SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(AN AUTONOMOUS INSTITUTION)

B.Tech – Artificial Intelligence and Data Science
&
M.Tech-Artificial Intelligence and Data Science

Minutes of 9th Board of Studies Meeting

Venue
AI & ML Lab, University Block, Lower Ground Floor
Sri ManakulaVinayagar Engineering College
Madagadipet, Puducherry – 605 107

Date & Time
27.03.2025 & 11.30 AM Onwards

SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE
(AN AUTONOMOUS INSTITUTION)

The Ninth Board of Studies meeting for Department of Artificial Intelligence and Data Science was held on 27th March 2025 at 11:30 A.M in the AI & ML Lab, University Block, Lower Ground Floor, Sri Manakula Vinayagar Engineering College with the Head of the Department in the Chair.

The following members were present for the BoS meeting.

Sl. No.	Name of the Member	Designation
1. Head of the Department concerned (Chairperson)		
1	**Dr. J. Madhusudanan, M.E., Ph.D.,** Professor and Head Specialization: Ubiquitous and Edge Computing Years of Experience: 22 years Sri ManakulaVinayagar Engineering College hodaids@smvec.ac.in **+91 90037 39274**	Chairperson
2. All faculty members of the Department		
2	Dr. M.Auxilia. Associate professor Specialization: Cloud Computing, Deep Learning Years of Experience:19 years Sri Manakula Vinayagar Engineering College auxiliaaids@smvec.ac.in 9994276112	Member Secretary
3	Mr. K.Pragash, Assistant Professor, Specialization:Artificial Intelligence	Member
4	Mr. R.Rajan, Assistant Professor, Specialization: Machine Learning	Member
5	Mr.K.Muthukumaran, Assistant Professor Specialization: Cloud Security	Member
6	Mrs. M.Maragadhavalli Meenakshi,Assistant Professor, Specialization: Data Science, Deep Learning	Member
7	Ms.V,Shivaeeshwary, Assistant Professor, Specialization: Smart Computing	Member
8	Ms. S.Aishwarya Assistant Professor, Specialization: Machine Learning	Member
9	Mrs.S. Lakshmipriya, Assistant Professor, Specialization: Robotic Process Automation	Member
10	Mrs.P. Kanchanadevi, Assistant Professor, Specialization: Machine Learning, IoT	Member
11	Mrs.A.Ilakkiya Assistant Professor, Specialization: Smart Computing	Member
12	Mrs. V. Selvi, Assistant Professor Specialization: AI & ML	Member
13	Mrs.A. Keerthika, Assistant Professor Specialization:	Member
14	Mrs. N.Jayapratha, Assistant Professor Specialization: Networking	Member

15	Mrs. Subashini M, Assistant Professor Specialization:Wireless Communication	Member
16	Mrs.J. Roselin Lourd, Assistant Professor Specialization: IoT	Member
17	Mr. G. Dhanapathy,Assistant Professor Specialization: Computer Networks	Member
18	Mrs.S. Indira, Assistant Professor Specialization: Distributed Computing, Data Science	Member
19	Dr. M. Ganesan, Professor Specialization: Internet of Things	Member
3. Two subject experts from outside the Parent University are nominated by the Academic Council.		
20a	Dr. R. Srinivasa Perumal Professor SCOPE Vellore Institute of Technology, Vellore 8870537819 Mail id: Asstdean.acad3@vit.ac.in	Subject Expert
20b	Dr. N. Bhalaji M.E., Ph.D Professor Dept of IT & SACE SSN College of Engineering Chennai – 605 014. Ph:95000 86801 Mail id: bhalajin@ssn.edu.in	Subject Expert
4. One expert is nominated by the Vice-Chancellor from a panel of six recommended by the Autonomous College Principal as a University Nominee.		
21	Dr. N. Sreenath Professor Department of CSE Puducherry Technological University Puducherry Ph: 9443289642 Mail id: nsreenath@ptuniv.edu.in	University Nominee
5. One representative from industry/corporate sector/allied areasis nominated by the Principal as a Industry Nominee.		
22	Mr. E. Marie Joseph Antony Patrick Lead Software Engineer Freshworks Chennai Ph: 9677488961 Mail id: patrick.ernest@freshworks.com	Industry Expert
6. One member of the College alumni is nominated by the Principal.		
23	Ms. Madhu Srinvasan Engineer Director EMIS Health India Pvt. Ltd. Chennai Ph:99942 69567 Mail id: madhu_anusri@hotmail.com	Alumni

7. Experts from outside the Autonomous College, whenever special courses of studies are to be formulated, to be nominated by the Principal.		
24	Dr. V. Prasanna Venkatesan Professor Department of Banking Technology School of Management Pondicherry University prasanna.btm@pondiuni.edu.in +91 94887 34883	Member

AGENDA OF THE MEETING

B.Tech

1. Welcome Address and review of the eighth meeting of Board of Studies held on 10.09.2024.
2. To apprise about achievements of the institution and department
3. To discuss and approve syllabi of seventh Semester for the B. Tech Artificial Intelligence and Data Science students admitted from the academic year 2023-24 under R-2023 Regulation.
4. To review and finalize the syllabi for honors and minor courses offered by our department to other departments and those offered by the IT department to our department, ensuring alignment with academic and industry standards and to display the list of students enrolled for that.
5. To discuss and approve the Evaluation Systems for honour and minor degree course under the regulation R-2023.
6. To apprise the End Semester Results of the students in the even semester
7. To Discuss any other items with the permission of the chair

M.Tech

1. Welcome Address and review of the eighth meeting of Board of Studies held on 10.09.2024.
2. To apprise about achievements of the institution and department
3. To apprise the End Semester Results of the students in the odd semester
4. Any other items with the permission of the chair

Minutes of the Meeting

Dr. J. Madhusudanan, Chairperson, BoS opened the meeting by welcoming and introducing the external members, to the internal and co-opted members and thanked them for accepting to become the member of the Board of Studies and the meeting thereafter deliberated on items that had been approved by the Chairperson.

BoS/9/2025/ AD /UG/9.1	The BoS Chairperson apprised the board regarding the minutes of 8th BoS
BoS/9/2025/AD /UG/9.2	The BoS Chairperson apprised about the Achievements of College and Department. He portrayed the achievement of students in terms of co-curricular activities and placement records
BoS/9/2025/AD /UG/9.3	The BoS Chairperson apprised about the syllabus of VII Semester under R-2023 regulation. The syllabus was showcased to the BoS members and got concurrence and approval with minor modifications to be incorporated.

Sl. No	Regulation	Semester	Subject Name with Code	Unit	Particulars
1	R-2023	VII	Image Processing and Computer Vision U23ADT714	I, II	BoS Members have suggested to reduce some of the topics in unit I and II. The changes have been incorporated. **Kindly refer Annexure II**
2	R-2023	VII	AI Ethics U23ADE714	IV	The BoS Members have suggested to add some topics related to solutions in bias in unit IV. The changes have been incorporated. **Refer Annexure I and II**
3	R-2023	VII	Quantum AI U23ADE718	All units	The BoS Members have suggested keep important topics in all the units. The changes have been incorporated. **Kindly refer Annexure II**

BoS/9/2025/AD /UG/9.4	The BoS Chairperson apprised and got approval for Honours Degree – Courses, Syllabus and Credits with minor changes to be incorporated. **Refer Annexure II**

Sl. No	Regulation	Semester	Subject Name with Code	Unit	Particulars
1	R-2023	V	Advanced Deep Learning U23MXB501	I,II,III	BoS Members have suggested to reduce some of the topics in unit I and II and III. The changes have been incorporated. **Kindly refer Annexure III**

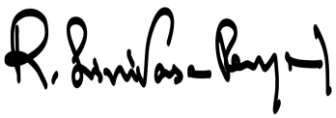
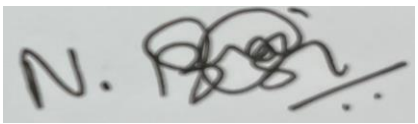
BoS/9/2025/AD /UG/9.5	The BoS Chairperson showcased the regulation and Evaluation Systems for honour and minor degree course under the regulation R-2023 and the BoS members gracefully accepted the same.**Refer Annexure IV**
BoS/9/2025/AD /UG/9.6	The BoS Chairperson apprised the End Semester Results of the students in the odd semester. The BoS expert members

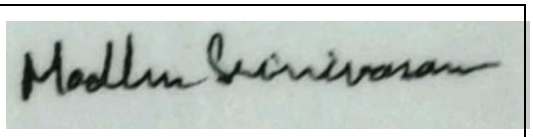
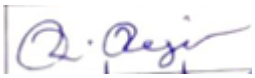
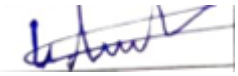
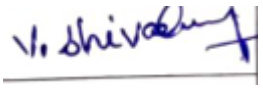
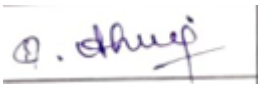
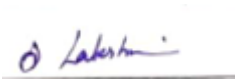
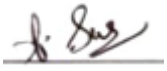
	appreciated the results and asked about the remedial measures for failed students and the BoS Chairperson explained the steps taken for remedial measures.
BoS/9/2025/AD /UG/9.7	The BoS Chairperson informed about a student named Harini from III Year who is going to redo her course from V semester as she had lack of attendance due to some medical reasons. Ms.Harini.R has to undergo the course with the next batch of students 2023-2027under R2023 from the V semester. The BoS members analysed the equivalence and approved the change of regulation request

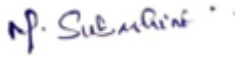
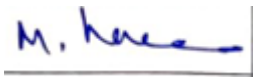
M.Tech Artificial Intelligence and Data Science

BoS/9/2025/ AD /PG/9.1	The BoS Chairperson apprised the board regarding the minutes of 8th BoS
BoS/9/2025/AD /PG/9.2	The BoS Chairperson portrayed the achievement of students in terms of co-curricular activities and placement records. The BoS members appreciated the students and the department.
BoS/9/2025/AD /PG/9.3	The BoS Chairperson apprised the End Semester results of the students in the odd semester. The Bos Members appreciated the department for the results.
BoS/9/2025/AD /PG/9.4	The BoS Chairperson got suggestions from the members regarding the project domain selection and project proposal

The meeting was concluded at 12.36 PM with a vote of thanks by **Dr. J. Madhusudanan**, Head of Department, Artificial Intelligence and Data Science.

Sl. No.	Name of the Member	Designation	Signature
1	**Dr. J. Madhusudanan, M.E., Ph.D.,** Professor and Head Specialization: Ubiquitous and Edge Computing Years of Experience: 22 years Sri ManakulaVinayagar Engineering College hodaids@smvec.ac.in **+91 90037 39274**	Chairperson	
2	Dr.N.Sreenath Professor Department of CSE Puducherry Technological University Puducherry Ph: 9443289642 Mail id: nsreenath@ptuniv.edu.in	University Nominee	
3	Dr.R.Srinivasa Perumal Professor SCOPE Vellore Institute of Technology, Chennai 8870537819 Mail id: r.srinivasaperumal@vit.ac.in	Subject Expert	
4	Dr. N. Bhalaji M.E., Ph.D Principal Rajalakshmi Institute of Technology (An Autonomous Instituition) Chennai Ph:95000 86801 Mail id: bhalajin@ssn.edu.in	Subject Expert	
5	Dr. V. Prasanna Venkatesan Professor Department of Banking Technology School of Management Pondicherry University prasanna.btm@pondiuni.edu.in +91 94887 34883	Member	
6	Mr. E. Marie Joseph Antony Patrick Lead Software Engineer Freshworks Chennai Ph:9677488961 Mail id: patrick.ernest@freshworks.com	Industry Expert	

7	Ms. Madhu Srinvasan Engineer Director EMIS Health India Pvt. Ltd. Chennai Ph:99942 69567 Mail id: madhu_anusri@hotmail.com	Alumni	
8	Dr. M. Auxilia. Associate professor Specialization: Cloud Computing, Deep Learning Years of Experience:19 years Sri Manakula Vinayagar Engineering College auxiliaaids@smvec.ac.in 9994276112	Member Secretary	
9	Mr. K.Pragash, Assistant Professor, Specialization:Artificial Intelligence	Member	
10	Mr. R.Rajan, Assistant Professor, Specialization: Machine Learning	Member	
11	Mr.K.Muthukumaran, assistant Professor Specialization: Cloud Security	Member	
12	Mrs. M.Maragadhavalli Meenakshi,Assistant Professor, Specialization: Data Science, Deep Learning	Member	
13	Ms.V. Shivaeeshwary, Assistant Professor, Specialization: Smart Computing	Member	
14	Ms. S.Aishwarya Assistant Professor, Specialization: Machine Learning	Member	
15	Mrs.S. Lakshmipriya, Assistant Professor, Specialization: Robotic Process Automation	Member	
16	Mrs.P. Kanchanadevi, Assistant Professor, Specialization: Machine Learning, IoT	Member	
17	Mrs.A.Ilakkiya Assistant Professor, Specialization: Smart Computing	Member	
18	Mrs. V. Selvi, Assistant Professor Specialization: AI & ML	Member	
19	Mrs.A. Keerthika, Assistant Professor Specialization:	Member	
20	Mrs. N.Jayapratha, Assistant Professor Specialization: Networking	Member	

21	Mrs. Subashini M, Assistant Professor Specialization:Wireless Communication	Member	
22	Mrs.J. Roselin Lourd,Assistant Professor Specialization: IoT	Member	
23	Mr. G. Dhanapathy,Assistant Professor Specialization: Computer Networks	Member	
24	Mrs.S. Indira, Assistant Professor Specialization: Distributed Computing, Data Science	Member	
25	Dr. M. Ganesan, Professor Specialization: Internet of Things	Member	

Annexure-I

SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(AN AUTONOMOUS INSTITUTION)

(As per UGC - 2018 Regulations and Affiliated to Pondicherry University)

PUDUCHERRY – 605107

B.TECH.

ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Regulation-2023

CURRICULUM AND SYLLABI

COLLEGE VISION AND MISSION

Vision

To be globally recognized for excellence in quality education, innovation and research for the transformation of lives to serve the society.

Mission

M1: Quality Education:

To provide comprehensive academic system that amalgamates the cutting-edge technologies with best practices.

M2: **Research and Innovation:**

To foster value- based research and innovation in collaboration with industries and institutions globally for creating intellectuals with new avenues.

M3: Employability and Entrepreneurship:

To inculcate the employability and entrepreneurial skills through value and skill-based training.

M4: Ethical Values:

To instill deep sense of human values by blending societal righteousness with academic professionalism for the growth of society.

DEPARTMENT VISION AND MISSION

Vision

Incorporating the Data Science skills and applying the acquired analytical knowledge in the heterogeneous domains through Artificial Intelligence

Mission

M1: Understand Data Science:

Amalgamation of Programming Knowledge, Mathematical Skill Set and Knowledge of Business Domains to face the challenges of the real-world requirement

M2: Applying the Acquired Knowledge:

Inculcating the spirit of applying the acquired knowledge, innovation and creativity among students to work in heterogeneous domains

M3: Capstone Project:

Providing forum to carry out a capstone project through collaborations with the industries

M4: Be socially beneficial and other moral concerns:

Inspiring the educational experience in the field of application development and ensure the design, principle and ethic to be followed in the society.

M5: Continuous Learning for keen Initiative:

Affording continuous learning in the field of current trends in Artificial Intelligence and Data Science for keen initiative and enterprise focused.

PROGRAMME OUTCOMES (POs)

PO1: Engineering knowledge:

Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis:

Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions:

Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems:

Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.

PO5: **Modern tool usage:**

Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society:

Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability:

Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of and need for sustainable development.

PO8: Ethics:

Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work:

Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication:

Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance:

Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning:

Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Acquiring the data:

To create an essential knowledge for extracting data from heterogeneous domains.

PEO2: Information Inferring and Knowledge representation:

To equip the student with knowledge, through different programming skills and creating a knowledge representation for the inferred data, so that it can be applied in the real time scenario.

PEO3: Design method:

To enable the student as a Data Analyst by designing a right Machine Learning algorithm and seamless programming skill to solve any sort of application.

PEO4: Systematic Enhancement:

To provide them with a keen knowledge on current trends and to enhance its impact periodically on the existing applications to meet the future scenario.

PROGRAM SPECIFIC OBJECTIVES (PSOs)

PSO 1: Mathematical Foundation and Data Procuring:

To utilize the knowledge of Mathematical concept in procured Data from various Data sources.

PSO 2: Intellect Applications and Research Technologies:

To utilize the technical concepts, ideas, methodologies and the new emerging technologies in Artificial Intelligence and use this knowledge in their analytic skill to solving the current and future Data Analytics real time applications.

PSO 3: Developments of Real Time Applications:

To utilize the knowledge acquired and create a forum to carry out a capstone project through collaborations with the industries

STRUCTURE FOR UNDERGRADUATE ENGINEERING PROGRAM

Sl. No	Course Category	Breakdown of Credits
1	Humanities and Social Sciences including Management courses (HS)	16
2	Basic Science Courses (BS)	17
3	Engineering Science Courses (ES)	41
4	Professional Core Courses (PC)	58
5	Professional Elective Courses (PE)	18
6	Open Elective Courses (OE)	09
7	Project Work and Internship (PA)	13
8	Ability Enhancement Courses (AEC*)	-
9	Mandatory Courses (MC*)	-
Total		**172**

SCHEME OF CREDIT DISTRIBUTION – SUMMARY

Sl.No	Course Category	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	Humanities and Social Science Courses (HS)	4	3	3	1	2	-	-	3	16
2	Basic Science Courses (BS)	4	4	5	4		-	-	-	17
3	Engineering Science Courses (ES)	12	12	6	11	-	-	-	-	41
4	Professional Core Courses (PC)	4	4	8	4	12	15	11	-	58
5	Professional Elective Courses (PE)	-	-	-	3	3	3	3	6	18
6	Open Elective Courses (OE)	-	-	-		3	3	3	-	09
7	Project Work (PA)	-	-	-	-	1	1	2	8	12
8	Internship (PA)	-	-	-	-	-	-	1	-	01
9	Ability Enhancement courses (AEC*) Courses (AEC*)	-	-	-	-	-	-	-	-	-
10	Mandatory Courses (MC*)	-	-	-	-	-	-	-	-	-
Total		**22**	**23**	**22**	**23**	**21**	**22**	**20**	**17**	**172**

*** AEC and MC course Credits are not included for CGPA calculation**

HONOURS DEGREE PROGRAMME:

The student is permitted to opt for earning an honours degree in the same discipline of engineering in addition to the degree in his/her own discipline. To earn an honours degree the student is required to earn an additional 18 - 20 credits (over and above the total 170 credits prescribed in the curriculum) starting from fourth semester onwards by completing 5 additional courses offered in respective semesters. A student is eligible to exercise this option if he/she has passed all the courses offered upto third semester in the first attempt itself and has earned a CGPA / GPA* (*for lateral entry) of not less than 8.0. The prescribed courses offered for Honours degree are given in **Annexure V**.

B. TECH CURRICULUM

SEMESTER – I										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23MATC01	Engineering Mathematics – I	BS	3	1	0	4	25	75	100
2	U23ESTC03	Basics of Electrical and Electronics Engineering	ES	3	0	0	3	25	75	100
3	U23CSTC01	Programming In C	ES	3	0	0	3	25	75	100
4	U23ADT101	Digital System Design	ES	3	0	0	3	25	75	100
5	U23ADT102	Fundamental of Data Science	PC	3	0	0	3	25	75	100
Theory cum Practical										
6	U23ENBC01	Communicative English -I	HS	2	0	2	3	50	50	100
Practical										
7	U23CSPC01	Programming in C Laboratory	ES	0	0	2	1	50	50	100
8	U23ESPC03	Engineering Graphics using AutoCAD	ES	0	0	2	1	50	50	100
9	U23ADP101	Fundamental of Data Science Laboratory	PC	0	0	2	1	50	50	100
Ability Enhancement Courses										
10	U23ADC1XX	Certification Course-I**	AEC	0	0	4	0	100	-	100
Mandatory Course										
11	U23ADM101	Induction Programme	MC	2 Weeks			0	-	-	-
							22	425	575	1000

SEMESTER – II										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23MATC02	Engineering Mathematics – II	BS	3	1	0	4	25	75	100
2	U23BSTC01	Physical Science for Engineers	ES	3	0	0	3	25	75	100
3	U23ADTC01	Programming in Python	ES	3	0	0	3	25	75	100
4	U23CSTC03	Data Structures	ES	3	0	0	3	25	75	100
5	U23ADT203	Database Technologies	PC	3	0	0	3	25	75	100
Theory cum Practical										
6	U23ENBC02	Communicative English -II	HS	2	0	2	3	50	50	100
Practical										
7	U23ESPC02	Design Thinking and Idea Lab	ES	0	0	2	1	50	50	100
8	U23ADPC01	Programming in Python Laboratory	ES	0	0	2	1	50	50	100
9	U23CSPC02	Data Structures Laboratory	ES	0	0	2	1	50	50	100
10	U23ADP202	Database Technologies Laboratory	PC	0	0	2	1	50	50	100
Ability Enhancement Courses										
11	U23ADC2XX	Certification Course-II**	AEC	0	0	4	0	100	-	100
Mandatory Course										
12	U23ADM202	Sports Yoga and NSS	MC	0	0	2	0	100	-	100
							23	575	625	1200

**** Certification Courses are to be selected from the list given in Annexure III***

SEMESTER – III										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23MATC03	Probability and Statistics	BS	3	1	0	4	25	75	100
2	U23ADT304	Software Engineering and Agile Software Development	ES	3	0	0	3	25	75	100
3	U23ADT305	Artificial Intelligence and Expert System	PC	3	0	0	3	25	75	100
4	U23ADT306	Basic Machine Learning Techniques	PC	3	0	0	3	25	75	100
5	U23HSTC01	Universal Human Values-II	HS	2	0	0	2	25	75	100
Theory cum Practical										
6	U23CSBC01	Design and Analysis of Algorithms	PC	2	0	2	3	50	50	100
Practical										
7	U23ENPC01	General Proficiency – I	HS	0	0	2	1	50	50	100
8	U23MAPC01	Engineering Mathematics Laboratory	BS	0	0	2	1	50	50	100
9	U23ADP303	Artificial Intelligence and Expert System Laboratory	PC	0	0	2	1	50	50	100
10	U23ADP304	Basic Machine Learning Techniques Laboratory	PC	0	0	2	1	50	50	100
Ability Enhancement Courses										
11	U23ADC3XX	Certification Course-III**	AEC	0	0	4	-	100	-	100
12	U23ADS301	Skill Enhancement Course-I*	AEC	0	0	2	-	100	-	100
Mandatory Course										
13	U23ADM303	Climate Change	MC	2	0	0	-	100	-	100
							22	675	625	1300

SEMESTER – IV										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23MATC05	Discrete Mathematics and Graph Theory	BS	3	1	0	4	25	75	100
2	U23ADDC01	Computer Networks and Security	ES	3	0	0	3	25	75	100
3	U23ITTCO2	Programming in JAVA	ES	3	0	0	3	25	75	100
4	U23ADT407	Advanced Machine Learning Techniques	PC	3	0	0	3	25	75	100
5	U23ADE4XX	Professional Elective – I#	PE	3	0	0	3	25	75	100
Theory cum Practical										
6	U23ADB401	Linux Internals	ES	2	0	2	3	50	50	100
Practical										
7	U23ENPC02	General Proficiency – II	HS	0	0	2	1	50	50	100
8	U23ADP405	Computer Networks and Security Laboratory	ES	0	0	2	1	50	50	100
9	U23ITPCO2	Programming in JAVA Laboratory	ES	0	0	2	1	50	50	100
10	U23ADP406	Advanced Machine Learning Techniques Laboratory	PC	0	0	2	1	50	50	100
Ability Enhancement Courses										
11	U23ADC4XX	Certification Course-IV**	AEC	0	0	4	-	100	-	100
12	U23ADS402	Skill Enhancement Course-II*	AEC	0	0	2	-	100	-	100
Mandatory Course										
13	U23ADM404	Right to Information and Good Governance	MC	2	0	0	-	100	-	100
							23	675	625	1300

 # Professional Elective Courses are to be selected from the list given in Annexure I
****Skill Enhancement Courses (1 and 2) are to be selected from the list given in Annexure IV***

SEMESTER – V										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23HSTC02	Research Methodology	HS	2	0	0	2	25	75	100
2	U23ADT508	Cloud Computing and Data Management Architectures	PC	3	0	0	3	25	75	100
3	U23ADT509	Deep Learning	PC	3	0	0	3	25	75	100
4	U23ADT510	Data Visualization	PC	3	0	0	3	25	75	100
5	U23ADE5XX	Professional Elective – II#	PE	3	0	0	3	25	75	100
6	U23ADO5XX	Open Elective – I$	OE	3	0	0	3	25	75	100
Practical										
7	U23ADP507	Cloud Computing and Data Management Architectures Laboratory	PC	0	0	2	1	50	50	100
8	U23ADP508	Deep Learning Laboratory	PC	0	0	2	1	50	50	100
9	U23ADP509	Data Visualization Laboratory	PC	0	0	2	1	50	50	100
Project Work										
10	U23ADW501	Micro project	PA	0	0	2	1	100	-	100
Ability Enhancement Courses										
11	U23ADC5XX	Certification Course-V**	AEC	0	0	4	-	100	-	100
Mandatory Course										
12	U23ADM505	Essence of Indian Traditional Knowledge	MC	2	0	0	-	100	-	100
							21	600	600	1200

SEMESTER – VI										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23ADTC02	NLP and Chatbot	PC	3	0	0	3	25	75	100
2	U23ADT611	Robotic Process Automation – UI Path	PC	3	0	0	3	25	75	100
3	U23CSTC07	Web Designing	PC	3	0	0	3	25	75	100
4	U23ADE6XX	Professional Elective – III#	PE	3	0	0	3	25	75	100
5	U23ADO6XX	Open Elective – II $	OE	3	0	0	3	25	75	100
Theory cum Practical										
6	U23ADB602	Blockchain and Cryptography	PC	2	0	2	3	50	50	100
Practical										
7	U23ADP610	NLP and Chatbot Laboratory	PC	0	0	2	1	50	50	100
8	U23ADP611	Robotic Process Automation – UI Path Laboratory	PC	0	0	2	1	50	50	100
9	U23CSPC06	Web Designing Laboratory	PC	0	0	2	1	50	50	100
Project Work										
10	U23ADW602	Mini project	PA	0	0	2	1	100	-	100
Ability Enhancement Course										
11	U23ADC6XX	Certification Course – VI	AEC	0	0	4	-	100	-	100
Mandatory Course										
12	U23ADM606	Gender Equality	MC	2	0	0	-	100	-	100
							22	625	575	1200

$ Choose any one Open Elective Course from the list given in Annexure II

SEMESTER – VII										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23ADT712	Intelligent Systems and Control	PC	3	0	0	3	25	75	100
2	U23ADT713	IoT Systems and Analytics	PC	3	0	0	3	25	75	100
3	U23ADT714	Image Processing and Computer Vision	PC	3	0	0	3	25	75	100
4	U23ADE7XX	Professional Elective – IV#	PE	3	0	0	3	25	75	100
5	U23ADO7XX	Open Elective – III$	OE	3	0	0	3	25	75	100
Practical										
6	U23ADP712	Intelligent Systems and Control Laboratory	PC	0	0	2	1	50	50	100
7	U23ADP713	IoT Systems and Analytics Laboratory	PC	0	0	2	1	50	50	100
Project Work										
8	U23ADW703	Project Phase – I	PA	0	0	4	2	50	50	100
9	U23ADW704	Internship / In plant Training	PA	0	0	2	1	100	-	100
							20	375	525	900

SEMESTER – VIII										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U23HSTC03	Entrepreneurship and Business Management	HS	3	0	0	3	25	75	100
2	U23ADE8XX	Professional Elective – V#	PE	3	0	0	3	25	75	100
3	U23ADE8XX	Professional Elective – VI#	PE	3	0	0	3	25	75	100
Project Work										
4	U23ADW805	Project Phase – II	PA	0	0	16	8	50	100	150
							17	125	325	450

ANNEXURE - I
PROFESSIONAL ELECTIVE COURSES (18 CREDITS)

Sl. No.	Course Code	Course Title
Professional Elective – I (Offered in Semester IV)		
1	U23CSDC01	Automata and Compiler Design
2	U23ADE401	Introduction to Computer Vision
3	U23ADE402	R Programming
4	U23ADE403	Tools and Techniques of Data Science
5	U23ADE404	Data Handling and Preprocessing
Professional Elective – II (Offered in Semester V) *		
1	U23ADE505	Text Mining and Sentiment Analysis
2	U23ADE506	User Experience Design
3	U23ADE507	Java Programming: Essential Concepts to Advanced Mastery
4	U23ADE508	Exploratory Data Analysis
5	U23ADE509	Designing Machine Learning Systems
Professional Elective – III (Offered in Semester VI) *		
1	U23ADE610	Speech Processing and Analytics
2	U23ITEC05	Augmented Reality and Virtual Reality
3	U23ADE611	Advanced Java Programming
4	U23ADE612	Predictive Data Analytics
5	U23ADE613	Advanced Natural Language Processing
Professional Elective – IV (Offered in Semester VII) *		
1	U23ADE714	AI Ethics
2	U23ADE715	Prompt Engineering
3	U23ADE716	Ethics in Data Science
4	U23ADE717	Cloud based Machine Learning Platforms
5	U23ADE718	Quantum AI
Professional Elective – V (Offered in Semester VIII) *		
1	U23ADE819	AI in Agriculture
2	U23ADE820	AI in Healthcare
3	U23ADE821	Stream Processing
4	U23ADE822	Sustainable AI
5	U23ADE823	AI in Finance
Professional Elective – VI (Offered in Semester VIII) *		
1	U23ADE824	Augmented Analytics
2	U23ADE825	Modern Cryptography
3	U23ADE826	AI in Automobile Industry
4	U23ADE827	AI in E-Commerce
5	U23ADE828	AI in Smart Cities

ANNEXURE - II

OPEN ELECTIVE COURSES (09 CREDITS)

S. No	Course Code	Course Title	Offering Department	Permitted Departments
Open Elective – I / Open Elective-II (Offered in Semester V/VI) (Offered in Semester V for **CSE, IT, MECH, Mechatronics, AI&DS**) (Offered in Semester VI for **EEE, ECE, ICE, CIVIL, BME, CCE**)				
1	U23ADDC02	Principle of Artificial Intelligence and Machine Learning	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics
2	U23ADOC01	Introduction to Data Science	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics
Open Elective – III (Offered in Semester VII)				
3	U23ADOC02	Data science Application of Vision	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE
4	U23ADOC03	Artificial Intelligence Applications	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics

ANNEXURE - III

ABILITY ENHANCEMENT COURSES-(A) CERTIFICATION COURSES

S. No	Course Code	Course Title	Certified By
1	U23XXCX01	Adobe Photoshop	Adobe
2	U23XXCX02	Adobe Animate	Adobe
3	U23XXCX03	Adobe Dreamweaver	Adobe
4	U23XXCX04	Adobe After Effects	Adobe
5	U23XXCX05	Adobe Illustrator	Adobe
6	U23XXCX06	Adobe InDesign	Adobe
7	U23XXCX07	Autodesk AutoCAD -ACU	Autodesk
8	U23XXCX08	Autodesk Inventor - ACU	Autodesk
9	U23XXCX09	Autodesk Revit - ACU	Autodesk
10	U23XXCX10	Autodesk Fusion 360 - ACU	Autodesk
11	U23XXCX11	Autodesk 3ds Max - ACU	Autodesk
12	U23XXCX12	Autodesk Maya - ACU	Autodesk
13	U23XXCX13	Cloud Security Foundations	AWS
14	U23XXCX14	Cloud Computing Architecture	AWS
15	U23XXCX15	Cloud Foundation	AWS
16	U23XXCX16	Cloud Practitioner	AWS
17	U23XXCX17	Cloud Solution Architect	AWS
18	U23XXCX18	Data Engineering	AWS
19	U23XXCX19	Machine Learning Foundation	AWS
20	U23XXCX20	Robotic Process Automation / Medical Robotics	Blue Prism
21	U23XXCX21	Advance Programming Using C	CISCO
22	U23XXCX22	Advance Programming Using C ++	CISCO
23	U23XXCX23	C Programming	CISCO
24	U23XXCX24	C++ Programming	CISCO
25	U23XXCX25	CCNP Enterprise: Advanced Routing	CISCO
26	U23XXCX26	CCNP Enterprise: Core Networking	CISCO
27	U23XXCX27	Cisco Certified Network Associate - Level 2	CISCO
28	U23XXCX28	Cisco Certified Network Associate- Level 1	CISCO
29	U23XXCX29	Cisco Certified Network Associate- Level 3	CISCO

30	U23XXCX30	Fundamentals Of Internet of Things	CISCO
31	U23XXCX31	Internet Of Things / Solar and Smart Energy System with IoT	CISCO
32	U23XXCX32	Java Script Programming	CISCO
33	U23XXCX33	NGD Linux Essentials	CISCO
34	U23XXCX34	NGD Linux I	CISCO
35	U23XXCX35	NGD Linux II	CISCO
36	U23XXCX36	Advance Java Programming	Ethnotech
37	U23XXCX37	Android Programming / Android Medical App Development	Ethnotech
38	U23XXCX38	Angular JS	Ethnotech
39	U23XXCX39	Catia	Ethnotech
40	U23XXCX40	Communication Skills for Business	Ethnotech
41	U23XXCX41	Coral Draw	Ethnotech
42	U23XXCX42	Data Science Using R	Ethnotech
43	U23XXCX43	Digital Marketing	Ethnotech
44	U23XXCX44	Embedded System Using C	Ethnotech
45	U23XXCX45	Embedded System with IOT / Arduino	Ethnotech
46	U23XXCX46	English For IT	Ethnotech
47	U23XXCX47	Plaxis	Ethnotech
48	U23XXCX48	Sketch Up	Ethnotech
49	U23XXCX49	Financial Planning, Banking and Investment Management	Ethnotech
50	U23XXCX50	Foundation Of Stock Market Investing	Ethnotech
51	U23XXCX51	Machine Learning / Machine Learning for Medical Diagnosis	Ethnotech
52	U23XXCX52	IOT Using Python	Ethnotech
53	U23XXCX53	Creo (Modelling & Simulation)	Ethnotech
54	U23XXCX54	Soft Skills, Verbal, Aptitude	Ethnotech
55	U23XXCX55	Software Testing	Ethnotech
56	U23XXCX56	MX-Road	Ethnotech
57	U23XXCX57	CLO 3D	Ethnotech
58	U23XXCX58	Solid works	Ethnotech
59	U23XXCX59	Staad Pro	Ethnotech
60	U23XXCX60	Total Station	Ethnotech
61	U23XXCX61	Hydraulic Automation	Festo

62	U23XXCX62	Industrial Automation	Festo
63	U23XXCX63	Pneumatics Automation	Festo
64	U23XXCX64	Agile Methodologies	IBM
65	U23XXCX65	Block Chain	IBM
66	U23XXCX66	Devops	IBM
67	U23XXCX67	Artificial Intelligence	ITS
68	U23XXCX68	Cloud Computing	ITS
69	U23XXCX69	Computational Thinking	ITS
70	U23XXCX70	Cyber Security	ITS
71	U23XXCX71	Data Analytics	ITS
72	U23XXCX72	Databases	ITS
73	U23XXCX73	Java Programming	ITS
74	U23XXCX74	Networking	ITS
75	U23XXCX75	Python Programming	ITS
76	U23XXCX76	Web Application Development (HTML, CSS, JS)	ITS
77	U23XXCX77	Network Security	ITS & Palo alto
78	U23XXCX78	MATLAB	MathWorks
79	U23XXCX79	Azure Fundamentals	Microsoft
80	U23XXCX80	Azure AI (AI-900)	Microsoft
81	U23XXCX81	Azure Data (DP -900)	Microsoft
82	U23XXCX82	Microsoft 365 Fundamentals (SS-900)	Microsoft
83	U23XXCX83	Microsoft Security, Compliance and Identity (SC-900)	Microsoft
84	U23XXCX84	Microsoft Power Platform (PI-900)	Microsoft
85	U23XXCX85	Microsoft Dynamics Fundamentals 365 – CRM	Microsoft
86	U23XXCX86	Microsoft Excel	Microsoft
87	U23XXCX87	Microsoft Excel Expert	Microsoft
88	U23XXCX88	Securities Market Foundation	NISM
89	U23XXCX89	Derivatives Equinity	NISM
90	U23XXCX90	Research Analyst	NISM
91	U23XXCX91	Portfolio Management Services	NISM
92	U23XXCX92	Cyber Security	Palo alto
93	U23XXCX93	Cloud Security	Palo alto

94	U23XXCX94	PMI – Ready	PMI
95	U23XXCX95	Tally – GST & TDS	Tally
96	U23XXCX96	Advance Tally	Tally
97	U23XXCX97	Associate Artist	Unity
98	U23XXCX98	Certified Unity Programming	Unity
99	U23XXCX99	VR Development	Unity

ANNEXURE - IV

ABILITY ENHANCEMENT COURSES-(B) SKILL ENHANCEMENT COURSES

Sl. No.	Course Code	Course Title
1.	U23ADS301	**SKILL ENHANCEMENT COURSE - I**
		a) Clean code
		b) Exploring of GITHUB
		c) Aptitude - I
2.	U23ADS402	**SKILL ENHANCEMENT COURSE - II**
		a) API design - I
		b) Exploring of Research Tools
		c) Aptitude - II

**** Choose any one SKILL ENHANCEMENT COURSE in the list for SEC - I, SEC - II***

Annexure – V

HONOURS PROGRAMME – Artificial Intelligence and Machine Learning

COURSE DETAILS											
Sl. No.	**Semester**	**Course Code**	**Course Title**	**Category**	**Periods**			**Credits**	**Max. Marks**		
					L	**T**	**P**		**CAM**	**ESM**	**Total**
Theory											
1	IV	U23MXT401	Parallel Programming and High Performance Computing	PC	3	0	0	3	25	75	100
2	V	U23MXB501	Advanced Deep Learning	PC	3	0	2	4	50	50	100
3	VI	U23MXB602	Reinforcement Learning	PC	3	0	2	4	50	50	100
4	VII	U23MXT702	Image and Video Analytics	PC	3	0	0	3	25	75	100
5	VIII	U23MXT803	Prompt Engineering	PC	3	0	0	3	25	75	100
6	VIII	U23MXW801	Project	PA	0	0	4	2	50	50	100
	Total							**19**	**225**	**375**	**600**
Equivalent NPTEL courses[##]											
1	IV	U23MXTN01	Parallel Programming	**3**	**NPTEL** ***Students can opt for any of these courses instead of theory papers in IV, VII and VIII semesters**				**12 Weeks Course**		
2	VII	U23MXTN02	Deep Learning for Computer Vision	**3**							
3	VIII	U23MXTN03	Introduction to Large Language Models (LLMs)	**3**							

[##] The student shall be given an option to earn 3 credits through one equivalent 12-week NPTEL course instead of any one course listed for honours degree programme that should be completed before the commencement of eighth semester. The equivalent courses are subject to change based on its availability as per NPTEL course list.

Annexure-II

Department	**Artificial Intelligence and Data Science**	Programme: **B.Tech.**					
Semester	**VII**	Course Category Code: **PC**			End Semester Exam Type: **TE**		
Course Code	**U23ADT712**	Periods/Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	**INTELLIGENT SYSTEMS AND CONTROL**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
AI & DS								
Prerequisite	**Neural Networks & Deep Learning**							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Describe the fundamentals of intelligent control systems and their applications.	**K2**
	CO2 Apply fuzzy logic and neural networks to design intelligent controllers.	**K3**
	CO3 Implement Neural network control strategies.	**K3**
	CO4 Implement reinforcement learning-based control strategies.	**K3**
	CO5 Describe hybrid intelligent control systems combining multiple AI techniques.	**K2**

Unit-I	**Introduction to Intelligent Systems and Control**	**Periods: 9**	
Overview of conventional vs. intelligent control-Applications in robotics, automation, and real-world systems-Basics of knowledge-based and learning-based control-Transfer functions, state-space modelling-Stability analysis: Routh-Hurwitz, Nyquist, Bode plots			**CO1**
UNIT-II	**Fuzzy Logic Control**	**Periods:9**	
Introduction to fuzzy sets and membership functions-Fuzzy inference systems (Mamdani & Sugeno models)-Design of fuzzy logic controllers (FLC)-Applications of fuzzy control in real-world systems			**CO2**
UNIT-III	**Neural Networks in Control**	**Periods:9**	
Basics of artificial neural networks (ANN)-Multi-layer perceptron (MLP) and backpropagation-Adaptive control using neural networks -Case studies in neural control			**CO3**
UNIT-IV	**Genetic Algorithms & Reinforcement Learning for Control**	**Periods:9**	
Introduction to genetic algorithms (GA) -Evolutionary strategies for optimization -Applications in controller tuning- Fundamentals of reinforcement learning (RL) -Q-learning and policy gradient methods -Deep reinforcement learning for control applications			**CO4**
UNIT-V	**Hybrid Intelligent Control Systems**	**Periods:9**	
Combining fuzzy logic, neural networks, and genetic algorithms-Adaptive neuro-fuzzy inference systems (ANFIS)-Hybrid models for intelligent control-Real-world applications of hybrid control systems			**CO5**

Lecture Periods:45	**Tutorial Periods:-**	**Practical Periods:-**	**TotalPeriods:45**

Text Books

1. K.S. Narendra and K. Parthasarathy, Intelligent Control Systems with an Introduction to System of Systems Engineering, 1st Edition, CRC Press.2009.
2. Timothy J. Ross, Fuzzy Logic with Engineering Applications, 3rd Edition, Wiley Publication, 2016
3. Laxmi P. Prajapati and S. P. Harsha, Intelligent Systems: Architecture, Design, and Control, 1st Edition CRC Press.2016.
4. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 4th Edition Pearson 2020.
5. Nikolaus Correll, Bradley Hayes, Introduction to Autonomous Robots: Mechanisms, Sensors, Actuators, and Algorithms, 1st Edition MIT Press.2017.

Reference Books

1. M. Gopal, Intelligent Control Systems, 2st Edition, Wiley-Blackwell.2008.
2. Jerry M. Mendel, Fuzzy Control and Fuzzy Systems, 1st Edition, Prentice Hall ,2012
3. Ogata Katsuhiko, Modern Control Engineering. 5th Edition, Prentice Hall, 20210

Web References

1. https://onlinecourses.nptel.ac.in/noc25_ee89/preview
2. https://www.sc.iitb.ac.in/courses.html#602
3. https://www.baeldung.com/cs/genetic-algorithms-vs-neural-networks

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	2	2	2	-	-	-	-	-	-	-	2	3	3
2	2	3	3	2	2	-	-	-	-	-	-	-	3	3	3
3	2	2	3	2	2	-	-	-	-	-	-	-	2	3	3
4	3	2	2	2	3	-	-	-	-	-	-	-	3	3	3
5	2	3	2	2	3	-	-	-	-	-	-	-	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Artificial Intelligence and Data Science**	Name of the Programme: **B.Tech**						
Semester	**VII**	Course Category: **PC**			*End Semester Exam Type: **TE**			
Course Code	**U23ADT713**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**IOT SYSTEMS AND ANALYTICS**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
AI&DS								

Prerequisite	Basics of Programming (C, C++), Computer Networks and Communication Protocols		
Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Explain the concept of IoT.	**K2**
	CO2	Describe various protocols for IoT.	**K2**
	CO3	Design a IoT system using Rasperry Pi/Arduino.	**K3**
	CO4	Explain the concept of data analytics and use cloud offerings related to IoT.	**K2**
	CO5	Design and Develop a IoT application in real time scenario.	**K3**

UNIT – I	**Fundamentals of IoT**	**Periods:9**	
volution of Internet of Things - Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Architecture and Core IoT Functional ai Stack -– Fog, Edge and Cloud in IoT – Functional blocks of an IoT ecosystem – Sensors, Actuators, SAI mart Objects and Connecting Smart Objects			**CO1**
UNIT – II	**IoT Protocols**	**Periods: 9**	
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			**CO2**
UNIT – III	**Design and Development**	**Periods: 9**	
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.			**CO3**
UNIT – IV	**Data Analytics and Supporting Services**	**Periods: 9**	
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 – AWS s for IoT – System Management with NETCONF-YANG			**CO4**
UNIT – V	**Case Studies/Industrial Applications**	**Periods: 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			**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Textbooks

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
2. Jean Philippejava Vasseur and Adam Dunkels, “Interconnecting Smart Objects with IP, The Next Internet”, Morgan Kaufmann, Elsevier, 2016.
3. Arshdeep Bahga, Vijay Madisetti, —Internet of Things – A hands-on approach‖, Universities Press, 2018.
4. Andy King, “Programming the Internet of Things” Oreilly Publications, 2020

References

1. Olivier Hersent, David Boswarthick, Omar Elloumi , —The Internet of Things – Key applications and Protocolsǁ, Wiley, 2016 (for Unit 2).
2. 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, 2018.
3. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —Architecting the Internet of Thingsǁ, Springer, 2018.

Web References

. 1. https://www.sciencedirect.com/science/article/pii/S1877050916316428
2. https://www.tibco.com/reference-center/what-is-iot-analytics
3. https://mite.ac.in/wp-content/uploads/2021/04/iot_module4.pdf

POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	2	2	2	-	-	-	-	-	-	-	2	3	3
2	2	3	3	2	2	-	-	-	-	-	-	-	3	3	3
3	2	2	3	2	2	-	-	-	-	-	-	-	2	3	3
4	3	2	2	2	3	-	-	-	-	-	-	-	3	3	3
5	2	3	2	2	3	-	-	-	-	-	-	-	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 –High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Artificial Intelligence and Data Science**			Programme: **B.Tech.**				
Semester	**VI**			Course Category Code: **PC**		End Semester Exam Type: **TE**		
Course Code	**U23ADT714**			Periods/Week		Credit	Maximum Marks	
				L	T	P	C	CAM	ESE	TM
Course Name	**IMAGE PROCESSING AND COMPUTER VISION**			**3**	**0**	**0**	**3**	**25**	**75**	**100**
AI & DS										
Prerequisite	Artificial Intelligence, Quantum Mechanics									
Course Outcomes	**On completion of the course, the students will be able to**						BT Mapping (Highest Level)			
	CO1	Recognize and describe both the theoretical and practical aspects of computing with images.					**K2**			
	CO2	Explain object segmentation methods.					**K2**			
	CO3	Describe shape representation methods.					**K2**			
	CO4	Implement deep learning techniques for vision tasks.					**K3**			
	CO5	Apply emerging trends and advanced applications in computer vision.					**K3**			

UNIT-I	**Foundations of Image Processing**	**Periods: 9**	
Digital image representation (grayscale, RGB, HSV) – Sampling - quantization and color spaces – Histograms - point operations and contrast enhancement - Linear/non-linear filtering (Gaussian, median, bilateral).			**CO1**
UNIT-II	**OBJECT SEGMENTATION**	**Periods:9**	
Image smoothing - Edge Detectors – Scaling - Canny Edge Detector - Image Segmentation: Thresholding, Region-Based Segmentation – Contour Detection and Shape Analysis – Morphological Operations: Dilation, Erosion, Opening, Closing.			**CO2**
UNIT-III	**Shape Representation**	**Periods:9**	
Region identification - contour based shape representation - simple geometric border representation - Fourier transform of boundaries - region based shape representation - convex hull - region decomposition - region neighbourhood graphs.			**CO3**
UNIT-IV	**Deep Learning for Computer Vision**	**Periods:9**	
Deep Learning Frameworks (TensorFlow, PyTorch) – Autoencoders and GANs – Image Segmentation using Deep Learning (U-Net, Mask R-CNN) – Video Processing and Action Recognition – 3D Computer Vision – Face Detection and Recognition.			**CO4**
UNIT-V	**Advanced Topics and Applications**	**Periods:9**	
Explainable AI in Computer Vision – Vision Transformers (ViTs) – Augmented and Virtual Reality – Robotics and Autonomous Systems – Real-time Applications – Ethical Considerations and Bias in Computer Vision – Research Trends.			**CO5**

Lecture Periods:45	**Tutorial Periods:-**	**Practical Periods:-**	**TotalPeriods:45**

Text Books

1. Richard Szeliski, Computer Vision: Algorithms and Applications, 3rd ed., Springer, 2024.
2. R. C. Gonzalez, R. E. Woods, Digital Image Processing, 5th ed., Pearson, 2024.
3. Milan Sonka, Vaclav Hlavac, Roger Boyle “Image Processing, Analysis and Machine Vision”, Springer US,2013
4. E. R. Davies, Computer & Machine Vision, Fourth Edition, Academic Press, 2012

Reference Books

1. Adrian Rosebrock, Practical Python and OpenCV: An Introductory Guide to Computer Vision, 4th ed., 2023.
2. François Chollet, Deep Learning with Python, 2nd ed., Manning, 2021.
3. D. Forsyth, J. Ponce, Computer Vision - A Modern Approach, 3rd ed., Pearson, 2024.
4. D. Forsyth and J. Ponce, "Computer Vision - A modern approach" McGraw-Hill, 2012
5. Richard Szeliski, "Computer Vision: Algorithms and Applications", 2nd ed. 2020.

Web References

1. https://www.coursera.org/specializations/computer-vision
2. https://www.tensorflow.org/tutorials/images
3. https://www.pyimagesearch.com/ https://onlinecourses.nptel.ac.in/noc25_ee13/preview
4. https://www.youtube.com/watch?v=iXNsAYOTzgM&ab_channel=freeCodeCamp.org
5. https://www.youtube.com/watch?v=2FYm3GOonhk&ab_channel=Murtaza%27sWorkshopRoboticsandAI

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	2	3	3	2	-	-	-	-	-	-	2	2	2
2	2	3	3	3	2	1	-	-	-	-	-	-	2	2	1
3	2	3	3	2	1	-	-	-	-	-	-	-	2	2	1
4	2	2	3	2	3	2	-	-	-	-	-	-	2	3	1
5	3	2	2	3	3	1	-	-	-	-	-	-	2	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Artificial Intelligence and Data Science**	Programme: **B.Tech.**						
Semester	**VII**	Course Category Code: **PC**				End Semester Exam Type: **LE**		
Course Code	**U23ADP712**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**INTELLIGENT SYSTEMS AND CONTROL LABORATORY**	**0**	**0**	**2**	**1**	**50**	**50**	**100**
AI & DS								
Prerequisite	**Machine Intelligence**							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Implement fundamental AI and ML algorithms for controlling a system	**K3**
	CO2 Apply supervised and unsupervised learning techniques to solve real-world programs	**K3**
	CO3 Optimize deep learning models for improved performance and efficiency	**K4**
	CO4 Utilize natural language processing (NLP) tools for text analysis and language understanding	**K3**
	CO5 Implement and simulate intelligent robotic systems for automated decision-making	**K3**

List of Experiments

1. Develop a fuzzy logic controller for a simple dynamic system.
2. Train an artificial neural network (ANN) to approximate a nonlinear system
3. Design and analyze a Proportional-Integral-Derivative (PID) controller for a DC motor.
4. Implement an adaptive control system that adjusts parameters in real time.
5. Use a genetic algorithm to optimize PID parameters for a given system.
6. Develop a Q-learning algorithm for an autonomous agent in a simulated environment.
7. Implement MPC for trajectory optimization in robotic control.
8. Implement A* or Dijkstra's algorithm for robot navigation.
9. Use OpenCV and deep learning for real-time object detection in a robotic system.
10. Simulate swarm intelligence (e.g., ant colony or particle swarm optimization) for collaborative robotics.

Lecture Periods:	**Tutorial Periods:**	**Practical Periods: 30**	**Total Periods: 30**

Reference Books

1. M. Gopal, Intelligent Control Systems, 2st Edition, Wiley-Blackwell.2008.
2. Jerry M. Mendel, Fuzzy Control and Fuzzy Systems, 1st Edition, Prentice Hall ,2012
3. Ogata Katsuhiko, Modern Control Engineering. 5th Edition, Prentice Hall, 20210

Web References

1. https://onlinecourses.nptel.ac.in/noc25_ee89/preview
2. https://www.sc.iitb.ac.in/courses.html#602

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	2	2	2	-	-	-	-	-	-	-	2	3	3
2	2	3	3	2	2	-	-	-	-	-	-	-	3	3	3
3	2	2	3	2	2	-	-	-	-	-	-	-	2	3	3
4	3	2	2	2	3	-	-	-	-	-	-	-	3	3	3
5	2	3	2	2	3	-	-	-	-	-	-	-	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Artificial Intelligence and Data Science**	Name of the Programme: **B.Tech**						
Semester	**VII**	Course Category: **PC**			*End Semester Exam Type: **LE**			
Course Code	**U23ADP713**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**IOT SYSTEMS AND ANALYTICS LABORATORY**	**0**	**0**	**2**	**1**	**50**	**50**	**100**
AI&DS								

Prerequisite	Basic knowledge of electronics, programming (C/C++ for Arduino, Python for Raspberry Pi)	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Implement the fundamentals of the Internet of Things (IoT) and its hardware and software components in a simple application	**K3**
	CO2 Interface I/O devices, sensors, and communication modules with microcontrollers and microprocessors.	**K3**
	CO3 Implement wireless communication between IoT devices for data exchange.	**K3**
	CO4 Utilize cloud platforms to upload, retrieve, and analyze sensor data	**K3**
	CO5 Develop an IoT-based real-time system integrating devices, gateways, and data management techniques.	**K4**

List of Experiments

1. Introduction to Arduino platform and programming
2. Interfacing of temperature sensor LM35 with Arduino.
3. Interfacing of the Active Buzzer with Arduino
4. Building Intrusion Detection System with Arduino and Ultrasonic Sensor.
5. Interfacing Arduino to Bluetooth Module.
6. Introduction to Raspberry PI platform and python programming
7. Interfacing sensors to Raspberry PI.
8. Communicate between Arduino and Raspberry PI using any wireless medium
9. Interface on Raspberry Pi to retrieve temperature and humidity data from thingspeak cloud.
10. Design a real time IOT based system.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

References Books

1. Shahidul Islam Khan, Internet of Things (IoT): Concepts and Applications, CRC Press, 2023.
2. Rajiv Pandey, Munesh C. Trivedi, Vishnu Swaroop, Internet of Things: Architecture, Implementation, and Security, Springer, 2022.
3. Peter Waher, Learning Internet of Things, 2nd Edition, Packt Publishing, 2021.
4. Donald Norris, The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi, and BeagleBone Black, 2nd Edition, McGraw-Hill, 2020.Jeremy Blum, Exploring Arduino: Tools and Techniques for Engineering Wizardry, 2nd Edition, Addison-Wesley, 2019.
5. Simon Monk, Raspberry Pi Cookbook, 3rd Edition, O'Reilly Media, 2019.
6. Peter Waher, Mastering IoT with Arduino and Raspberry Pi, Packt Publishing, 2018.

Web References

1. https://www.arduino.cc/en/Guide/Introduction
2. https://tutorials-raspberrypi.com/connect-and-control-raspberry-pi-sensors/
3. https://www.mathworks.com/help/thingspeak/retrieve-data-from-channel-feed.html

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	2	2	-	-	-	-	-	-	-	2	3	3
2	3	2	2	2	2	-	-	-	-	-	-	-	2	3	3
3	3	3	3	2	3	-	-	-	-	-	-	-	3	3	3
4	3	3	3	2	3	-	-	-	-	-	-	-	3	3	3
5	3	3	3	2	3	-	-	-	-	-	-	-	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

Department	**Artificial Intelligence and Data Science**	Programme: **B.Tech.**						
Semester	**VII**	Course Category Code: **PE**			End Semester Exam Type: **TE**			
Course Code	**U23ADE714**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**AI ETHICS**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
AI&DS								
Prerequisite	Basic understanding of AI, Basic knowledge of Ethics, Computer science and Engineering Fundamental, data science or data analytics knowledge, Social implication Knowledge							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Explain the ethical considerations in Artificial Intelligence (AI)	**K2**
	CO2 Differentiate between human intelligence and machine intelligence.	**K2**
	CO3 Describe privacy concerns related to AI applications	**K2**
	CO4 Identify and explain bias in AI decision-making	**K2**
	CO5 Apply ethical principles to assess the impact of AI in real-life scenarios.	**K3**

UNIT- I	**Introduction**	**Periods: 9**	
The AI Hype and Fears – The Real and Pervasive Impact of AI – Ethical and Societal Problems – Superintelligence and Transhumanism – Frankenstein's New Monster – Transcendence and the AI Apocalypse			**CO1**
UNIT- II	**AI and Humans**	**Periods:9**	
Fundamental Differences between Humans and Machines – Modernity, Posthumanism, and Postphenomenology – Questioning the Moral Status of AI – Moral Agency – Moral Patiency – Toward More Practical Ethical Issues			**CO2**
UNIT- III	**Privacy and the Other Usual Suspects**	**Periods:9**	
Privacy and Data Protection – Manipulation, Exploitation, and Vulnerable Users – Negative use of AI – Safety and Security – Moral Responsibility – Transparency and Explainability			**CO3**
UNIT- IV	**Bias and Challenges of Policymakers**	**Periods:9**	
Bias, Challenges, and Solutions – Future of Work and Life – Key Questions for Policymakers – Ethical Principles and Justifications – Technological Solutions and Implementation – Proactive and Practice-Oriented Ethics – Positive Ethics – Interdisciplinarity and Transdisciplinarity – Risk of AI Winter and Unregulated AI Use – Solutions for Bias Mitigation, Ethical AI Governance, and Sustainable AI Policies.			**CO4**
UNIT- V	**AI in Everyday Life**	**Periods:9**	
The Integration of AI in Daily Activities - AI in Healthcare, Education, and Entertainment - The Role of AI in Consumer Behavior and Personalization - Ethical Concerns in Everyday AI Applications-The Future of AI in Personal Life and Society.			**CO5**

Lecture Periods:45	**Tutorial Periods:-**	**Practical Periods:-**	**TotalPeriods:45**

Text Books

1. Genesis: Artificial Intelligence, Hope, and the Human Spirit," Published by Penguin Press, 2024.
2. The Alignment Problem: Machine Learning and Human Values," Published by W.W. Norton & Company, October 6, 2020.
3. Mark Coeckelbergh, "AI Ethics", MIT Press, 2020.
4. S. Matthew Liao, "Ethics of Artificial Intelligence", Oxford University Press, 2020.
5. Frank Pasquale, Markus Dirk Dubber, Sunit Das, "The Oxford Handbook of Ethics of AI", Oxford University Press, 2020

Reference Books

1. Paula Boddington, “Towards a Code of Ethics for Artificial Intelligence”, Springer International Publishing, 2017.
2. Abhivardhan, "Artificial Intelligence Ethics and International Law", BPB Publications, 2019
3. Saswat Sarangi, Pankaj Sharma, “Artificial Intelligence: Evolution, Ethics and Public Policy”, Taylor & Francis, 2018
4. Keith Frankish, William M. Ramsey, “The Cambridge Handbook of Artificial Intelligence”, Cambridge University Press, 2014
5. Ingrid Vasiliu-Feltes, Jane Thomason, “Applied Ethics in a Digital World”, IGI Global, 2021

Web References

1. https://www.techtarget.com/whatis/definition/AI-code-of-ethics
2. https://www.onespan.com/blog/trustworthy-ai-why-we-need-it-and-how-achieve-it
3. www. tutorialspoint.com

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	-	-	-	-	-	1	1	1	2	1	-
2	3	2	1	1	-	-	-	-	-	1	1	1	2	1	-
3	3	2	2	1	-	-	-	-	-	1	1	1	2	1	-
4	3	2	2	1	-	-	-	-	-	1	1	1	2	1	-
5	3	2	3	1	-	-	-	-	-	1	1	1	2	1	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Artificial Intelligence and Data Science**	**B.Tech**						
Semester	**VIII**	Course Category: **PE**			*End Semester Exam Type: **TE**			
Course Code	**U23ADE715**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**PROMPT ENGINEERING**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
AI & DS								
Prerequisite	Strong understanding of Natural Language Processing, familiarity with Machine Learning models and techniques.							

Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Interpret the basic concepts and importance of prompt engineering, including various types of prompts and their applications.	**K2**
	CO2	Apply skills in designing effective prompts with clear structure and contextual relevance, avoiding common pitfalls.	**K3**
	CO3	Apply various metrics and feedback, and improve prompt effectiveness.	**K3**
	CO4	Apply advanced techniques in prompt engineering for handling different types of prompts	**K3**
	CO5	Apply prompt engineering concepts in various for building interactive systems.	**K3**

UNIT-I	**Introduction to Prompt Engineering**	**Periods: 9**
Introduction – Importance and Applications – Types of Prompts – Components of Effective Prompts – Challenges and Solutions – Case Studies in Prompt Engineering.		**CO1**
UNIT-II	**Designing Effective Prompts**	**Periods: 9**
Principles of Prompt Design – Structuring Prompts – Contextual Relevance – Clarity and Precision – Examples and Best Practices – Common Pitfalls and How to Avoid Them.		**CO2**
UNIT-III	**Evaluating Prompt Performance**	**Periods: 9**
Metrics for Prompt Effectiveness – User Feedback and Iteration – Testing and Validation Methods – Analyzing User Engagement – Improving Prompt Responsiveness – Tools for Evaluation and Optimization.		**CO3**
UNIT-IV	**Advanced Techniques in Prompt Engineering**	**Periods: 9**
Adaptive Prompting Techniques – Leveraging Machine Learning for Prompt Improvement – Multi-turn Prompts and Conversations – Personalization and Customization – Integrating Prompts with AI Systems – Ethical Considerations and Bias Mitigation.		**CO4**
UNIT-V	**Case Studies and Applications**	**Periods: 9**
Industry-Specific Prompt Engineering Applications – Healthcare, Finance, Education, and Customer Service – Building Interactive Systems with Prompts – Real-world Case Studies and Success Stories – Future Trends in Prompt Engineering – Capstone Project: Designing a Prompt System.		**CO5**

LecturePeriods:45	**TutorialPeriods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. John D. Kelleher, Brian Mac Namee, and Aoife D'Arcy, "Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples, and Case Studies," MIT Press, 2015.
2. Christopher Manning, Hinrich Schütze, and Prabhakar Raghavan,"Introduction to Information Retrieval," Cambridge University Press, 2008.
3. Kathleen R. McKeown,"Introduction to Natural Language Processing," McGraw-Hill, 1992.
4. Jacob Andreas, "Task-Oriented Dialogue Systems for Conversational AI," Springer, 2020.

Reference Books
1. Daniel Jurafsky and James H. Martin,"Speech and Language Processing," 3rd Edition, Pearson, 2021. 2. Yoav Goldberg,"Neural Network Methods for Natural Language Processing," Morgan & Claypool Publishers, 2017. 3. Christopher D. Manning and Hinrich Schütze, "Foundations of Statistical Natural Language Processing," MIT Press, 1999. 4. Mike Lewis and Tom Kwiatkowski, "Advanced Methods for Natural Language Processing," Springer, 2022.
Web References
1. https://www.nltk.org/book/ 2. https://github.com/dennybritz/deeplearning-pytorch 3. https://towardsdatascience.com/prompt-engineering-7e1666f71e7f 4. https://github.com/f/awesome-chatgpt-prompts 5. https://ai.googleblog.com/search/label/Dialog%20Systems

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	3	-	-	-	-	-	-	-	3	3	2
2	3	3	3	3	1	-	-	-	-	-	-	-	3	3	2
3	3	3	3	3	1	-	-	-	-	-	-	-	3	3	3
4	3	3	3	3	1	-	-	-	-	-	-	-	3	3	3
5	3	3	3	3	1	-	-	-	-	-	-	-	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

*

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Artificial Intelligence and Data Science**	Programme: **B.Tech.**						
Semester	**VII**	Course Category Code: **PE**			End Semester Exam Type: **TE**			
Course Code	**U23ADE716**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**ETHICS IN DATA SCIENCE**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
AI & DS								
Prerequisite	Data Science							

Course Outcomes		On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1	Describe the fundamental principles of ethics in data science, recognizing the importance of ethical decision-making in the field.	**K2**
	CO2	Apply techniques to protect data privacy in various contexts and analyze privacy concerns and data protection laws	**K3**
	CO3	Identify biases in data and algorithms, developing strategies to ensure fairness and mitigate bias in data science projects.	**K3**
	CO4	Evaluate the roles of transparency and accountability in algorithmic decision-making, advocating for explainable AI and interpretability of models.	**K2**
	CO5	Apply ethical guidelines in data science projects, demonstrating an ability to navigate ethical challenges in innovation and technology development.	**K3**

UNIT – I	**Introduction To Ethics in Data Science**	**Periods:9**	
Fundamental principles of ethics - Importance of ethics in data science - Ethical decision-making frameworks - Case studies on ethical dilemmas in data science.			**CO1**
UNIT – II	**Privacy and Data Protection**	**Periods:9**	
Concepts of privacy in the digital age - Data protection laws and regulations - Techniques for protecting privacy in data collection and analysis - Challenges of anonymization and data masking.			**CO2**
UNIT – III	**Bias and Fairness**	**Periods:9**	
Understanding bias in data and algorithms - Measures to ensure fairness in machine learning models - Impact of bias on societal and individual levels - Strategies for mitigating bias in data science projects.			**CO3**
UNIT – IV	**Transparency and Accountability**	**Periods:9**	
The role of transparency in data science - Explainable AI and interpretability of models - Accountability in algorithmic decision making - Ethical considerations in AI deployments.			**CO4**
UNIT – V	**Ethics in Practice**	**Periods:9**	
Ethical guidelines for data scientists - Developing ethical data science projects - Role of ethics in innovation and technology development - Future challenges in ethics and data science.			**CO5**

Lecture Periods:45	**Tutorial Periods:-**	**Practical Periods:-**	**TotalPeriods:45**

Text Books

1. Mike Loukides, Ethics and Data Science, O'Reilly Media, 2018.
2. Gry Hasselbalch, Pernille Tranberg, Data Ethics: The New Competitive Advantage, DataEthics.eu, 2019.
3. Michael Kearns, Aaron Roth, The Ethical Algorithm, Oxford University Press, 2019.
4. Kirsten Martin, Ethics of Data and Analytics: Concepts and Cases, First Edition, Taylor & Francis, 2022.
5. Anne L. Washington, Ethical Data Science Prediction in the Public Interest, Oxford, 2023

Reference Books

1. Safiya Umoja Noble, Algorithms of Oppression, New York University Press, 2018.
2. Linnet Taylor, Gargi Sharma, Aaron Martin, Shazade Jameson (Eds.), Data Justice and COVID-19: Global Perspectives, Routledge, 2021.
3. Julia Lane, Victoria Stodden, Stefan Bender, Helen Nissenbaum (Eds.), Privacy, Big Data, and the Public Good: Frameworks for Engagement, Cambridge University Press, 2014.

Web References

1. www.datasociety.net
2. www.futureofprivacy.org
3. http:// www. fairnessandaccuracy.org
4. www. aiethicslab.com

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	-	-	-	-	-	-	-	1	2	1	1
2	3	2	1	1	-	-	-	-	-	-	-	1	2	1	1
3	2	2	-	-	-	1	-	-	-	-	-	1	2	1	1
4	3	2	1	1	-	1	-	-	-	1	-	1	2	1	1
5	3	2	1	1	-	1	-	-	-	1	-	1	2	1	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Artificial Intelligence and Data Science**	Programme: **B.Tech.**						
Semester	**VII**	Course Category: **PE**				End Semester Exam Type:**TE**		
Course Code	**U23ADE717**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**CLOUD BASED MACHINE LEARNING PLATFORMS**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
AI & DS								
Prerequisite	Programming Skills (Python), Basics of Machine Learning, Cloud Computing basics							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Describe the basics of cloud computing and its role in machine learning.	**K2**
	CO2 Describe the fundamental cloud-based machine learning platforms and tools.	**K2**
	CO3 Apply cloud-based machine learning models using AWS, Google Cloud, and Azure.	**K3**
	CO4 Deploy and manage machine learning models on cloud platforms.	**K3**
	CO5 Implement a cloud-based ML project with real-world applications.	**K3**

UNIT-I	**Introduction to Cloud and Machine Learning**	**Periods: 9**
Basics of Cloud Computing – Why use Cloud for Machine Learning? – Introduction to Cloud Services (AWS, Google Cloud, Azure) – Basics of Machine Learning (Supervised, Unsupervised, Deep Learning) – Setting up a Cloud ML environment.		**CO1**
UNIT-II	**Building Machine Learning Models on Cloud**	**Periods: 9**
Uploading and Managing Data on the Cloud – Training Simple ML Models using Cloud Tools (Google Colab, AWS SageMaker, Azure ML) – AutoML: Training Models Without Coding – Understanding Cloud Storage and Databases.		**CO2**
UNIT-III	**Cloud-Based ML Platforms**	**Periods: 9**
Overview of AWS, Google Cloud, and Azure ML Services – Hands-on with Google Vertex AI and AWS SageMaker – Running Jupyter Notebooks on the Cloud – Introduction to Cloud AI APIs (Vision, Speech, Translation).		**CO3**
UNIT-IV	**Deploying and Using ML Models on Cloud**	**Periods: 9**
Model Deployment – Deploying ML Models on Google Cloud and AWS – Using Pre-trained AI Models – Creating a Simple Web App for ML Predictions – Basics of Cloud Security for ML Applications.		**CO4**
UNIT-V	**Mini Project: Cloud ML Application**	**Periods: 9**
Choosing a Simple ML Problem – Building and Training a Model on Cloud – Deploying the Model as a Web Application – Testing and Improving the Model – Real-world Case Studies of Cloud ML Applications.		**CO5**

Lecture Periods: 45	**Tutorial Periods:**	**Practical Periods:**	**Total Periods: 45**

Textbooks

1. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow, O'Reilly Media, 3rd Edition, 2022.
2. Luis Pedro Coelho, Building Machine Learning Systems with Python, Packt Publishing, 2nd Edition, 2013.
3. Valliappa Lakshmanan, Martin Görner, Ryan Gillard, Machine Learning Design Patterns: Solutions to Common Challenges in Data Preparation, Model Building, and MLOps, O'Reilly Media, 1st Edition, 2020.
4. Mark C. Chu-Carroll, Cloud Native Data Center Networking: Architecture, Protocols, and Tools for a New Age of Application Delivery, O'Reilly Media, 2019.

Reference Books

1. Jake VanderPlas, Machine Learning with Google Cloud Platform, O'Reilly Media, 2nd Edition, 2022.
2. Giuseppe Bonaccorso, Machine Learning Algorithms, Packt Publishing, 2nd Edition, 2020.
3. Nishant Shukla, Machine Learning with TensorFlow, Manning Publications, 2nd Edition, 2018.
4. Emmanuel Raj, Applied Machine Learning and AI for Engineers, Apress, 2021.
5. S. Girija, R. Arvind, Cloud Computing for Machine Learning and Cognitive Applications, CRC Press, 2020.

Web References
1.https://cloud.google.com/ai-platform – Google Cloud AI Platform Documentation
2. https://aws.amazon.com/machine-learning – AWS Machine Learning Services
3.https://azure.microsoft.com/en-us/products/machine-learning – Microsoft Azure Machine Learning
4.https://www.tensorflow.org/cloud – TensorFlow Cloud Guide

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	1	2	-	-	-	-	-	-	-	3	2	1
2	2	3	2	2	3	-	-	-	-	-	-	-	3	3	2
3	3	3	3	1	2	-	-	-	-	-	-	-	3	2	1
4	1	2	1	3	3	-	-	-	-	-	-	-	2	2	2
5	2	1	2	3	2	-	-	-	-	-	-	-	1	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

*Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Artificial Intelligence and Data Science**	Programme: **B.Tech.**						
Semester	**VI**	Course Category Code: **PE**			End Semester Exam Type: **TE**			
Course Code	**U23ADE718**	Periods/Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**QUANTUM AI**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
AI & DS								
Prerequisite	Artificial Intelligence, Quantum Mechanics							

Course Outcomes			BT Mapping (Highest Level)
	On completion of the course, the students will be able to		
	CO1	Comprehend key concepts of quantum computing.	**K2**
	CO2	Explain quantum algorithms and apply their efficiency in comparison to classical algorithms	**K2, K3**
	CO3	Apply quantum computing to accelerate machine learning tasks	**K3**
	CO4	Apply quantum computing tools like Qiskit and explore practical applications of Quantum AI in real-world scenarios.	**K3**
	CO5	Apply quantum AI concepts to address decoherence, hybrid systems, optimization, and future research trends	**K3**

UNIT-I	**Introduction to Quantum Computing**	**Periods: 9**	
Introduction to Quantum Computing, Quantum Mechanics Basics: Qubits, quantum states, quantum gates. Quantum Circuits: Building simple circuits, quantum measurement. Quantum Computers and Architectures: Gate-based models, quantum processors (D-Wave, IonQ), coherence time, and error correction.			**CO1**
UNIT-II	**Quantum Algorithms**	**Periods:9**	
Quantum vs. Classical Algorithms, Quantum Superposition and Interference in Algorithms. Quantum Search Algorithms: Grover's Algorithm, Quantum Fourier Transform (QFT), Shor's Algorithm. Variational Quantum Algorithms (VQA): Quantum variational circuits, Quantum Approximate Optimization Algorithm (QAOA), AI applications in optimization.			**CO2**
UNIT-III	**Quantum Machine Learning (QML)**	**Periods:9**	
Introduction to QML: Classical ML vs. Quantum ML, Quantum-enhanced learning models, Quantum Data Encoding. Quantum Neural Networks (QNN): Quantum perceptron, hybrid QNN architectures, applications in pattern recognition. Quantum Support Vector Machines (QSVM).			**CO3**
UNIT-IV	**Quantum AI Tools and Platforms**	**Periods:9**	
Introduction to Quantum Development Platforms: Overview of Qiskit and Cirq, Building Quantum Circuits in Qiskit, Implementing Quantum Teleportation. Quantum AI Use Cases: Applications in finance and healthcare. Quantum Noise and Error Mitigation: Decoherence and error correction techniques.			**CO4**
UNIT-V	**Challenges and Future Directions in Quantum AI**	**Periods:9**	
Current Limitations: Quantum decoherence, scalability issues. Hybrid Quantum-Classical Systems: Combining classical and quantum AI. Quantum AI for Optimization Problems: Applications in logistics and supply chain. Future Directions: Research trends in Quantum AI.			**CO5**

Lecture Periods:45	**Tutorial Periods:-**	**Practical Periods:-**	**TotalPeriods:45**

Text Books

1. Jack D. Hidary,"Quantum Computing: An Applied Approach", Springer, 2nd Edition, 2021
2. Michael A. Nielsen, Isaac L. Chuang,"Quantum Computation and Quantum Information", Cambridge University Press, 10th Anniversary Edition,2010
3. Phillip Kaye, Raymond Laflamme, Michele Mosca,"An Introduction to Quantum Computing", Oxford University Press, 2007
4. Peter Wittek," Quantum Machine Learning: What Quantum Computing Means to Data Mining", Academic Press,1st Edition, 2014.

Reference Books

1. Hassi Norlén et al.,"Learning Quantum Computation Using Qiskit",IBM Quantum Experience, 2019,
2. Eleanor G. Rieffel, Wolfgang H. Polak, "Quantum Computing: A Gentle Introduction",MIT Press, 2014
3. Jack D. Hidary,"Quantum Computing: An Applied Approach",Springer (1st Edition), 2019
4. Eric R. Johnston, Nic Harrigan, Mercedes Gimeno-Segovia,"Programming Quantum Computers: Essential Algorithms and Code Samples", O'Reilly Media, 2019.
5. Elias F. Combarro, Leandro A. Fernandez, "Quantum Machine Learning",Springer, 2023.

Cos/Pos/PSOs Mapping

Cos	Program Outcomes (Pos)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	2	3	3	2	-	-	-	-	-	-	2	2	2
2	2	3	3	3	2	1	-	-	-	-	-	-	2	2	1
3	2	3	3	2	1	-	-	-	-	-	-	-	2	2	1
4	2	2	3	2	3	2	-	-	-	-	-	-	2	3	1
5	3	2	2	3	3	1	-	-	-	-	-	-	2	2	2

Correlation Level: 1 – Low, 2 – Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	5	5	5	5	5	75	100

***** Application oriented / Problem solving / Design / Analytical in content beyond the syllabus

Department	**Artificial Intelligence and Data Science**	**B.Tech**						
Semester	**VII**	Course Category Code: **PA**				End Semester Exam Type: **LE**		
Course Code	**U23ADW703**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**PROJECT PHASE-I**	**0**	**0**	**4**	**2**	**50**	**50**	**100**
AI & DS								
Prerequisite	Artificial Intelligence, Machine Learning, Deep Learning, Programming in C, Python, Natural Language Processing							

Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Identify and define a real-world problem relevant to their field of study.	**K2**
	CO2	Formulate clear problem objectives and project requirements.	**K2**
	CO3	Apply appropriate concepts and techniques to design a preliminary solution.	**K3**
	CO4	Develop an initial model or prototype using selected tools and technologies.	**K4**
	CO5	Document and present the project proposal and preliminary findings effectively.	**K6**

The project work involves developing a solution to a real-world problem using emerging technologies and engineering principles. Students will work in teams to analyze, design, develop, and evaluate a functional prototype or software application. The project must demonstrate the application of theoretical knowledge to practical challenges, integrating concepts from the core areas of the curriculum.

The project spans an academic term and includes multiple reviews to assess progress, quality, and implementation. Students are expected to conduct literature reviews, define clear objectives, apply suitable methodologies, perform data collection and analysis, and present their findings in a comprehensive report.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

COs/POs/PSOs Mapping

COs	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
1	3	3	-	2	-	-	-	-	-	2	-	2	3	3	-
2	3	3	-	2	-	-	-	-	-	-	-	2	3	3	-
3	3	3	3	-	3	-	-	-	2	2	-	-	3	3	-
4	3	-	3	2	3	-	-	-	2	2	-	-	3	3	3
5	-	-	-	-	2	-	-	-	3	3	3	2	-	-	3

Correlation Level: 1 – Low, 2 – Medium, 3 – High

Evaluation Method

Assessment	CAM				ESE			Total
	Review 1		Review 2		Report	Presentation and Viva	Demo	
	Presentation and Viva	Supervisor	Presentation and Viva	Supervisor				
	15	10	15	10	15	20	15	100
CAM/ESE Marks	CAM Marks=50				ESE Marks =50			

Department	**Artificial Intelligence and Data Science**	**B.Tech**						
Semester	**VII**	Course Category Code: **PA**				End Semester Exam Type: **-**		
Course Code	**U23ADW704**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**INTERNSHIP / IN PLANT TRAINING**	**0**	**0**	**2**	**1**	**100**	**-**	**100**
AI & DS								

The student is required to undergo 'internship' in industry / research laboratory / higher learning institution for a minimum period of 4 weeks during vacations and shall complete the internship before the completion of 7th semester.

i) The internship carries 1 credit.

ii) Each spell of internship shall be for a period not less than 2 weeks.

iii) The main purpose of internship is to enhance the general professional outlook and capability of the student to advance his/her chances of improving the career opportunities. The student should get prior approval from the Head of the Department and Training and Placement cell at the college before undertaking the internship and submit a detailed report after completion for the purpose of assessment. The internship marks will be given in 7th semester mark sheet.

iv) The project work carried out in industry in the eighth semester is not to be treated as internship.

Evaluation Methods

Assessment	**Continuous Assessment Marks (CAM)**		**Total Marks**
	Report	**Presentation**	
Marks	50	50	100

Annexure-III

Department	**Artificial Intelligence and Data Science**	Name of the Programme: **B.Tech / (Honour / Minor) – Artificial Intelligence and Machine Learning**						
Semester	**IV**	Course Category: **PC**			*End Semester Exam Type: **TE**			
Course Code	**U23MXT401**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**PARALLEL PROGRAMMING AND HIGH PERFORMANCE COMPUTING**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Common to all Branches except AI & DS								
Prerequisite	Basics of Programming (C, C++), Linux Operating Systems							

Course Outcomes		On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1	Apply MPI framework for passing message parallelly across processes	**K3**
	CO2	Apply Pthreads for creating shared memory parallel programs	**K3**
	CO3	Apply OpenMP paradigms to create shared memory parallel programs	**K3**
	CO4	Apply either OpenMP, MPI for parallel algorithms for searching and sorting	**K3**
	CO5	Apply CUDA programming for configuring hardware and transfer data across GPU and CPU	**K3**

UNIT – I	**Message Passing Paradigm**	**Periods:9**	
Basic MPI programming – MPI_Init and MPI_Finalize – MPI communicators – SPMD programs – Message passing – MPI_Send and MPI_Recv – Message matching – MPI I/O – Parallel I/O – Collective communication – MPI_Reduce - MPI_Allreduce, broadcast, scatter, gather, allgather – Derived types – Remote Memory Access – Performance evaluation of MPI programs			**CO1**
UNIT – II	**Shared Memory Paradigm: Pthreads**	**Periods: 9**	
Basics of Pthreads – Thread synchronization – Critical sections – Busy waiting – Mutex – Semaphores – Barriers and condition variables – Read write locks with examples - Caches, cache coherence and false sharing – Pthreads case study			**CO2**
UNIT – III	**Shared Memory Paradigm: OpenMP**	**Periods: 9**	
Basic OpenMP constructs – scope of variables – Reduction clause – Parallel For directive – loops in OpenMP – Scheduling loops – Synchronization in OpenMP – Case Study: Producer-Consumer problem – Cache issues – Threads safety in OpenMP – OpenMP best practices			**CO3**
UNIT – IV	**Parallel Algorithms**	**Periods: 9**	
Elementary parallel algorithms: Reduction – Broadcast - Prefix sum. Matrix multiplication: Algorithm for processor array - Algorithm for multiprocessors and multicomputer. Sorting: Odd even transposition sort - Bitonic merge - Quick sort algorithms.			**CO4**
UNIT – V	**GPU Programming with CUDA**	**Periods: 9**	
GPUs and GPGPU - GPU architectures - Heterogeneous computing – Simple CUDA program - Threads, blocks, and grids - Vector addition – CUDA trapezoidal rule – improvements - Implementation of trapezoidal rule with warp Size thread blocks – block with more than one warp			**CO5**

Lecture Periods:45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Textbooks

1. Peter S. Pacheco, Matthew Malensek, “An introduction to parallel programming”, Second edition, Morgan Kaufmann, 2021
2. Niranjan N. Chiplunkar, Raju K, “Introduction to Parallel Computing”, Wiley, 2021.
3. Michael J. Quinn, “Parallel Computing: Theory & Practice”, Tata McGraw Hill, Second edition, Reprint 2017

References

1. A. Munshi, B. Gaster, T. G. Mattson, J. Fung, and D. Ginsburg, “OpenCL programming guide”, Addison Wesley, 2011
2. M. J. Quinn, “Parallel programming in C with MPI and OpenMP”, Tata McGraw Hill, 2011.
3. Rob Farber, “CUDA application design and development”, Morgan Haufmann, 2011

Web References

1. http://condor.cc.ku.edu/~grobe/docs/intro-MPI-C.shtml
2. http://www.hpcc.unn.ru/mskurs/ENG/DOC/pp09.pdf
3. https://www.cs.cmu.edu/afs/cs/academic/class/15492-f07/www/pthreads.html
4. https://www.openmp.org/
5. https://developer.nvidia.com/blog/even-easier-introduction-cuda/

POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	3	-	-	-	-	-	-	-	3	3	2
2	3	3	3	3	1	-	-	-	-	-	-	-	3	3	2
3	3	3	3	3	1	-	-	-	-	-	-	-	3	3	3
4	3	3	3	3	1	-	-	-	-	-	-	-	3	3	3
5	3	3	3	3	1	-	-	-	-	-	-	-	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks##	Total Marks
	CAT 1	CAT 2	Model Exam##	Assignment#	Attendance##		
Test Marks	50*	50*	75*	20*	5	75	
Weightage for CAM	5	5	5	5	5	75	
CAM / ESE Marks	CAM Marks = 25					ESE Marks = 75	100

#Open Book Analytical Exam/Analyse Real world problems and propose solutions/ Tool or Subject Proficiency Analysis –
Test the Students skill by giving individual task/ Paper Presentation/Micro Project Presentation/Idea Presentation for the Societal Problem;
Distribution of Marks for Attendance, the Question Paper Pattern for Model and ESE are same as given in
B. Tech. Regulations R2023 for Theory Courses.

Department	**Artificial Intelligence and Data Science**	Name of the Programme: **B.Tech / (Honour / Minor) – Artificial Intelligence and Machine Learning**						
Semester	**V**	Course Category: **PC**			*End Semester Exam Type: **TE**			
Course Code	**U23MXB501**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**ADVANCED DEEP LEARNING**	**3**	**0**	**2**	**4**	**50**	**50**	**100**
Common to all Branches except AI & DS								
Prerequisite	Solid understanding of basic machine learning concepts and neural network architectures, Proficiency in Python Programming							

Course Outcomes		**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1	Apply different Convolutional Neural Network for processing images effectively, and to apply generative models for image synthesis, style transfer, and data augmentation tasks	**K3**
	CO2	Apply advanced sequence models for NLP tasks like text generation, summarization, and multimodal learning and apply reinforcement learning concepts in AI, robotics, and autonomous systems.	**K3**
	CO3	Apply techniques such as neural architecture search and meta-learning to optimize models for edge devices and energy-efficient AI systems.	**K3**
	CO4	Implement practical solutions for real-world problems using deep learning and RL	**K3**
	CO5	Implement practical solutions for real-world problems using optimization Tools	**K3**

UNIT – I	**Artificial Neural Networks and Convolution Neural Networks**	**Periods:10**	
Basics of Neural Networks: Perceptron, activation functions (Sigmoid, ReLU, Softmax), backpropagation, loss functions, Convolutional Neural Networks (CNNs): Convolution, pooling, architectures of VGG, ResNet, DenseNet, Inception, and their architectures. Transfer Learning: EfficientNet: Pre-trained models, fine-tuning, domain adaptation.			**CO1**
UNIT – II	**Sequence Models, NLP**	**Periods:10**	
Recurrent Neural Networks (RNNs): Advanced concepts in LSTMs, GRUs, and bidirectional RNNs. Transformers: Architecture, self-attention mechanism, positional encoding. BERT, GPT, T5 Models: Pre-training, fine-tuning, masked language models. Multimodal Learning: Combining text, images, and audio for richer representations.			**CO2**
UNIT – III	**Neural Architecture Search and Model Optimization**	**Periods:10**	
Neural Architecture Search (NAS): ENAS, AutoML, Model Pruning and Quantization, Knowledge Distillation: Transfer of knowledge from large to smaller models, Meta-Learning: Few-shot learning, model adaptation, Applications: Optimizing models for edge devices, mobile AI, energy-efficient deep learning			**CO3**
UNIT – IV	**Laboratory Exercises**	**Periods:15**	
• Implement CNNs for image classification and object detection. • Train and evaluate GANs for image synthesis and style transfer. • Apply transfer learning with pre-trained models. • Build and train RNNs and Transformers for NLP tasks. • Multimodal Sentiment Analysis Using Text and Audio			**CO4**
UNIT – V	**Laboratory Exercises**	**Periods:15**	
• Experiment with NAS tools to design optimized architectures. • Apply pruning, quantization, and knowledge distillation. • Develop models for mobile AI applications. • Implement a NAS algorithm for image classification. • Apply meta-learning techniques for few-shot learning.			**CO5**

Lecture Periods:30	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods:60**

Textbooks

1. Ian Goodfellow, Yoshua Bengio, and Aaron Courville, "Deep Learning", MIT Press, 1st Edition, 2016.
2. Charu C. Aggarwal, "Neural Networks and Deep Learning", Springer, 2018.
3. Denis Rothman, "Transformers for Natural Language Processing",Packt Publishing, 1st Edition,2021.
4. Frank Hutter, Lars Kotthoff, and Joaquin Vanschoren, "AutoML: Methods, Systems, Challenges", Springer Cham, 1st Edition, 2021.

References

1. Cosma Rohilla Shalizi, “Advanced Data Analysis from an Elementary Point of View”, Cambridge University Press, 2015.
2. Deng & Yu, “Deep Learning: Methods and Applications”, Now Publishers, 2014.
3. Michael Nielsen, “Neural Networks and Deep Learning”, Determination Press, 2015.
4. Josh Patterson, Adam Gibson, “Deep Learning A Practitioner's Approach”, O'Reilly Media, 2017.
5. Nikhil Buduma, “Fundamentals of Deep Learning”, O’Reilly, 2017.

Web References

1. https://nptel.ac.in/courses/106/106/106106184/
2. http://deeplearning.net/Dj
3. https://www.guru99.com/deep-learning-tutorial.html
4. https://www.coursera.org/specializations/deep-learning
5. http://neuralnetworksanddeeplearning.com

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	3	-	-	-	-	-	-	-	3	3	2
2	3	3	3	3	1	-	-	-	-	-	-	-	3	3	2
3	3	3	3	3	1	-	-	-	-	-	-	-	3	3	3
4	3	3	3	3	1	-	-	-	-	-	-	-	3	3	3
5	3	3	3	3	1	-	-	-	-	-	-	-	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM) – Maximum 50 Marks									End Semester Examination (ESE) Marks (Theory)	Total Marks (CAM+ ESE)
	Continuous Assessment (Theory)					Continuous Assessment (Practical)					
	CAT 1	CAT 2	Model ##	Attendance##	Total	Conduction of Practical	Report	Viva	Total	End Semester Examination (ESE) Marks (Practical)		
Marks	50	50	75	5		15	10	5	30*	30	75 *(To be weighted for* 50 Marks)	
Weightage of CAM	2.5	2.5	2.5	2.5	**10**	**To be weighted for 10 Marks*			**10**	**30**		
CAM / ESE Marks	***CAM Marks =10+10+30=50***										***ESE Marks = 50***	**100**

Distribution of Marks for Attendance, the Question Paper Pattern for Model and ESE are same as given in B. Tech. Regulations R2023 for Theory cum practical Courses

Department	**Artificial Intelligence and Data Science**	Name of the Programme: **B.Tech / (Honour / Minor) – Artificial Intelligence and Machine Learning**						
Semester	**VI**	Course Category: **PC**			*End Semester Exam Type: **TE**			
Course Code	**U23MXB602**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**REINFORCEMENT LEARNING**	**3**	**0**	**2**	**4**	**50**	**50**	**100**

Common to all Branches except AI & DS

Prerequisite	Machine Learning, Programming in Python, knowledge of Probability and statistics	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Apply reinforcement learning algorithms to real-world problem	**K3**
	CO2 Apply advanced techniques for building models	**K3**
	CO3 Apply, train, and evaluate RL models	**K3**
	CO4 Implement practical solutions for sequential decision-making problems	**K3**
	CO5 Implement practical solutions using advanced techniques	**K3**

UNIT-I	**Foundations of Reinforcement Learning**	**Periods: 10**	
RL Framework, Intelligent Agents, Problem-Solving, Searching, Probability Axioms, Random Variables, PMF, PDF, Agent-Environment Interface, Goals, Rewards, Returns, Policies, Value Function, Notation for episodic and continuing tasks.			**CO1**
UNIT-II	**Dynamic Programming and Monte Carlo Methods**	**Periods: 10**	
Policy Evaluation, Policy Improvement, Policy Iteration, Value Iteration, Monte Carlo Methods: Prediction, Estimation of Action Values, Control with and without Exploring Starts, Model-Free Prediction and Control: Monte Carlo Control in unknown environments.			**CO2**
UNIT-III	**Temporal-Difference Learning and Advanced Techniques**	**Periods: 10**	
Temporal-Difference (TD) Learning: TD Prediction, TD (0) Method, Sarsa (on-policy), Q-learning (off-policy), Eligibility Traces: Forward and Backward View, Planning and Learning: Dyna-Q, Prioritized Sweeping, Real-time DP, Monte Carlo Tree Search (MCTS): Planning at Decision Time.			**CO3**
UNIT-IV	**Laboratory Exercises**	**Periods: 15**	
• Implement a basic RL environment with OpenAI Gym. • Develop a simple agent for a grid-world environment. • Analyze agent behavior with different reward settings. • Build and analyze MDP models. • Implement Monte Carlo Prediction and Control			**CO4**
UNIT-V	**Laboratory Exercises**	**Periods: 15**	
• Develop Q-learning agents for maze navigation. • Experiment with policy evaluation and improvement • Develop a TD learning agent. • Implement Monte Carlo Tree Search for game playing. • Explore Dyna-Q with planning and learning components			**CO5**

LecturePeriods:30	**TutorialPeriods:-**	**PracticalPeriods: 30**	**Total Periods:60**

Text Books

1. Russell, S. J., & Norvig, P. “Artificial Intelligence: A Modern Approach”, 4th Edition, Pearson, 2020.
2. Busoniu, L., Babuška, R., & De Schutter, B., “Reinforcement Learning and Dynamic Programming Using Function Approximators”. CRC Press, 2010
3. Richard S. Sutton, Andrew G. Barto, “Reinforcement Learning,An Introduction: Adaptive Computation and Machine Learning series”, MIT Press, 4th edition,2018
4. Paul A. Gagniuc, “Markov Chains: From Theory to Implementation and Experimentation”, John Wiley & Sons, 2017.

Reference Books

1. Sutton, R. S., & Barto, A. G. "Reinforcement Learning: An Introduction", 2nd Edition, 2018.
2. Silver, D."UCL Course on Reinforcement Learning" , 2015..
3. Mnih, V., et al., "Human-level control through deep reinforcement learning". Springer Nature, 2015.

Web References

1. https://www.datacamp.com/tutorial/reinforcement-learning-python-introduction
2. https://medium.com/analytics-vidhya/a-beginners-guide-to-reinforcement-learning-and-its-basic-implementation-from-scratch-2c0b5444cc49
3. https://towardsdatascience.com/reinforcement-learning-101-e24b50e1d292
4. https://towardsdatascience.com/introduction-to-reinforcement-learning-rl-part-5-monte-carlo-methods-25067003bb0f

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	3	-	-	-	-	-	-	-	3	3	2
2	3	3	3	3	1	-	-	-	-	-	-	-	3	3	2
3	3	3	3	3	1	-	-	-	-	-	-	-	3	3	3
4	3	3	3	3	1	-	-	-	-	-	-	-	3	3	3
5	3	3	3	3	1	-	-	-	-	-	-	-	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM) – Maximum 50 Marks									End Semester Examination (ESE) Marks (Theory)	Total Marks (CAM+ ESE)
	Continuous Assessment (Theory)					Continuous Assessment (Practical)					
	CAT 1	CAT 2	Model	Attendance	Total	Conduction of Practical	Report	Viva	Total	End Semester Examination (ESE) Marks (Practical)		
Marks	50	50	75	5		15	10	5	30*	30	75 *(To be weighted for* 50 Marks)	
Weightage of CAM	2.5	2.5	2.5	2.5	**10**	**To be weighted for 10 Marks*			**10**	**30**		
CAM / ESE Marks	***CAM Marks =10+10+30=50***										***ESE Marks = 50***	**100**

Distribution of Marks for Attendance, the Question Paper Pattern for Model and ESE are same as given in B. Tech. Regulations R2023 for Theory cum practical Courses

Department	**Artificial Intelligence and Data Science**	**B.Tech / (Honour / Minor) – Artificial Intelligence and Machine Learning**						
Semester	**VII**	Course Category: **PC**			*End Semester Exam Type: **TE**			
Course Code	**U23MXT702**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**IMAGE AND VIDEO ANALYTICS**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Common to all Branches except AI & DS								
Prerequisite	Basic image processing concepts, knowledge of Machine Learning and Deep Learning fundamentals							

Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Interpret Digital image and video processing techniques for processing image and video files	**K2**
	CO2 Interpret the concepts of Image and Video enhancement and restoration for effective image analysis	**K2**
	CO3 Apply various concepts of Image analysis and video analysis.	**K3**
	CO4 Apply multifarious feature detection and description techniques for image analytics	**K3**
	CO5 Apply various object detection and recognition techniques for tracking objects in videos	**K3**

UNIT-I	**Introduction to Digital Image and Video Processing**	**Periods: 9**
Digital image representation - Sampling and Quantization - Types of Images - Basic Relations between Pixels – Neighbors – Connectivity - Distance Measure, Introduction to Digital Video - Sampled Video - Video Transmission. Gray-Level Processing: Image Histogram, Arithmetic Operations between Images - Geometric Image Operations. Binary Image Processing, Binary Image Morphology.		**CO1**
UNIT-II	**Image and Video Enhancement and Restoration**	**Periods: 9**
Spatial domain - Linear and Non-linear Filtering - Morphological filtering, Homomorphic Filtering, Blotch Detection - Motion Vector Repair and Interpolating Corrupted Intensities - Intensity Flicker Correction – Flicker Parameter Estimation - Wavelet based image denoising - Basic methods for image restoration using deconvolution filters.		**CO2**
UNIT-III	**Image and Video Analysis**	**Periods: 9**
Image Compression: Huffman coding - Run length coding - LZW coding - Lossless Coding - Wavelets based image compression. Video Compression: Basic Concepts and Techniques of Video Coding and the H.264 Standard - MPEG-1 and MPEG-2 Video Standards.		**CO3**
UNIT-IV	**Feature Detection and Description**	**Periods: 9**
Introduction to feature detectors - descriptors - matching and tracking - Basic edge detectors– canny – sobel - prewitt etc. - Image Segmentation - Region Based Segmentation – Region Growing and Region Splitting and Merging - Thresholding– Basic global thresholding - optimum global thresholding using Otsu's Method		**CO4**
UNIT-V	**Object Detection and Recognition**	**Periods: 9**
Object detection and recognition in image and video - basic texture descriptors - GLCM - LBP and its applications in image and video analysis - object tracking in videos.		**CO5**

LecturePeriods:45	**TutorialPeriods: -**	**PracticalPeriods: -**	**Total Periods:45**

Text Books

1. Alan Bovik, "Handbook of Image and Video Processing" , 2nd Edition, Academic Press, 2005.
2. Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", 3rd Edition, Pearson Education, 2008.
3. Richard Szeliski, "Computer Vision – Algorithms and Applications ", Springer, 2011.
4. Ali Ismail Awad and Mahmoud Hassaballah, "Image Feature Detectors and Descriptors", Foundations and Applications, Springer; 1st ed. 2016 edition.
5. Xiaoyue Jiang and Abdenour Hadid, "Deep Learning in Object Detection and Recognition Hardcover", Springer; 1st ed. 2019 edition (27 November 2019).

Reference Books
1. Anil K Jain, “Fundamentals of Digital Image Processing “, PHI, 2011.
2. Oge Marques, “Practical Image and Video Processing Using MatLab “, Wiley, 2011.
3. John W. Woods,” Multidimensional Signal, Image, Video Processing and Coding “, Academic Press, 2006.
4. Mohammed Salemdeeb, “Object Detection and Recognition Using Deep Learning”, Scholars' Press, 2020.
5. Davut Armagan Kaya, “Feature Detection and Matching”, Grin Verlag , 1st edition, 2021).
Web References
1. https://www.geeksforgeeks.org/digital-image-processing-basics/ 2. https://www.javatpoint.com/digital-image-processing-tutorial 3. https://www.tutorialspoint.com/dip/index.htm

POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	3	-	-	-	-	-	-	-	3	3	2
2	3	3	3	3	1	-	-	-	-	-	-	-	3	3	2
3	3	3	3	3	1	-	-	-	-	-	-	-	3	3	3
4	3	3	3	3	1	-	-	-	-	-	-	-	3	3	3
5	3	3	3	3	1	-	-	-	-	-	-	-	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks##	Total Marks
	CAT 1	CAT 2	Model Exam##	Assignment#	Attendance##		
Test Marks	50*	50*	75*	20*	5	75	100
Weightage for CAM	5	5	5	5	5	75	
CAM / ESE Marks	CAM Marks = 25					ESE Marks = 75	

#Open Book Analytical Exam/Analyse Real world problems and propose solutions/ Tool or Subject Proficiency Analysis – Test the Students skill by giving individual task/ Paper Presentation/Micro Project Presentation/Idea Presentation for the Societal Problem;
Distribution of Marks for Attendance, the Question Paper Pattern for Model and ESE are same as given in B. Tech. Regulations R2023 for Theory Courses.

Department	**Artificial Intelligence and Data Science**	**B.Tech / (Honour / Minor) – Artificial Intelligence and Machine Learning**						
Semester	**VIII**	Course Category: **PC**			*End Semester Exam Type: **TE**			
Course Code	**U23MXT803**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**PROMPT ENGINEERING**	**3**	**0**	**0**	**3**	**25**	**75**	**100**
Common to all Branches except AI & DS								
Prerequisite	Strong understanding of Natural Language Processing, familiarity with Machine Learning models and techniques.							

Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Interpret the basic concepts and importance of prompt engineering, including various types of prompts and their applications.	**K2**
	CO2	Apply skills in designing effective prompts with clear structure and contextual relevance, avoiding common pitfalls.	**K3**
	CO3	Apply various metrics and feedback, and improve prompt effectiveness.	**K3**
	CO4	Apply advanced techniques in prompt engineering for handling different types of prompts	**K3**
	CO5	Apply prompt engineering concepts in various for building interactive systems.	**K3**

UNIT-I	**Introduction to Prompt Engineering**	**Periods: 9**
Introduction – Importance and Applications – Types of Prompts – Components of Effective Prompts – Challenges and Solutions – Case Studies in Prompt Engineering.		**CO1**
UNIT-II	**Designing Effective Prompts**	**Periods: 9**
Principles of Prompt Design – Structuring Prompts – Contextual Relevance – Clarity and Precision – Examples and Best Practices – Common Pitfalls and How to Avoid Them.		**CO2**
UNIT-III	**Evaluating Prompt Performance**	**Periods: 9**
Metrics for Prompt Effectiveness – User Feedback and Iteration – Testing and Validation Methods – Analyzing User Engagement – Improving Prompt Responsiveness – Tools for Evaluation and Optimization.		**CO3**
UNIT-IV	**Advanced Techniques in Prompt Engineering**	**Periods: 9**
Adaptive Prompting Techniques – Leveraging Machine Learning for Prompt Improvement – Multi-turn Prompts and Conversations – Personalization and Customization – Integrating Prompts with AI Systems – Ethical Considerations and Bias Mitigation.		**CO4**
UNIT-V	**Case Studies and Applications**	**Periods: 9**
Industry-Specific Prompt Engineering Applications – Healthcare, Finance, Education, and Customer Service – Building Interactive Systems with Prompts – Real-world Case Studies and Success Stories – Future Trends in Prompt Engineering – Capstone Project: Designing a Prompt System.		**CO5**

LecturePeriods:45	**TutorialPeriods: -**	**Practical Periods: -**	**Total Periods:45**

Text Books

1. John D. Kelleher, Brian Mac Namee, and Aoife D'Arcy, "Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples, and Case Studies," MIT Press, 2015.
2. Christopher Manning, Hinrich Schütze, and Prabhakar Raghavan,"Introduction to Information Retrieval," Cambridge University Press, 2008.
3. Kathleen R. McKeown,"Introduction to Natural Language Processing," McGraw-Hill, 1992.
4. Jacob Andreas, "Task-Oriented Dialogue Systems for Conversational AI," Springer, 2020.

Reference Books

1. Daniel Jurafsky and James H. Martin,"Speech and Language Processing," 3rd Edition, Pearson, 2021.
2. Yoav Goldberg,"Neural Network Methods for Natural Language Processing," Morgan & Claypool Publishers, 2017.
3. Christopher D. Manning and Hinrich Schütze, "Foundations of Statistical Natural Language Processing," MIT Press, 1999.
4. Mike Lewis and Tom Kwiatkowski, "Advanced Methods for Natural Language Processing," Springer, 2022.

Web References

1. https://www.nltk.org/book/
2. https://github.com/dennybritz/deeplearning-pytorch
3. https://towardsdatascience.com/prompt-engineering-7e1666f71e7f
4. https://github.com/f/awesome-chatgpt-prompts
5. https://ai.googleblog.com/search/label/Dialog%20Systems

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	3	-	-	-	-	-	-	-	3	3	2
2	3	3	3	3	1	-	-	-	-	-	-	-	3	3	2
3	3	3	3	3	1	-	-	-	-	-	-	-	3	3	3
4	3	3	3	3	1	-	-	-	-	-	-	-	3	3	3
5	3	3	3	3	1	-	-	-	-	-	-	-	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Methods

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks##	Total Marks
	CAT 1	CAT 2	Model Exam##	Assignment#	Attendance##		
Test Marks	50*	50*	75*	20*	5	75	
Weightage for CAM	5	5	5	5	5	75	
CAM / ESE Marks	CAM Marks = 25					ESE Marks = 75	100

#Open Book Analytical Exam/Analyse Real world problems and propose solutions/ Tool or Subject Proficiency Analysis – Test the Students skill by giving individual task/ Paper Presentation/Micro Project Presentation/Idea Presentation for the Societal Problem;
Distribution of Marks for Attendance, the Question Paper Pattern for Model and ESE are same as given in B. Tech. Regulations R2023 for Theory Courses.

Department	**Artificial Intelligence and Data Science**	**B.Tech / (Honour / Minor) – Artificial Intelligence and Machine Learning**							
Semester	**VI**	Course Category Code: **PA**				End Semester Exam Type: **PA**			
Course Code	**U23MXW801**	Periods / Week			Credit	Maximum Marks			
		L	T	P	C	CAM	ESE	TM	
Course Name	**PROJECT**	**0**	**0**	**4**	**2**	**50**	**50**	**100**	
Common to all Branches except AI & DS									
Prerequisite	Artificial Intelligence, Machine Learning, Deep Learning, Programming in C, Python								

Course Outcomes		On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1	Identify and define a real-world problem relevant to their field of study.	**K2**
	CO2	Develop and implement the proposed solution using appropriate tools and technologies.	**K3,K5**
	CO3	Present the project findings effectively through a structured report and oral presentation.	**K6**

The project work involves developing a solution to a real-world problem using emerging technologies and engineering principles. Students will work individually to analyze, design, develop, and evaluate a functional prototype or software application. The project must demonstrate the application of theoretical knowledge to practical challenges, integrating concepts from the core areas of the curriculum.

The project spans an academic term and includes multiple reviews to assess progress, quality, and implementation. Students are expected to conduct literature reviews, define clear objectives, apply suitable methodologies, perform data collection and analysis, and present their findings in a comprehensive report.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 30**	**Total Periods: 30**

COs/POs/PSOs Mapping

COs	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
1	3	3	2	2	2	1	-	1	3	3	-	1	3	3	2
2	3	3	3	3	3	1	2	1	3	3	3	1	2	3	3
3	2	2	3	2	2	1	-	1	3	3	3	1	2	2	2

Correlation Level: 1 – Low, 2 – Medium, 3 – High

Evaluation Method

Assessment	**CAM**				**ESE**			**Total**
	Review 1		**Review 2**		**Report**	**Presentation and Viva**	**Demo**	
	Presentation and Viva	**Supervisor**	**Presentation and Viva**	**Supervisor**				
	15	**10**	**15**	**10**	**15**	**20**	**15**	**100**
CAM/ESE Marks	**CAM Marks=50**				**ESE Marks =50**			