3rd Edition,Prentice Hall, 2013.
2	AnkitFadia ― Ethical Hacking Second Edition, Macmillan India Ltd, 2006
3	Kenneth C.Brancik ―Insider Computer Fraud‖ Auerbach Publications Taylor &Francis Group–200

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	2	-	-	-	-	-	2	-	3	2	3	2	-
CO2	3	2	-	-	-	-	-	-	-	1	3	1	1	2	-
CO3	3	2	1	-	-	-	-	-	1	1	2	2	2	2	-
CO4	3	2	2		-	-	-	-	2	2	3	1	2	1	-
CO5	3	2	1	-	-	-	-	-	2	2	2	3	2	2	-
Average	3	2	1.2	-	-	-	-	-	1.4	1.2	2.6	1.8	2	1.8	-

1 - Low, 2 - Medium, 3 - High, ‘-“- No Correlation

MAHENDRA ENGINEERING COLLEGE (Autonomous)							
Syllabus							
Department	**Artificial Intelligence & Data Science**	**Programme Code**			**1161**		
Program Elective							
Course code	**Course Name**	**Hours/week**			**Credit**	**Maximum Marks**	
		L	**T**	**P**	**C**		
24AI15040	**ETHICAL HACKING**	3	0	0	3	**100**	
Objective(s)	**The student should be made to:** • Understand the basics of computer based vulnerabilities. • Explore different foot printing, reconnaissance and scanning methods. • Expose the enumeration and vulnerability analysis methods. • Understand hacking options available in Web and wireless applications. • Explore the options for network protection.						
Outcome(s)	**At the end of this course, the students will be able:** • Explain express knowledge on basics of computer based vulnerabilities • To gain understanding on different foot printing, reconnaissance and scanning methods. • Demonstrate the enumeration and vulnerability analysis methods • Analyze tne gain knowledge on hacking options available in Web and wireless applications. • Acquire knowledge on the options for network protection						
UNIT-I	**INTRODUCTION**						**9**
Ethical Hacking : Overview- Role of Security and Penetration Testers .- Penetration Testing. Methodologies- Laws of the Land - Overview of TCP/IP- The Application Layer - The Transport Layer - The Internet Layer - IP Addressing .- Network and Computer Attacks - Malware - Protecting Against Malware Attacks.- Intruder Attacks - Addressing Physical Security.							
UNIT-II	**FOOT PRINTING,RECONNAISSANCE AND SCANNING NETWORKS**						**9**
Foot printing Concepts – Foot printing through Search Engines, Web Services, Social Networking Sites, Website, Email - Competitive Intelligence – Foot printing through Social Engineering – Foot printing Tools - Network Scanning Concepts - Port-Scanning Tools - Scanning Techniques - Scanning Beyond IDS and Firewall.							
UNIT-III	**ENUMERATION AND VULNERABILITY ANALYSIS**						**9**
Enumeration Concepts - NetBIOS Enumeration – SNMP, LDAP, NTP, SMTP and DNS Enumeration - Vulnerability Assessment Concepts - Desktop and Server OS Vulnerabilities - Windows OS Vulnerabilities - Tools for Identifying Vulnerabilities in Windows- Linux OS Vulnerabilities- Vulnerabilities of Embedded OSS.							
UNIT-IV	**SYSTEM HACKING**						**9**
Hacking Web Servers - Web Application Components- Vulnerabilities - Tools for Web Attackers and Security Testers Hacking Wireless Networks - Components of a Wireless Network – War driving- Wireless Hacking - Tools of the Trade .							

UNIT-V	HACKING WEB SERVICES & SESSION HIJACKING	9
Web application vulnerabilities, application coding errors, SQL injection into Back-end Databases, cross-site scripting, cross-site request forging, authentication bypass, web services and related flaws, protective http headers Understanding Session Hijacking, Phases involved in Session Hijacking, Types of Session Hijacking, Session Hijacking Tools.		
	TOTAL HOURS	**45**

TEXT BOOK:	
1	Michael T. Simpson, Kent Backman, and James E. Corley, Hands-On Ethical Hacking and Network Defense,Course Technology,Delmar Cengage Learning,2010.
2	The Basics of Hacking and Penetration Testing - Patrick Engebretson SYNGRESS,Elsevier,2013.
REFERENCES:	
1	The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws, Dafydd Stuttardand MarcusPinto,2011.
2	Black Hat Python:Python Programming for Hackers and Pentesters,Justin Seitz, 2014.

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	-	-	-	-	-	-	-	2	2	3	-	-
CO2	2	2	2	-	-	-	-	-	-	-	2	2	2	-	-
CO3	2	2	2	-	-	-	-	-	-	-	2	2	-	2	-
CO4	3	-	-	-	-	-	-	-	-	-	-	1	-	3	-
CO5	3	-	-	-	-	-	-	-	-	-	2	1	-	-	-
Average	**2.4**	**1.2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1.6**	**1.6**	**1**	**1**	**-**

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

<table>
<tr><td colspan="6">MAHENDRA ENGINEERING COLLEGE
(Autonomous)</td></tr>
<tr><td colspan="6">Syllabus</td></tr>
<tr><td>Department</td><td colspan="2">Artificial Intelligence and Data Science</td><td colspan="2">Programme Code</td><td>1161</td></tr>
<tr><td colspan="6">Program Elective</td></tr>
<tr><td>Course code</td><td>Course Name</td><td colspan="3">Hours/week</td><td>Credit</td><td>Maximum Marks</td></tr>
<tr><td rowspan="2">24AI15041</td><td rowspan="2">INFORMATION SECURITY</td><td>L</td><td>T</td><td>P</td><td>C</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Objective(s)</td><td colspan="6">The student should be made to:
• Learn the basics of Information Security
• Know the legal, ethical and professional issues in information security.
• Gain information about the aspects of risk management
• Design the security architecture, policies, standards and practices
• To familiarize Authentication service, electronic mail security, and web security.</td></tr>
<tr><td>Outcome(s)</td><td colspan="6">Upon completion of this course , students will be able to
• Discuss the basics of information security
• Illustrate the legal, ethical and professional issues in information security
• Demonstrate the aspects of risk management.
• Become aware of various standards in the Information Security System
• Understanding of Authentication functions and Authentication Service and ElectronicMail Security</td></tr>
<tr><td>UNIT-I</td><td colspan="4">INTRODUCTION</td><td>9</td></tr>
<tr><td colspan="6">History - What is Information Security? - Critical Characteristics of Information - NSTISSC Security Model - Components of an Information System - Securing the Components - Balancing Security and Access - The SDLC - The Security SDLC.</td></tr>
<tr><td>UNIT-II</td><td colspan="4">SECURITY INVESTIGATION</td><td>9</td></tr>
<tr><td colspan="6">Need for Security - Business Needs - Threats – Attacks - Legal - Ethical and Professional Issues. An overview of computer security-Access control matrix, Policy-Security policies-Confidentiality policies, Integrity Policies and Hybrid policies.</td></tr>
<tr><td>UNIT-III</td><td colspan="4">SECURITY ANALYSIS</td><td>9</td></tr>
<tr><td colspan="6">Introduction - An Overview of Risk Management - Risk Identification -Risk Assessment - Risk Control Strategies - Selecting a Risk Control Strategy - Risk Management Discussion Points – Documenting Results - Recommended Practices in Controlling Risk.</td></tr>
<tr><td>UNIT-IV</td><td colspan="4">LOGICAL DESIGN</td><td>9</td></tr>
<tr><td colspan="6">Introduction - Information Security Policy, Standards and Practices -The Information Security Blueprint: ISO 17799/BS 7799, ISO 27001and its controls - NIST Security Models - Design of Security Architecture - Continuity Strategies.</td></tr>
<tr><td>UNIT-V</td><td colspan="4">WEB SECURITY</td><td>9</td></tr>
</table>

Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET), Intruders, Viruses and related threats. FIREWALL: Firewall Design principles, Trusted Systems.	
TOTAL HOURS	**45**

TEXT BOOK:	
1	Michael E Whitman and Herbert J Mattord, ―Principles of Information Security, Vikas Publishing House, New Delhi, 2003 (Unit I – V)
2	William Stallings (2000), Network Security Essentials (Applications and Standards), Pearson Education, India.
REFERENCES:	
1	Micki Krause, Harold F. Tipton, ― Handbook of Information Security Management, Vol 1-3 CRC Press LLC, 2004.
2	Stuart Mc Clure, Joel Scrambray, George Kurtz, ―Hacking Exposed, Tata McGraw-Hill, 2003
3	Matt Bishop, ― Computer Security Art and Science, Pearson/PHI, 2002.
4	Robert Bragg, Mark Rhodes (2004), Network Security: The complete reference, Tata Mc Grawhill, India.
E-REFERENCES:	
1.	http://www.consciouskidsacademy.org/Principles%20of%20Information%20Security%204th%20edition%20-%20Michael%20E%20Whitman.pdf
2.	https://lecturenotes.in/subject/453/information-security-is

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	1	-	-	-	-	1	3	1	2	3	1	-
CO2	1	3	3	3	2	-	-	-	1	2	2	2	2	1	-
CO3	2	3	3	3	1	-	-	-	1	3	1	2	1	2	-
CO4	2	3	2	2	1	-	-	-	2	2	1	2	1	3	-
CO5	1	1	3	3	2	-	-	-	2	2	2	2	2	2	-
Average	3	3	2	2	2	-	-	-	2	2	2	1	2	2	-

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

MAHENDRAENGINEERINGCOLLEGE (Autonomous)							
Syllabus							
Department	**Artificial Intelligence & Data Science**		**Programme Code**			**1161**	
Program Elective							
Program Elective	**Course Name**	**Hours/week**				**Credit**	**Maximum Marks**
24AI15042	**SWARM INTELLIGENCE**	**L**	**T**	**P**		**C**	**100**
		3	0	0		3	
Objective(s)	**The student should be made to:** • Learn the various characteristics of intelligent agents. • Familiarize the different search strategies in ACO. • Learn to represent knowledge in solving Swarm Optimization. • Gain the different ways of designing software agents. • Know about the various fish swarm Algorithms.						
Outcome(s)	**Upon completion of the course, students will be able to** • Use appropriate search algorithms for any AI Problem • Represent a problem using ACO Algorithm for feature selection. • Provide the apt agent strategy to solve a given problem. • Design software agents to solve a problem. • Design glow swarm optimization culture algorithm, cellular learning automata						
UNIT-I	**INTRODUCTION**						9
Introduction to Swarm Intelligence – Essence of an Algorithm, Algorithms and Self – Organization, Links between Algorithms and Self-Organization-Characteristics of Meta heuristics- Swarm Intelligence based algorithms – Ant Algorithms- Bee Algorithms-Particle Swarm Optimization and Krill Herd Algorithms-Strategies for state space search in AI- Depth First and Breadth First Search Heuristic Search- Best First Search and Hill Climbing.							
UNIT-II	**OPTIMIZATION ALGORITHM**						9
Ant Colony Optimization (ACO) - Theoretical Considerations-Combinatorial optimization and meta heuristic-Stigmergy-Convergence Proofs-ACO Algorithm- ACO and Model Based Search-Variations Of ACO- Elitist Ant System (EAS)-Minmax Ant System (MMAS) and Rank Based Ant Colony System (RANKAS)-ACO Algorithm for Travelling Sales Person problem-ACO algorithm for feature selection.							
UNIT-III	**SWARM OPTIMIZATION**						9
Particle Swarm Optimization: Principles of Bird Flocking and Fish Schooling-Evolution of PSO-Operating Principles- PSO Algorithm- Neighborhood Topologies-Convergence Criteria-Variations of PSO.							
UNIT-IV	**ABC OPTIMIZATION**						9

Artificial Bee Colony (ABC) Optimization - Behavior of real bees-ABC Algorithm-Variations of ABC- Abcgbest and Abcgbestdist-Case Study: Application of ABC algorithm in solving Travelling Salesman Problem-Knapsack Problem and for feature selection.

UNIT-V	**FISH SWARM OPTIMIZATION**	9
Fish swarm algorithm, Variants-Simplified binary fish swarm algorithm-fast artificial swarm algorithm-New Artificial swarm algorithm-Mutation-Fuzzy Adaptive-Hybridization –glow swarm optimization- culture algorithm – cellular learning automata		
	TOTALHOURS	**45**

TEXTBOOKS:	
1	Xin-She Yang, Zhihua Cui, Renbin Xiao, Amir Hossein Gandomi, Mehmet Karamanoglu, "Swarm Intelligence and Bio-Inspired Computation, Theory and Applications", Elsevier 2013.
2	Marco Dorigo and Thomas Stutzle, "Ant Colony Optimization", MIT Press, Cambridge, England, 2004.
REFERENCES:	
1	Ben Coppin, "Artificial Intelligence Illuminated", Jones and Bartlett Publishers, 2004.
2	Kennedy J and Russel C Eberhart, "Swarm Intelligence", Morgan Kaufmann Publishers, USA, 2001
3	Aboul Ella Hassanien Eid Emary, Bahriye Akay," SWARM INTELLIGENCE Principles, Advances, and Applications © 2016 by Taylor & Francis Group, LLC CRC Press is an imprint of Taylor & Francis Group, an Informa business.

COs Vs POs and PSOs Mapping

Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO1	3	2	2	-	-	-	-	-	2	2	3	3	3	2	-
CO2	3	1	2	-	-	-	-	-	1	1	3	3	3	2	-
CO3	3	2	1	-	-	-	-	-	1	1	3	3	2	2	-
CO4	2	2	2	-	-	-	-	-	2	2	2	3	2	3	-
CO5	3	2	-	-	-	-	-	-	1	1	3	3	2	2	-
Average	**2.8**	**1.8**	**1.4**	**-**	**-**	**-**	**-**	**-**	**1.4**	**1.2**	**2.8**	**3**	**2**	**2**	**-**

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation

MAHENDRA ENGINEERING COLLEGE

(Autonomous)

Syllabus

Department	Artificial Intelligence And Data Science	Programme Code	1161

Program Elective

Course code	Course Name	Hours/week			Credit	Maximum marks
		L	T	P	C	
24AI15043	DATA SECURITY	3	0	0	3	100

Objective(s)	**The student should be made to:** • Learn the fundamental concepts related to Data Security • Know the legal, ethical and professional issues in Information Security • Become familiar with Digital Signature and Authentication • Equip the students' knowledge on digital signature • To learn about the security issues in the cloud environment
Outcome(s)	**Upon completion of this course, students will be able to:** • Identify the concepts of data and information security • Discuss the legal, ethical and professional issues in information security • Describe the various authentication schemes to simulate different applications. • Apply various security practices and system security standards • Explain security challenges in the cloud environment

UNIT-I	**INTRODUCTION TO IMAGE FORMATION AND PROCESSING**	9

History, What is Information Security?, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC

UNIT-II	**SECURITY INVESTIGATION**	9

Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues - An Overview of Computer Security - Access Control Matrix, Policy-Security policies, Confidentiality policies, Integrity policies and Hybrid policies

UNIT-III	**DIGITAL SIGNATURE AND AUTHENTICATION**	9

Digital Signature and Authentication Schemes: Digital signature-Digital Signature Schemes and their Variants- Digital Signature Standards-Authentication: Overview- Requirements Protocols - Applications - Kerberos -X.509 Directory Services

UNIT-IV	**E-MAIL AND IP SECURITY**	9

E-mail and IP Security: Electronic mail security: Email Architecture -PGP – Operational Descriptions- Key management- Trust Model- S/MIME.IP Security: Overview- Architecture - ESP, AH Protocols IPSec Modes – Security association - Key management

UNIT-V	CLOUD SECURITY	9

Virtualization System-Specific Attacks: Guest hopping – VM migration attack – hyperjacking. Data

Security and Storage; Identity and Access Management (IAM) - IAM Challenges - IAM Architecture and Practice.	
TOTAL HOURS	**45**

TEXT BOOKS :	
1	Michael E Whitman and Herbert J Mattord, "Principles of Information Security, Course Technology, 6th Edition, 2017
2	Stallings William. Cryptography and Network Security: Principles and Practice, Seventh Edition, Pearson Education, 2017.
REFERENCES:	
1	Harold F. Tipton, Micki Krause Nozaki,, "Information Security Management Handbook, Volume 6, 6th Edition, 2016.
2	Stuart McClure, Joel Scrambray, George Kurtz, "Hacking Exposed", McGraw- Hill, Seventh Edition, 2012
3	Matt Bishop, "Computer Security Art and Science, Addison Wesley Reprint Edition, 2015
4	Behrouz A Forouzan, Debdeep Mukhopadhyay, Cryptography And network security, 3rd Edition, . McGraw-Hill Education, 2015

COs Vs POs and PSOs Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2	3	1	-	-	-	-	1	3	1	2	3	1	-
CO2	1	3	3	3	2	-	-	-	1	2	2	2	2	1	-
CO3	2	3	3	3	1	-	-	-	1	3	1	2	1	2	-
CO4	2	3	2	2	1	-	-	-	2	2	1	2	1	3	-
CO5	3	3	1	1	2	-	-	-	2	2	2	2	2	2	-
Average	**3**	3	**2**	**2**	**2**	-	-	-	**2**	**2**	**2**	**1**	**2**	**2**	-

1 - Low, 2 - Medium, 3 - High, '-"- No Correlation