BOARD OF STUDIES (BoS) PROCEEDING
of
CENTRE FOR ARTIFICIAL INTELLIGENCE

[under the RGPV Structure]

(Meeting Dated - 2nd December, 2025

Centre for Artificial Intelligence

Date: 03.12.2025

Minutes of Meeting of Board of Studies (BoS)
in
Centre for Artificial Intelligence
[under the Madhav Institute of Technology & Science-Deemed University (MITS-DU)]

The meeting of the Board of Studies (BoS) in the Centre for Artificial Intelligence (under MITS-DU) was held on 02 Dec., 2025 at 04:30 PM in offline mode (in room no.: M104). The following deliberation took place in the meeting:

Agenda Item 1	To confirm the minutes of previous BoS meeting held in the month of June 2025 **The minutes of the previous BoS meeting held on 06 June, 2025 were presented, discussed and confirmed.**
Agenda Item 2	To propose the scheme structure of VIII Semester with the provision of ONE DE & ONE OC course to be offered in online mode with credit transfer for the batch admitted in academic year 2022-23. (The total credits from I-VIII semester should not be less than 160 for this batch). **The scheme structure of B. Tech. VIII Semester in Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning, batch admitted in academic session 2022 – 23, was analyzed, discussed and recommended. The scheme structure of VIII semester for each branch is annexed as Annexure-I. Also it was confirmed that the total credits of each branch (from I-VIII semester are not less than 160.**
Agenda Item 3	To propose the list of courses which the students can opt from SWAYAM/NPTEL/ other MOOC Platforms/ Institution (MITS) MOOC, to be offered in online mode under Departmental Elective (DE) category courses (DE4) and open category (OC3) for credit transfer in the VIII Semester under the flexible curriculum (Batch admitted in academic year 2022-23) **The list of courses which the students can opt from SWAYAM/NPTEL/ other MOOC Platforms/ Institution (MITS) MOOC, to be offered in online mode under Departmental Elective (DE) category courses (DE4) and open category (OC3) for credit transfer in the VIII Semester under the flexible curriculum for Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning (Batch admitted in academic year 2022-23), were presented, discussed and recommended. The same is available in Annexure - I.**
Agenda Item 4	To propose the list of "Additional Courses" which can be opted for getting an: i. Honours (for students of the host department); ii. Minor Specialization (for students of other departments); offered through SWAYAM/NPTEL/MOOC based Platforms for the B.Tech. VIII semester students (for the batch admitted in 2022-23)] and for B.Tech. VI semester (for the batch admitted in 2023-24] **The list of courses offered under Honours and Minors components, offered from SWAYAM/NPTEL/MOOC based Platforms for the B.Tech. VIII semester Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning students (for the batch admitted in**

	2022-23)] and for B.Tech. VI semester (for the batch admitted in 2023-24], were presented, discussed and recommended. The same are available in Annexure I and II.
Agenda Item 5	To review and finalize the scheme structure of B.Tech VI Semester under the flexible curriculum (Batch admitted in 2023-24) **The scheme structure of B. Tech. VI Semester in Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning, batch admitted in academic session 2023 – 24, was analyzed, discussed and recommended. The scheme structure of VI semester for each branch is annexed as Annexure-II.**
Agenda Item 6	To review & finalize the syllabi for departmental Core Course(s) (DC) of B. Tech VI Semester (for batch admitted in 2023-24) under the flexible curriculum along with COs. **The syllabi along with the course outcomes of each course of B. Tech. VI Semester in Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning, batch admitted in academic session 2023 – 24, was analyzed, discussed and recommended. The syllabus of all the courses of VI semester in each branch is annexed as Annexure-III.**
Agenda Item 7	To propose the list of courses from SWAYAM/NPTEL/MOOC Platforms to be offered for batch admitted in 2023-24 in online mode under Departmental Elective (DE) Course with credit transfer, in the VI Semester. **The list of courses from SWAYAM/NPTEL/MOOC Platforms to be offered for batch admitted in 2023-24 in online mode under Departmental Elective (DE) Course with credit transfer, in the VI Semester in Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning, was presented, discussed and recommended. The same is available in Annexure - II.**
Agenda Item 8	To review and finalize the courses & syllabi to be offered (for batch admitted in 2023-24) under the Open Category (OC) Courses to be offered in traditional mode for B Tech VI semester of other departments along with their COs. **The courses & syllabi to be offered (for batch admitted in 2023-24) under the Open Category (OC) Courses to be offered in traditional mode for B Tech VI semester were presented and recommended. The same is available in Annexure - IV**
Agenda Item 9	To review and finalize the Experiment list/ Lab manual/Skill based mini-project for all the Laboratory Courses to be offered in B.Tech.VI semester (for batch admitted in 2023-24). **The Experiment list/ Lab manual/Skill based mini-project for all the Laboratory Courses to be offered in B.Tech. VI semester in Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning (for batch admitted in 2023-24) was discussed and recommended. The same is available in Annexure - III.**

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Agenda Item 10	To review the PO attainment, CO-PO mapping matrix and action to be taken to improve PO attainment level. **The PO attainment, CO-PO mapping matrix and action to be taken to improve PO attainment level for batch admitted in 2021-22 for Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning was presented and the same is annexed as Annexure - VI.**
Agenda Item 11	To review curricula feedback from various stakeholders, its analysis and impact **The curricula feedback from various stakeholders, its analysis and impact for the course taught in Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning, during Jan.-June 2025 session was analysed and reviewed. The same is annexed as Annexure - V.**

The meeting ended with the vote of thanks to all the members.

Dr. Pawan Dubey **Dr. Tej Singh**

Dr. Rajni Ranjan Singh
Head, Centre for Artificial Intelligence [Chairperson, BoS]

ANNEXURE - I

Scheme structure of
B.Tech.
[Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning]
VIII semester
for the Batch admitted in 2022-23

Centre for Artificial Intelligence

Scheme of Evaluation

B. Tech. VIII Semester *(Information Technology (Artificial Intelligence and Robotics))*

(for batch admitted in academic session 2022 – 23)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted									Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam
				Theory Slot				Practical Slot			MOOCs								
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation		Assignment	Exam		L	T	P			
				End Sem. Exam.	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab work & Sessional	Skill Based Mini Project									
1.	DE	DE	Departmental Elective* (DE-4)	-	-	-	-	-	-	-	25	75	100	-	-	-	3	Online	MCQ
2.	OC	OC	Open Category* (OC-3)	-	-	-	-	-	-	-	25	75	100	-	-	-	3	Online	MCQ
3.	2240821	DLC	Internship/ Research Project/ Innovation & Start-up***	-	-	-	-	250	150	-	-	-	400	-	-	18	9	Offline	SO
4.	2240822	-	Professional Development#	-	-	-	-	50	-	-	-	-	50	-	-	4	2	Interactive	SO
Total				-	-	-	-	**300**	**150**	**-**	**50**	**150**	**650**	**-**	**-**	**22**	**17**	**-**	**-**
Additional Course for Honours or minor Specialization				**Permitted to opt for maximum two additional courses for the award of Honours or Minor specialization**															

*All of these courses will run through SWAYAM/ NPTEL/ MOOC with credit transfer.

#Evaluation will be based on participation/laurels brought by the students to the institution in national/state level technical and other events during the complete tenure of the UG programme (participation in professional chapter activities, club activities, cultural events, sports, personality development activities, collaborative events, MOOCs, technical events, institute/department committees, etc.). ***Innovation/ start-up: only for those students who have opted relevant NEC

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral

Mode of Teaching				Mode of Examination					Total Credits
Theory		Lab	PDC	Theory			Project/ Internship	PDC	
Online	Blended	Offline	Interactive	PP	AO	MCQ	SO	SO	
6	-	9	2	-	-	6	9	2	**17**
35.29	**-**	**52.95**	**11.76**	**-**	**-**	**35.29**	**52.95**	**11.76**	**Credits %**

Recommended in the Board of Studies Meeting of Centre for Artificial Intelligence held on 2nd Dec., 2025

Centre for Artificial Intelligence

B. Tech. VIII Semester *(Information Technology (Artificial Intelligence and Robotics))*

DE-4*		
S. No.	**Subject Code**	**Subject Name**
1	2240831	Introduction to Large Language Models (LLMs) (12 weeks)
2	2240832	Foundations of Cyber Physical Systems (12 weeks)
3	2240833	Control Engineering for Robotics (12 weeks)
4	2240834	Advanced Robotics (12 weeks)

OC-3* *(to be opted by students of other Department)*		
S. No.	**Subject Code**	**Subject Name**
1	OC-3	Foundation for Virtual and Augmented reality systems (12 weeks)
2	OC-3	Predictive modelling with applications- Supervised & unsupervised learning (8 weeks)
3	OC-3	Introduction to Large Language Models(12 weeks)
-	-	-

List of courses to be opted for Honours in VIII Semester

Honours* *(to be opted by students of Parent Department)*			
Course Code	**Course Name**	**Course Code**	**Course Name**
Track 1: Information Security		**Track 2: Internet of Things**	
H24082601	Foundations of Cryptography (12 weeks)	H24082604	Wireless Ad Hoc and Sensor Networks (8 weeks)
H24082602	Blockchain and its Applications (12 weeks)	H24082603	Foundations of Cyber Physical Systems (12 weeks)
H24082603	Foundations of Cyber Physical Systems (12 weeks)	H24082602	Blockchain and its Applications (12 weeks)
H24082604	Wireless Ad Hoc and Sensor Networks (8 weeks)	H24052603	Introduction to Internet of Things (12 weeks)
Track 3: High Performance Computing			
H24082605	Affective Computing (12 weeks)	H24082607	Neural Networks for Computer Vision and Natural Language Processing (12 weeks)
H24082606	Human Computer Interaction (In English) (12 weeks)	H24082608	User-centric Computing For Human-Computer Interaction (8 weeks)

*** Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform**

Note: In each semester (starting from V to VIII semester), it is required to opt for new subjects towards Honours Degree/ Minor Specialization.

Centre for Artificial Intelligence

Scheme of Evaluation

B. Tech. VIII Semester *(Artificial Intelligence (AI) and Data Science)*

(for batch admitted in academic session 2022 – 23)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted									Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam
				Theory Slot				Practical Slot			MOOCs								
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation		Assignment	Exam		L	T	P			
				End Sem. Exam.	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab work & Sessional	Skill Based Mini Project									
1.	DE	DE	Departmental Elective* (DE-4)	-	-	-	-	-	-	-	25	75	100	-	-	-	3	Online	MCQ
2.	OC	OC	Open Category* (OC-3)	-	-	-	-	-	-	-	25	75	100	-	-	-	3	Online	MCQ
3.	2270821	DLC	Internship/ Research Project/ Innovation & Start-up***	-	-	-	-	250	150	-	-	-	400	-	-	18	9	Offline	SO
4.	2270822	-	Professional Development#	-	-	-	-	50	-	-	-	-	50	-	-	4	2	Interactive	SO
Total				-	-	-	-	**300**	**150**	**-**	**50**	**150**	**650**	**-**	**-**	**22**	**17**	**-**	**-**
Additional Course for Honours or minor Specialization				**Permitted to opt for maximum two additional courses for the award of Honours or Minor specialization**															

*All of these courses will run through SWAYAM/ NPTEL/ MOOC with credit transfer.

#Evaluation will be based on participation/laurels brought by the students to the institution in national/state level technical and other events during the complete tenure of the UG programme (participation in professional chapter activities, club activities, cultural events, sports, personality development activities, collaborative events, MOOCs, technical events, institute/department committees, etc.). ***Innovation/ start-up: only for those students who have opted relevant NEC

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral

Mode of Teaching				Mode of Examination					Total Credits
Theory		Lab	PDC	Theory			Project/ Internship	PDC	
Online	Blended	Offline	Interactive	PP	AO	MCQ	SO	SO	
6	-	9	2	-	-	6	9	2	**17**
35.29	**-**	**52.95**	**11.76**	**-**	**-**	**35.29**	**52.95**	**11.76**	**Credits %**

Recommended in the Board of Studies Meeting of Centre for Artificial Intelligence held on 2nd Dec., 2025

Centre for Artificial Intelligence

B. Tech. VIII Semester *(Artificial Intelligence (AI) and Data Science)*

DE -4*		
S. No.	**Subject Code**	**Subject Name**
1	2270831	User-centric Computing For Human-Computer Interaction (8 weeks)
2	2270832	Introduction to Large Language Models (LLMs) (12 weeks)
3	2270833	Foundations of Cyber Physical Systems (12 weeks)

OC-3* *(to be opted by students of other Department)*		
S. No.	**Subject Code**	**Subject Name**
1	OC-3	Foundation for Virtual and Augmented reality systems (12 weeks)
2	OC-3	Predictive modelling with applications- Supervised & unsupervised learning (8 weeks)
3	OC-3	Introduction to Large Language Models(12 weeks)

List of courses to be opted for Honours in VIII Semester

Honours* *(to be opted by students of Parent Department)*			
Course Code	**Course Name**	**Course Code**	**Course Name**
Track 1: Information Security		**Track 2: Internet of Things**	
H24082601	Foundations of Cryptography (12 weeks)	H24082604	Wireless Ad Hoc and Sensor Networks (8 weeks)
H24082602	Blockchain and its Applications (12 weeks)	H24082603	Foundations of Cyber Physical Systems (12 weeks)
H24082603	Foundations of Cyber Physical Systems (12 weeks)	H24082602	Blockchain and its Applications (12 weeks)
H24082604	Wireless Ad Hoc and Sensor Networks (8 weeks)	H24052603	Introduction to Internet of Things (12 weeks)
Track 3: High Performance Computing			
H24082605	Affective Computing (12 weeks)	H24082607	Neural Networks for Computer Vision and Natural Language Processing (12 weeks)
H24082606	Human Computer Interaction (In English) (12 weeks)	H24082608	User-centric Computing For Human-Computer Interaction (8 weeks)

*** Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform**

Note: In each semester (starting from V to VIII semester), it is required to opt for new subjects towards Honours Degree/ Minor Specialization.

Centre for Artificial Intelligence

Scheme of Evaluation

B. Tech. VIII Semester *(Artificial Intelligence (AI) and Machine Learning)*

(for batch admitted in academic session 2022 – 23)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted									Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam
				Theory Slot				Practical Slot			MOOCs								
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation		Assignment	Exam		L	T	P			
				End Sem. Exam.	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab work & Sessional	Skill Based Mini Project									
1.	DE	DE	Departmental Elective* (DE-5)	-	-	-	-	-	-	-	25	75	100	-	-	-	3	Online	MCQ
2.	OC	OC	Open Category* (OC-3)	-	-	-	-	-	-	-	25	75	100	-	-	-	3	Online	MCQ
3.	2280821	DLC	Internship/ Research Project/ Innovation & Start-up***	-	-	-	-	250	150	-	-	-	400	-	-	18	9	Offline	SO
4.	2280822	-	Professional Development#	-	-	-	-	50	-	-	-	-	50	-	-	4	2	Interactive	SO
Total				-	-	-	-	**300**	**150**	**-**	**50**	**150**	**650**	**-**	**-**	**22**	**17**	**-**	**-**
Additional Course for Honours or minor Specialization				**Permitted to opt for maximum two additional courses for the award of Honours or Minor specialization**															

*All of these courses will run through SWAYAM/ NPTEL/ MOOC with credit transfer.

#Evaluation will be based on participation/laurels brought by the students to the institution in national/state level technical and other events during the complete tenure of the UG programme (participation in professional chapter activities, club activities, cultural events, sports, personality development activities, collaborative events, MOOCs, technical events, institute/department committees, etc.). ***Innovation/ start-up: only for those students who have opted relevant NEC

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral

Mode of Teaching				Mode of Examination					Total Credits
Theory		Lab	PDC	Theory			Project/ Internship	PDC	
Online	Blended	Offline	Interactive	PP	AO	MCQ	SO	SO	
6	-	9	2	-	-	6	9	2	**17**
35.29	**-**	**52.95**	**11.76**	**-**	**-**	**35.29**	**52.95**	**11.76**	**Credits %**

Recommended in the Board of Studies Meeting of Centre for Artificial Intelligence held on 2nd Dec., 2025

Centre for Artificial Intelligence

B. Tech. VIII Semester *(Artificial Intelligence (AI) and Machine Learning)*

DE -4*		
S. No.	**Subject Code**	**Subject Name**
1	2280831	User-centric Computing For Human-Computer Interaction (8 weeks)
2	2280832	Introduction to Large Language Models (LLMs) (12 weeks)
3	2280833	Foundations of Cyber Physical Systems (12 weeks)

OC-3* *(to be opted by students of other Department)*		
S. No.	**Subject Code**	**Subject Name**
1	OC-3	Foundation for Virtual and Augmented reality systems (12 weeks)
2	OC-3	Predictive modelling with applications- Supervised & unsupervised learning (8 weeks)
3	OC-3	Introduction to Large Language Models(12 weeks)

List of courses to be opted for Honours in VIII Semester

Honours* *(to be opted by students of Parent Department)*			
Course Code	**Course Name**	**Course Code**	**Course Name**
Track 1: Information Security		**Track 2: Internet of Things**	
H24082601	Foundations of Cryptography (12 weeks)	H24082604	Wireless Ad Hoc and Sensor Networks (8 weeks)
H24082602	Blockchain and its Applications (12 weeks)	H24082603	Foundations of Cyber Physical Systems (12 weeks)
H24082603	Foundations of Cyber Physical Systems (12 weeks)	H24082602	Blockchain and its Applications (12 weeks)
H24082604	Wireless Ad Hoc and Sensor Networks (8 weeks)	H24052603	Introduction to Internet of Things (12 weeks)
Track 3: High Performance Computing			
H24082605	Affective Computing (12 weeks)	H24082607	Neural Networks for Computer Vision and Natural Language Processing (12 weeks)
H24082606	Human Computer Interaction (In English) (12 weeks)	H24082608	User-centric Computing For Human-Computer Interaction (8 weeks)

*** Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform**

Note: In each semester (starting from V to VIII semester), it is required to opt for new subjects towards Honours Degree/ Minor Specialization.

B. Tech. VIII Semester

(for batch admitted in academic session 2022 – 23)

Minor Specialization in Artificial Intelligence and Machine Learning*

(to be opted by students of other Department)

S. No.	Course Name
1	Introduction to Large Language Models (LLMs) (12 weeks)
2	GPU Architectures and Programming (12 weeks)
3	Edge Computing (8 weeks)
4	Natural Language Processing (12 weeks)

*** Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform**

Note: In each semester (starting from V to VIII semester), it is required to opt for new subjects towards Honours Degree/ Minor Specialization.

ANNEXURE - II

Scheme structure of
B.Tech.
[Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning]
VI semester
for the Batch admitted in 2023-24

Centre for Artificial Intelligence

Scheme of Evaluation

B. Tech. VI Semester *(Information Technology (Artificial Intelligence and Robotics))*

(for batch admitted in academic session 2023 – 24)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted									Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam.	Duration of Exam
				Theory Slot				Practical Slot			MOOCs									
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation		Assignment	Exam		L	T	P				
				End Sem. Exam.	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab work & Sessional	Skill Based Mini Project										
1.	3240621	DC	AI for Robotics	50	10	20	20	-	-	-	-	-	100	3	-	-	3	Blended	PP	2 Hrs
2.	3240622	DC	Image Processing	50	10	20	20	40	30	30	-	-	200	3	-	2	4	Blended	PP	2 Hrs
3.	3240623	DC	Artificial Intelligence & Machine Learning	50	10	20	20	40	30	30	-	-	200	3	-	2	4	Blended	PP	2 Hrs
4.	DE	DE	Departmental Elective* (DE-1)	-	-	-	-	-	-	-	25	75	100	3	-	-	3	Online	MCQ	3 Hrs
5.	OC	OC	Open Category (OC-1)	50	10	20	20	-	-	-	-	-	100	3	-	-	3	Blended	PP	2 Hrs
6.	3240624	DLC	Minor Project-II**	-	-	-	-	40	60	-	-	-	100	-	-	4	2	Offline	SO	-
7.	200XXX	CLC	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	-	-	50	-	-	2	1	Interactive	SO	-
8.	3240625	NSS	Natural Sciences & Skills#	200	40	80	80	90	30	30	-	-	550	1	-	2	2#	-	-	-
Total				**400**	**80**	**160**	**160**	**260**	**150**	**90**	**25**	**75**	**1400**	**16**	**0**	**12**	**22**	**-**	**-**	**-**
9.	1000007	MAC	Intellectual Property Rights (IPR)	50	10	20	20	-	-	-	-	-	100	2	-	-	GRADE	Online	MCQ	1.5 Hrs
Skill Enhancement Program/Research Internship/On Job Training for Four weeks duration: Evaluation in VII Semester																				
Additional Course for Honours or minor Specialization				**Permitted to opt for maximum two additional courses for the award of Honours or Minor specialization**																

$Proficiency in course/subject – includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in that particular course/subject

#("Natural Sciences & Skills" treated as Mandatory Audit Courses from first to fourth semester and cumulative marks converted as a cluster of credits and awarded in the VI semester)

*All of these courses will run through SWAYAM/ NPTEL/ MOOC with credit transfer. **MCQ:** Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral

Mode of Teaching				Mode of Examination					Total Credits
Theory		Lab	NEC	Theory			Lab	NEC	
Online	Blended	Offline	Interactive	PP	AO	MCQ	SO	SO	
3	14	2	1	14	-	3	2	1	22
13.63	**71.43**	**9.09**	**4.54**	**63.63**	**-**	**13.63**	**9.09**	**4.54**	**Credits %**

Recommended in the Board of Studies Meeting of Centre for Artificial Intelligence held on 2nd Dec., 2025

B. Tech. VI Semester *(Information Technology (Artificial Intelligence and Robotics))*

DE -1*		
S. No.	**Subject Code**	**Subject Name**
1	3240631	Collaborative Robots (COBOTS): Theory and Practice (8 weeks)
2	3240632	Introduction to Large Language Models (LLMs) (12 weeks)
3	3240633	Edge Computing (8 weeks)
4	3240634	Wheeled Mobile Robots (8 weeks)

OC-1 *(to be opted by students of other Department)*		
S. No.	**Subject Code**	**Subject Name**
1	OC-1	Information Security
2	OC-1	Data Mining & Warehousing

List of courses to be opted for Honours in VI Semester

Honours*
(to be opted by students of Parent Department)

Course Code	Course Name	Course Code	Course Name
Track 1: Information Security		**Track 2: Internet of Things**	
H24062701	Information Security - 5 - Secure Systems Engineering (8 weeks)	H24062704	Edge Computing (8 weeks)
H24062702	Secure Computation: Part I (12 weeks)	H24062705	Foundations of Cyber Physical Systems (12 weeks)
H24062703	Foundations of Cryptography (12 weeks)	H24062706	Embedded Systems Design (12 weeks)
-	-	H24052703	Introduction to Internet of Things (12 Weeks)
Track 3: High Performance Computing			
H24062707	Basics of Computational Complexity (12 weeks)		
H24062708	Advanced Computer Architecture (12 weeks)		
H24062709	Parallel Computer Architecture (12 weeks)		

*** Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform**

Note: In each semester (starting from V to VIII semester), it is required to opt for new subjects towards Honours Degree/ Minor Specialization.

Centre for Artificial Intelligence

Scheme of Evaluation

B. Tech. VI Semester *(Artificial Intelligence (AI) and Data Science)*

(for batch admitted in academic session 2023 – 24)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted									Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam.	Duration of Exam
				Theory Slot				Practical Slot			MOOCs									
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation		Assignment	Exam		L	T	P				
				End Sem. Exam.	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab work & Sessional	Skill Based Mini Project										
1.	3270621	DC	Natural Language Processing	50	10	20	20	-	-	-	-	-	100	3	-	-	**3**	Blended	PP	2 Hrs
2.	3270622	DC	Image Processing	50	10	20	20	40	30	30	-	-	200	3	-	2	**4**	Blended	PP	2 Hrs
3.	3270623	DC	Deep Learning	50	10	20	20	40	30	30	-	-	200	3	-	2	**4**	Blended	PP	2 Hrs
4.	DE	DE	Departmental Elective* (DE-1)	-	-	-	-	-	-	-	25	75	100	3	-	-	**3**	Online	MCQ	3 Hrs
5.	OC	OC	Open Category (OC-1)	50	10	20	20	-	-	-	-	-	100	3	-	-	**3**	Blended	PP	2 Hrs
6.	3270624	DLC	Minor Project-II**	-	-	-	-	40	60	-	-	-	100	-	-	4	**2**	Offline	SO	-
7.	200XXX	**CLC**	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	-	-	50	-	-	2	**1**	Interactive	SO	-
8.	3270625	**NSS**	Natural Sciences & Skills#	200	40	80	80	90	30	30	-	-	550	1	-	2	**2#**	-	-	-
Total				**400**	**80**	**160**	**160**	**260**	**150**	**90**	**25**	**75**	**1400**	**16**	**0**	**12**	**22**	**-**	**-**	**-**
9.	1000007	MAC	Intellectual Property Rights (IPR)	50	10	20	20	-	-	-	-	-	100	2	-	-	GRADE	Online	**MCQ**	1.5 Hrs
Skill Enhancement Program/Research Internship/On Job Training for Four weeks duration: Evaluation in VII Semester																				
Additional Course for Honours or minor Specialization				**Permitted to opt for maximum two additional courses for the award of Honours or Minor specialization**																

$Proficiency in course/subject – includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in that particular course/subject

#("Natural Sciences & Skills" treated as Mandatory Audit Courses from first to fourth semester and cumulative marks converted as a cluster of credits and awarded in the VI semester)

*All of these courses will run through SWAYAM/ NPTEL/ MOOC with credit transfer. **MCQ:** Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral

Mode of Teaching				Mode of Examination					Total Credits
Theory		Lab	NEC	Theory			Lab	NEC	
Online	Blended	Offline	Interactive	PP	AO	MCQ	SO	SO	
3	14	2	1	14	-	3	2	1	**22**
13.63	**71.43**	**9.09**	**4.54**	**63.63**	**-**	**13.63**	**9.09**	**4.54**	**Credits %**

Recommended in the Board of Studies Meeting of Centre for Artificial Intelligence held on 2nd Dec., 2025

Centre for Artificial Intelligence

B. Tech. VI Semester *(Artificial Intelligence (AI) and Data Science)*

DE -1*		
S. No.	**Subject Code**	**Subject Name**
1	3270631	Foundation for Virtual and Augmented Reality Systems (12 weeks)
2	3270632	Introduction to Large Language Models (LLMs) (12 weeks)
3	3270633	Business Intelligence & Analytics (12 weeks)

OC-1 *(to be opted by students of other Department)*		
S. No.	**Subject Code**	**Subject Name**
1	OC-1	Information Security
2	OC-1	Data Mining & Warehousing

List of courses to be opted for Honours or Minor specialization in VI Semester

Honours*
(to be opted by students of Parent Department)

Course Code	Course Name	Course Code	Course Name
Track 1: Information Security		**Track 2: Internet of Things**	
H24062701	Information Security - 5 - Secure Systems Engineering (8 weeks)	H24062704	Edge Computing (8 weeks)
H24062702	Secure Computation: Part I (12 weeks)	H24062705	Foundations of Cyber Physical Systems (12 weeks)
H24062703	Foundations of Cryptography (12 weeks)	H24062706	Embedded Systems Design (12 weeks)
-	-	H24052703	Introduction to Internet of Things (12 Weeks)
Track 3: High Performance Computing			
H24062707	Basics of Computational Complexity (12 weeks)		
H24062708	Advanced Computer Architecture (12 weeks)		
H24062709	Parallel Computer Architecture (12 weeks)		

*** Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform**

Note: In each semester (starting from V to VIII semester), it is required to opt for new subjects towards Honours Degree/ Minor Specialization.

Centre for Artificial Intelligence

Scheme of Evaluation

B. Tech. VI Semester *(Artificial Intelligence (AI) and Machine Learning)*

(for batch admitted in academic session 2023 – 24)

S. No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted									Total Marks	Contact Hours per week			Total Credits	Mode of Teaching	Mode of Exam.	Duration of Exam
				Theory Slot				Practical Slot			MOOCs									
				End Term Evaluation		Continuous Evaluation		End Sem. Exam.	Continuous Evaluation		Assignment	Exam		L	T	P				
				End Sem. Exam.	$Proficiency in subject /course	Mid Sem. Exam.	Quiz/ Assignment		Lab work & Sessional	Skill Based Mini Project										
1.	3280621	DC	Natural Language Processing	50	10	20	20	-	-	-	-	-	100	3	-	-	**3**	Blended	PP	2 Hrs
2.	3280622	DC	Image Processing	50	10	20	20	40	30	30	-	-	200	3	-	2	**4**	Blended	PP	2 Hrs
3.	3280623	DC	Deep Learning	50	10	20	20	40	30	30	-	-	200	3	-	2	**4**	Blended	PP	2 Hrs
4.	DE	DE	Departmental Elective* (DE-1)	-	-	-	-	-	-	-	25	75	100	3	-	-	**3**	Online	MCQ	3 Hrs
5.	OC	OC	Open Category (OC-1)	50	10	20	20	-	-	-	-	-	100	3	-	-	**3**	Blended	PP	2 Hrs
6.	3280624	DLC	Minor Project-II**	-	-	-	-	40	60	-	-	-	100	-	-	4	**2**	Offline	SO	-
7.	200XXX	**CLC**	Novel Engaging Course (Informal Learning)	-	-	-	-	50	-	-	-	-	50	-	-	2	**1**	Interactive	SO	-
8.	3280625	**NSS**	Natural Sciences & Skills#	200	40	80	80	90	30	30	-	-	550	1	-	2	**2#**	-	-	-
Total				**400**	**80**	**160**	**160**	**260**	**150**	**90**	**25**	**75**	**1400**	**16**	**0**	**12**	**22**	**-**	**-**	**-**
9.	1000007	MAC	Intellectual Property Rights (IPR)	50	10	20	20	-	-	-	-	-	100	2	-	-	GRADE	Online	**MCQ**	1.5 Hrs
Skill Enhancement Program/Research Internship/On Job Training for Four weeks duration: Evaluation in VII Semester																				
Additional Course for Honours or minor Specialization				**Permitted to opt for maximum two additional courses for the award of Honours or Minor specialization**																

$Proficiency in course/subject – includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in that particular course/subject

#("Natural Sciences & Skills" treated as Mandatory Audit Courses from first to fourth semester and cumulative marks converted as a cluster of credits and awarded in the VI semester)

*All of these courses will run through SWAYAM/ NPTEL/ MOOC with credit transfer. **MCQ:** Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral

Mode of Teaching				Mode of Examination					Total Credits
Theory		Lab	NEC	Theory			Lab	NEC	
Online	Blended	Offline	Interactive	PP	AO	MCQ	SO	SO	
3	14	2	1	14	-	3	2	1	**22**
13.63	**71.43**	**9.09**	**4.54**	**63.63**	**-**	**13.63**	**9.09**	**4.54**	**Credits %**

Recommended in the Board of Studies Meeting of Centre for Artificial Intelligence held on 2nd Dec., 2025

Centre for Artificial Intelligence

B. Tech. VI Semester *(Artificial Intelligence (AI) and Machine Learning)*

DE -1*		
S. No.	**Subject Code**	**Subject Name**
1	3280631	Foundation for Virtual and Augmented Reality Systems (12 weeks)
2	3280632	Introduction to Large Language Models (LLMs) (12 weeks)
3	3280633	Reinforcement Learning (12 weeks)

OC-1*(to be opted by students of other Department)*		
S. No.	**Subject Code**	**Subject Name**
1	OC-1	Information Security
2	OC-1	Data Mining & Warehousing

List of courses to be opted for Honours or Minor specialization in VI Semester

Honours*
(to be opted by students of Parent Department)

Course Code	Course Name	Course Code	Course Name
Track 1: Information Security		**Track 2: Internet of Things**	
H24062701	Information Security - 5 - Secure Systems Engineering (8 weeks)	H24062704	Edge Computing (8 weeks)
H24062702	Secure Computation: Part I (12 weeks)	H24062705	Foundations of Cyber Physical Systems (12 weeks)
H24062703	Foundations of Cryptography (12 weeks)	H24062706	Embedded Systems Design (12 weeks)
-	-	H24052703	Introduction to Internet of Things (12 Weeks)
Track 3: High Performance Computing			
H24062707	Basics of Computational Complexity (12 weeks)		
H24062708	Advanced Computer Architecture (12 weeks)		
H24062709	Parallel Computer Architecture (12 weeks)		

*** Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform**

Note: In each semester (starting from V to VIII semester), it is required to opt for new subjects towards Honours Degree/ Minor Specialization.

Centre for Artificial Intelligence

B. Tech. VI Semester

(for batch admitted in academic session 2023 – 24)

Minor Specialization in Artificial Intelligence and Machine Learning*

(to be opted by students of other Department)

S. No.	Course Name
1	Foundations of Deep Learning: Concepts and Applications (12 weeks)
2	Machine Learning for Engineering and Science Applications (12 weeks)
3	GPU Architectures and Programming (12 weeks)

* **Course run through SWAYAM/NPTEL/ MOOC Learning Based Platform**

Note: In each semester (starting from V to VIII semester), it is required to opt for new subjects towards Honours Degree/ Minor Specialization.

ANNEXURE - III

Syllabi for Departmental Core Course(s) (DC) along with the Experimental List of Lab Courses of B.Tech.

[Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning]

VI semester

for the Batch admitted in 2023-24

Centre for Artificial Intelligence
AI FOR ROBOTICS (3240621)

COURSE OBJECTIVES

- To study the concepts of Artificial Intelligence in Robotics.
- To learn the methods of solving problems in Robotics using Artificial Intelligence.
- To learn about planning, strategies and algorithms.

Unit I

Introduction to Robotics Engineering and AI Integration: Overview of Robotics Engineering, Laws of Robotics, Types of Robot, Components Needed for Robot, Robot Standards and Safety Regulations, Robot System Analysis, Trends in Robotics System, Requirements of AI for Robot Automation, AI agents, Algorithms used in Robotics, Case Studies: Sofia, ASIMO, IBM Watson.

Unit II

Path Planning and Control in Robotics: Overview of Path Planning and Control, Path Planning Categories: Environment-based, Algorithm-based, Completeness-based, Robot Control Architectures for Path Following, Robot Path Planning Problem, and Complexity.

Unit III

Artificial Intelligence for Global Path Planning: Classical Approaches to Path Planning, Graph Search Approaches: A* and AO* Algorithm, Heuristic Approaches: Tabu Search, Genetic Algorithm, Ant Colony Optimization, Hybrid Approaches in Path Planning, Case studies of AI-powered Path Planning in Robotics.

Unit IV

Simultaneous Localization and Mapping (SLAM): Introduction to SLAM, EKF-SLAM, Graph-based SLAM (G-SLAM), Feature-based Mapping: Feature extraction and matching, FastSLAM algorithm, Comparison of feature-based mapping techniques.

Unit V

Advancements in AI for Robotics: Swarm Robotics and Multi-Robot Systems, Bio-inspired Robotics, Integration of AI and Robotics in Industry 4.0.

RECOMMENDED BOOKS

1. Poole, Harry H. "Fundamentals of robotics engineering. Springer Science & Business Media", 2012.
2. Steven M. LaValle, "Planning Algorithms", 2006.
3. Anis Koubaa, Hachemi Bennaceur, Imen Chaari, Sahar Trigui, Adel Ammar, Mohamed-Foued Sriti, Maram Alajlan, Omar Cheikhrouhou, Yasir Javed, "Path Planning and Cooperation: Foundations, Algorithms and Experimentations", 2018.
4. Robin R. Murphy, "Introduction to AI Robotics", second edition, 2019.
5. Dubey, Ashutosh Kumar, Abhishek Kumar, S. Rakesh Kumar, N. Gayathri, and Prasenjit Das, eds. "AI and IoT-based Intelligent Automation in Robotics". John Wiley & Sons, 2021.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1. describe fundamental concepts in robotics engineering and Artificial Intelligence integration in robotics.

CO2. explain the basics of robotics path planning and control.

CO3. utilize various artificial intelligence techniques for effective global path planning solutions in diverse robotic scenarios.

CO4. discover appropriate Simultaneous Localization and Mapping techniques for robots.

CO5. evaluate the strengths, weaknesses, and trade-offs among various Simultaneous Localization and Mapping methods.

CO6. design and propose advanced solutions for addressing complex challenges in the field of Artificial Intelligence for robotics.

CO-PO Mapping Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	1	1			1	1	1	3	2
CO2	3	3	3	2	2	2			1				3	2
CO3	3	3	3	3	3	1					2		3	1
CO4	3	3	3	3	3		1		1		1	1	3	1
CO5	3	3	3	3	1	1	1	1		1	1	2	3	2
CO6	3	3	3	3	3	2	1	1	2	2	3	3	3	3

Centre for Artificial Intelligence

NATURAL LANGUAGE PROCESSING (3270621/ 3280621)

COURSE OBJECTIVES

- To illustrate the concepts, techniques and application of natural language processing (NLP).
- To understand linguistic phenomena, grammar and their hierarchy.
- To introduce real world problems and solutions of NLP and their relation to linguistics and statistics.

Unit I

Introduction: Brief History, steps, stages and application involved in natural language processing, goals of NLP, issues and challenges in NLP, basic concepts of phases of natural language processing morphological analysis, syntactic analysis, semantic analysis, pragmatic analysis, tools and techniques used for performing this analysis, ambiguities, Homonymy, Hyponymy, Hypernymy, Meronymy, Synonymy, Antonymy, Polysemy ambiguity in nlp.

Unit II

Structure of Words: Words and Their Components, Issues and Challenges, Morphological parsing, Morphological analysis, Inflectional and derivational morphology, Combining FST Lexicon and rules, Regular Expressions and finite Automata.

Unit III

Syntax Analysis: Rule based , stochastic based part of speech tagging, Transformation based tagging. Treebanks: A Data-Driven Approach to Syntax, Parsing with context free grammars, context free grammar, Probabilistic context free grammars, problems with probabilistic context free grammars , multiple tags and words, unknown words, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, top up and bottom up parsing, Multilingual Issues.

Unit IV

Semantic Analysis and Language Modelling: Semantic Analysis , Relation among lexemes and their senses, Internal Structure of words, Language model Introduction Hidden Markov Models, and the Viterbi Algorithm, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Cross Lingual Language Modeling.

Unit V

Application: Word net, fastext, CBOW , Skip gram, word sense disambiguation, information retrieval system, machine translation, question answer system, text categorization system, sentiment analysis , text summarization system.

RECOMMENDED BOOKS

1. Language processing An introduction to Natural Language Processing, Computational Linguistics and speech Recognition by Daniel Jurafsky and James H. Martin
2. Natural Language Processing with Python by Steven Bird, Ewan Klein, Edward Lopper Multilingual
3. Natural Language Processing Applications: From Theory to Practice by Daniel M. Bikel and Imed Zitouni, Pearson Publication
4. Natural Language Processing and Information Retrieval by Tanvier Siddiqui, U.S. Tiwary.

REFERENCE BOOK

1. Handbook of Natural Language Processing, Second Edition by NitinIndurkhya, Fred J. Damerau, Fred J. Damera.

COURSE OUTCOMES

After completion of the course students will be able to:

CO1 : explain the fundamentals of natural language processing

CO2: analyse the structure of word in NLP

CO3: differentiate between different types of ambiguities in NLP.

CO4: evaluate the role of syntactic and semantic of sentences in nlp

CO5: design different language modelling Techniques

CO6: create NLP based solutions to real world problems.

CO-PO Mapping Matrix														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	3	1	1	1	1	2	2		1	2	1
CO2	3	3	3	3	1	1	1	1	2	1	1	1	2	2
CO3	3	3	3	3	1	2	2	1	2	1		1	2	1
CO4	3	3	3	3	3	1	3	3	3	1	1	3	2	2
CO5	3	3	3	3	3	2	3	3	3	1	2	3	2	1
CO6	3	3	3	3	3	1	3	3	3	1	3	3	3	3

Centre for Artificial Intelligence

IMAGE PROCESSING (3240622/ 3270622/ 3280622)

COURSE OBJECTIVES

- To impart knowledge about the fundamental steps of image processing.
- To study the various image enhancement and segmentation techniques in spatial and frequency domain
- To understand image compression, image segmentation and Color image processing.

Unit I

Introduction: Digital image representation, Fundamental steps in image processing, Components of Digital Image processing systems, Elements of visual perception, Image Formation model, Image Sampling and quantization, Relationship between pixels – neighbourhood, adjacency connectivity, regions, boundaries and distance measures.

Unit II

Image Enhancement: Enhancement by point processing, Sample intensity transformation, Histogram processing, Image subtraction, Image averaging, Spatial filtering- Smoothing Spatial filters, Sharpening Spatial filters.

Unit III

Image Segmentation: Detection of discontinuities - point, line and edge detection, Edge linking and boundary detection, Thresholding, Region based segmentation - region growing, region splitting and merging, Use of motion in segmentation- Spatial techniques and Frequency domain techniques.

Unit IV

Image Restoration and Compression: A model of the image degradation/restoration process, noise models, restoration in the presence of noise–only spatial filtering, Weiner filtering, constrained least squares filtering, geometric transforms; Introduction to the Fourier transform and the frequency domain, estimating the degradation function. Image Data Compression: Fundamentals, Compression models, Error free compression, Lossy Compression, Image compression standards.

Unit V

Color Image Processing: Color Models, Pseudo color Image Processing, Color Transformations, Smoothing and sharpening, Image Segmentation based on color. Applications of Image Processing: Medical imaging, Robot vision, Character recognition, Remote Sensing.

RECOMMENDED BOOKS

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, Addison-Wesley Publishing Company, 2007
2. Gonzalez R. C, Woods R. E and Eddins S. L, Digital Image Processing using MATLAB, McGraw Hill Education, 2nd edition, 2017.
3. Sonka M. Hlavac V., Boyle R., Image Processing, Analysis and Machine Vision, Cengage Learning, 3rd edition, 2007.
4. A. K. Jain, Fundamentals of Digital Images Processing, Pearson Education India, 2015

COURSE OUTCOMES

After completion of the course students will be able to:

CO1: describe the fundamentals of image processing.

CO2: classify image enhancement techniques in both spatial and frequency domains

CO3: apply image segmentation for object and boundary detection.

CO4: analyze the causes for image degradation and image restoration.

CO5: evaluate image compression techniques.

CO6: implement novel image filtering techniques.

CO-PO Mapping Matrix														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	2	2	1	1			1	1	1	3	2
CO2	3	3	3	2	2				1				3	2
CO3	3	3	3	2	3	1			1		2		3	3
CO4	3	3	3	3	3		1		1		1	1	3	2
CO5	3	3	3	3	2	1	1			1	1	2	3	2
CO6	3	3	3	3	3	2	1		2	2	3	2	3	3

Centre for Artificial Intelligence
IMAGE PROCESSING (3240622/ 3270622/ 3280622)

LIST OF PROGRAMS

1. Image Acquisition & Display
2. Color Space Conversion (RGB ↔ Grayscale, HSV, LAB, YCbCr)
3. Image Negative & Intensity Transformations
4. Histogram Computation & Visualization
5. Histogram Equalization & Matching
6. Image Smoothing / Blurring (Mean, Gaussian, Median filters)
7. Image Sharpening (Laplacian, High-boost, Unsharp Masking)
8. Edge Detection Techniques (Sobel, Prewitt, Canny, Roberts)
9. Noise Addition & Removal (Gaussian, Salt-Pepper)
10. Image Thresholding (Global, Adaptive, Otsu's)
11. Morphological Operations (Erosion, Dilation, Opening, Closing)
12. Segmentation (Region Growing, Watershed, K-Means)
13. Image Registration (Alignment of Images)
14. Image Compression Techniques (JPEG, RLE, Lossy/Lossless)
15. Feature Extraction (SIFT, HOG, LBP, Harris Corners)
16. Template Matching (NCC-based Matching)
17. Image Restoration (Deblurring, Wiener Filter, Inverse Filtering)
18. Geometric Transformations (Scaling, Rotation, Affine)
19. Object Detection Basics (Contours, Bounding Boxes)
20. Image Fusion & Blending (Laplacian Pyramid)

COURSE OUTCOMES

After completing the course, the student will be able to:

CO1: develop the ability to write programs for color detection.

CO2: analyze color information in digital images.

CO3: apply image segmentation techniques to partition images into meaningful regions.

CO4: demonstrate competence in writing a program for object detection.

CO5: integrate image processing techniques to interpret and respond to hand gestures.

Centre for Artificial Intelligence

IMAGE PROCESSING (3240622/ 3270622/ 3280622)

SKILL BASED MINI PROJECTS

1. QR Code Scanner & Decoder using OpenCV + ZBar
2. Face Mask Detection using CNN
3. Automatic Image Background Removal (GrabCut / U²Net)
4. Real-Time Hand Gesture Recognition using MediaPipe
5. License Plate Detection & OCR (ANPR)
6. Plant Disease Detection using CNN and Segmentation
7. Crowd Counting using CSRNet (Density Map Estimation)
8. Road Lane Detection for Self-Driving Cars
9. Emotion Recognition from Facial Images (FER2013)
10. Super-Resolution Image Enhancement using SRGAN/ESRGAN
11. Skin Cancer (Melanoma) Detection using Transfer Learning
12. AI-based Document Scanner (Perspective Transform + Thresholding)
13. Real-Time Object Tracking (CSRT / DeepSORT)
14. Eye Blink & Drowsiness Detection using EAR
15. Image Forgery Detection (Copy-Move Tampering)
16. Fire & Smoke Detection using CNN
17. Virtual Try-On Filters (Glasses, Makeup) using Face Landmarks
18. Image Caption Generator (CNN + LSTM)
19. Food Recognition & Calorie Estimation using YOLO
20. Satellite Image Land Classification using UNET

Centre for Artificial Intelligence

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING (3240623)

COURSE OBJECTIVES

- To provide the fundamental knowledge of Artificial Intelligence and Machine Learning.
- To present the basic representation and reasoning paradigms used in Artificial Intelligence and Machine Learning.
- To understand the working of techniques used in Artificial Intelligence and Machine Learning.

Unit I

Introducing Artificial Intelligence: Computation, Psychology and Cognitive Science, Perception, Understanding and Action. Artificial Intelligence vs Machine Learning vs Deep Learning. Key Elements of Machine Learning: Representation, Process (Data Collection, Data Preparation, Model Selection, Model Training, Model Evaluation and Prediction), Evaluation and Optimization. Maximum likelihood estimation, Types of Learning: Supervised, Unsupervised and Reinforcement Learning. Regression vs Classification Problems Applications of Artificial intelligence and Machine Learning in the real world.

Unit II

Problem, Problem Space and Search: Production System, Blind Search: BFS & DFS, Heuristic Search, Hill Climbing, Best First Search.

Introduction to Neural Networks: History, Biological Neuron, Artificial Neural Network, Neural Networks Multilayer Perceptron, Back-propagation algorithm and its variants Stochastic gradient descent.

Unit III

Supervised Machine Learning: Linear Regression: Implementation, Applications & Performance Parameters, K-Nearest Neighbour Classification Decision Tree Classifier, Terminology, Classification vs Regression Trees, Tree Creation with Gini Index and Information Gain, IDE3 Algorithms, Applications and Performance Parameters. Random Forest Classifier, Naïve Bayes Classifier, Support Vector Machines Case Study on Regression and Classification for solving real world problems.

Unit IV

Unsupervised Machine Learning: Introduction, Types: Partitioning, Density Based, DBSCAN, Distribution Model-Based, Hierarchical, Agglomerative and Divisive, Common Distance Measures, K-Means Clustering Algorithms, Case Study on Clustering for solving real world problems.

Unit V

Deep Learning Architectures: Machine Learning and Deep Learning, Representation Learning, Width and Depth of Neural Networks, Activation Functions: RELU, LRELU, ERELU, Unsupervised Training of Neural Networks, Restricted Boltzmann Machines, Convolutional Neural Networks: Architectural Overview, Motivation, Layers, Filters, Parameter sharing, Regularization, Popular CNN Architectures, Deep Learning Applications.

Centre for Artificial Intelligence

RECOMMENDED BOOKS:

1. Artificial Intelligence: A Modern Approach, Stuart J. Russell and Peter Norvig, Prentice Hall.
2. Artificial Intelligence, Elaine Rich, Kevin Knight, Mc-Graw Hill.
3. Introduction to AI & Expert System, Dan W. Patterson, PHI.
4. Pattern Recognition and Machine Learning, Christopher M. Bishop
5. Introduction to Machine Learning using Python, Sarah Guido
6. Machine Learning in Action, Peter Harrington

COURSE OUTCOMES

After completing the course, the student will be able to:

CO1. describe the fundamental concepts of Artificial Intelligence and Machine Learning.

CO2: design heuristics driven search solutions for real-world problems.

CO3. identify machine learning based real world problem.

CO4. design Artificial Intelligence enabled intelligent systems for solving real world problems.

CO5. analyze Artificial Intelligence and machine learning algorithms.

CO6. evaluate the performance of Artificial Intelligence and machine learning techniques.

CO-PO Mapping Matrix														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	2	1	1				1	1	1	3	2
CO2	3	3	3	3	2	2	1	1	2		2	2	3	3
CO3	3	3	3	3	3	2	1		1		1	3	3	2
CO4	3	3	3	3	3	2	1	1	2		3	2	3	3
CO5	3	3	3	3	2	1	1		1	1	1	1	3	2
CO6	3	3	3	3	3	2	1	1	1	1	2	2	3	2

Centre for Artificial Intelligence

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING (3240623)

LIST OF PROGRAMS

1. Explore Python with AI ML libraries through data inspection and visualization on a structured dataset.
2. Apply preprocessing and feature engineering such as normalization, selection and PCA, on a retail or customer behavioral dataset. Analyze their influence on model performance.
3. Build a Linear Regression model for housing price prediction and evaluate using standard regression metrics.
4. Perform plant leaf classification using KNN and examine the effect of different K values on accuracy.
5. Construct a Decision Tree for clinical disease prediction and interpret results using tree visualization and feature importance.
6. Implement Random Forest classification on the clinical dataset and compare performance with Decision Tree using F1 score.
7. Conduct text classification using Naive Bayes on spam or news datasets and assess results with confusion matrix.
8. Classify quality inspection or feature-based image data using SVM kernels and compare statistical performance measures.
9. Apply K means clustering for customer segmentation and analyze cluster validity using silhouette score.
10. Implement DBSCAN clustering on customer or geospatial data and evaluate cluster shapes and noise detection.
11. Train an Artificial Neural Network for digit or traffic sign classification and measure accuracy and learning behavior.
12. Design a Convolutional Neural Network for medical scan or leaf disease image classification and test generalization on unseen samples.
13. Implement Q-Learning in a grid-world or navigation environment and study reward improvement over episodes.
14. Develop a complete ML workflow on a chosen real-world dataset including preprocessing, modeling, evaluation, and interpretation.

COURSE OUTCOMES

After completing the course, the student will be able to:

CO1: apply concepts of python programming to implement artificial intelligence based algorithms.

CO2: implement ML models in Python using machine learning libraries such as Scikit-Learn.

CO3: build k-means and hierarchical clustering model.

CO4: utilize the functions of NLTK and spaCy Python libraries for text classification and sentiment analysis.

CO5: perform feature engineering and optimize machine learning models.

CO6: apply AI and ML techniques to solve real world problems.

Centre for Artificial Intelligence

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING (3240623)

SKILL BASED MICRO PROJECTS

1. Perform Min Max normalization and compare data distribution before and after scaling.
2. Apply standardization (z score scaling) and analyze its impact on model performance.
3. Encode categorical features using binary and one hot encoding and verify transformations.
4. Perform multiclass label encoding and validate encoded outputs.
5. Plot histogram for numerical attributes and interpret feature distribution.
6. Visualize dataset using bar chart, box plot, scatter plot and heat map for feature relationships.
7. Generate descriptive statistics including mean, median, mode, skewness and standard deviation.

SKILL BASED MACRO PROJECTS

1. Apply PCA for dimensionality reduction and evaluate explained variance and model performance.
2. Apply LDA for dimensionality reduction and compare class separability vs PCA.
3. Implement filter based feature selection and analyze retained attributes and accuracy changes.
4. Implement wrapper based feature selection and measure computational cost vs accuracy gained.
5. Generate a correlation matrix and visualize strong or weak feature relationships.
6. Handle missing values using mean, median or model based imputation and compare outcomes.
7. Detect and treat outliers using IQR or Z score method and evaluate impact on model stability.
8. Plot and interpret confusion matrix of a classifier including error analysis and class wise accuracy.

SKILL BASED MINI PROJECTS

1. Build a handwritten digit recognition model using ANN or CNN and evaluate classification accuracy.
2. Perform SMS or email spam detection using Naive Bayes or SVM and analyze confusion matrix.
3. Develop a music recommendation system using collaborative or content based filtering.
4. Predict heart disease using multiple classifiers and compare best performance metrics.
5. Classify animal species using CNN on an image dataset and test generalization on sample images.
6. Transform a time series dataset into supervised format and apply classification models.
7. Apply Random Forest for classification on a dataset of choice and analyze feature importance.
8. Build a movie recommendation system using similarity based or ML based methods.
9. Improve classifier accuracy by applying meta heuristic based optimization like Genetic Algorithm or swarm optimization.
10. Create a simple number guessing interactive game using random number generation and logic control.

Centre for Artificial Intelligence
DEEP LEARNING (3270623/ 3280623)

COURSE OBJECTIVES

- To understand the theoretical foundations, algorithms and methodologies of neural networks
- To design and develop an application using specific deep learning models
- To provide practical knowledge in handling and analyzing real world applications.

Unit I

Fundamentals about Deep Learning. Perception Learning Algorithms. Early Neural Networks. How Deep Learning is different from Machine Learning. Building Blocks of Neural Network. Optimizers. Activation Functions. Loss Functions. Data Pre-processing for neural networks, Feature Engineering. Overfitting and Underfitting. Hyperparameters.

Unit II

Deep Learning Architectures: Machine Learning and Deep Learning, Representation Learning, Width and Depth of Neural Networks, Activation Functions: RELU, LRELU, ERELU, Unsupervised Training of Neural Networks, Restricted Boltzmann Machines, Auto Encoders, Deep Learning Applications

Unit III

Convolutional Neural Networks: Architectural Overview, Motivation, Layers, Filters, Parameter sharing, Regularization, Popular CNN Architectures: ResNet, AlexNet – Applications; Transfer learning Techniques, Variants of CNN: DenseNet, PixelNet.

Unit IV

Sequence Modeling – Recurrent and Recursive NETS: Recurrent Neural Networks, Bidirectional RNNs, Encoder-decoder sequence to sequence architectures - BPTT for training RNN, Long Short Term Memory Networks.

Unit V

Auto Encoders: Under complete Auto encoder, Regularized Autoencoder, stochastic Encoders and Decoders, Contractive Encoders; Deep Generative Models: Deep Belief networks, Boltzmann Machines, Deep Boltzmann Machine, Generative Adversarial Networks.

RECOMMENDED BOOKS

1. Ian Goodfellow, YoshuaBengio and Aaron Courville, " Deep Learning", MIT Press, 2017
2. Josh Patterson, Adam Gibson, "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017
3. Umberto Michelucci "Applied Deep Learning. A Case-based Approach to Understanding Deep Neural Networks" A press, 2018.
4. Giancarlo Zaccone, Md. Rezaul Karim, Ahmed Menshawy, "Deep Learning with TensorFlow: Explore neural networks with Python", Packt Publisher, 2017
5. Antonio Gulli, Sujit Pal, "Deep Learning with Keras", Packt Publishers, 2017.
6. Francois Chollet, "Deep Learning with Python", Manning Publications, 2017.

COURSE OUTCOMES

After completion of the course students will be able to:

CO1: illustrate the concepts of neural networks, activation functions and optimization algorithms.

CO2: explain the principles of backpropagation and gradient descent.

CO3: select an appropriate deep learning model for problem solving.

CO4: evaluate the performance of deep learning models.

CO5: compare the applicability of deep learning architectures across the problem domain.

CO6: develop novel deep learning architectures for specific applications.

CO-PO Mapping Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3							3	3	3
CO2	3	3	3	3	3							3	3	3
CO3	3	3	3	3	3							3	3	3
CO4	3	3	3	3	3							3	3	3
CO5	3	3	3	3	3	3				1	3	3	3	3
CO6	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Centre for Artificial Intelligence
DEEP LEARNING (3270623/ 3280623)
List of Programs

1. Train a Deep learning model to classify a given image using pre trained model
2. Object detection using Convolution Neural Network
3. Recommendation system from sales data using Deep Learning
4. Improve the Deep learning model by tuning hyper parameters
5. Perform Sentiment Analysis in network graph using RNN
6. Image generation using GAN
7. Develop a model by using AUTO ENCODERS.
8. Implement an LSTM based Autoencoder in TensorFlow/Keras.
9. Perform Sentiment Analysis using RNN
10. Using a pre-trained model on Keras for Transfer Learning.
11. Getting started with the python 3.x and installing libraries of Tensorflow, Keras, Pytorch.
12. Write a python program to perform tokenization by word and sentence using nltk
13. Create a python based application to eliminate stopwords using nltk.
14. Perform stemming using nltk in python.
15. Write a python program to perform lemmatization using nltk.
16. Perform Parts of Speech tagging using Hidden Markov Model
17. Perform Parts of Speech tagging using Viterbi Decoding
18. Implement chunking using nltk in python.
19. Implement Named Entity Recognition using nltk
20. Create an application which finds all unigrams, bigrams and trigrams present in the given corpus.

Course Outcomes of Lab:

After completion of the course students will be able to:

CO1: recognize the characteristics of deep learning models that are useful to solve real-world problems

CO2: design Convolution Neural Network for solving various problems pertaining to image processing.

CO3: apply deep learning model variants for implementing NLP based applications

CO4: examine the working mechanism of different deep learning algorithms.

CO5: solve real world problems using NLP techniques

CO6: develop autoencoders and generative models for suitable applications.

Centre for Artificial Intelligence
DEEP LEARNING (3270623/ 3280623)
List of Skill based Mini Projects

List of Micro Projects:

1. Implement a regression model in Keras.
2. Explain existing and emerging deep learning architectures for text and speech processing.
3. Hyper-Parameter Tuning in Multilayer Perceptron
4. Deep learning Packages Basics: Tensorflow, Keras, Theano and PyTorch
5. Classification of MNIST Dataset using CNN
6. Parameter Tuning in CNN
7. Implement a perceptron in TensorFlow/Keras Environment.

List of Macro Projects:

1. Implement simple vector addition in TensorFlow.
2. Implement an Image Classifier using CNN in TensorFlow/Keras.
3. Face recognition using CNN
4. Object detection using Transfer Learning of CNN architectures
5. Recommendation system using Deep Learning
6. Dimensionality Reduction using Deep learning
7. Language Modeling using RNN

List of Mini Projects:

1. Classification with Multilayer Perceptron using Scikit-learn (MNIST Dataset)
2. Time Series Prediction using RNN
3. Sentiment Analysis using LSTM
4. Image generation using GAN
5. Deep Learning using H2O
6. Deep Learning using DL4J
7. Use deep learning to solve real-life problem
8. Predictive analysis using H2O tool
9. Using a pre trained model on Keras for Transfer Learning
10. Recommendation system from sales data using Deep Learning.
11. Build a Python-based summarization tool to condense lengthy documents while retaining key information.
12. Develop a model using TensorFlow to classify news articles as reliable or fake.
13. Create a spam filter that classifies SMS messages as spam or legitimate using Python.
14. Design a system to identify abusive language or hate speech in online comments.
15. Implement a Python-based NER system to identify and categorize entities like names, dates, and locations.
16. Build a tool that generates effective and unique research paper titles using NLP techniques.
17. Develop a Python program to identify and correct spelling and grammatical errors in text.
18. Create a predictive text tool to suggest the next word or phrase in a sentence using context.
19. Implement a chatbot capable of engaging in natural, human-like conversations using NLP models.
20. Develop a Python-based sentiment analysis to classify text as positive, negative, or neutral.

ANNEXURE - IV

Syllabi of Open Category (OC) Courses for B.Tech.
[Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning]
VI semester
for the Batch admitted in 2023-24

Centre for Artificial Intelligence
DATA MINING & WAREHOUSING (OC-1)

COURSE OBJECTIVES

- To understand the significance of data mining in a real-world perspective. and gain the understanding of data mining techniques, algorithms and commonly used tools.
- To develop the ability for applying data mining techniques and tools for solving real-world problems.

Unit I

Introduction: Motivation, importance, Data types for Data Mining: Relational Databases, Data Ware-Houses. Transactional Databases, Advanced Database System and Its Applications, Data Mining Functionalities, Concept/Class Description, Association Analysis Classification & Prediction, Cluster Analysis, Outlier Analysis, Classification of Data Mining Systems, Major Issues in Data Mining.

Unit II

Data Pre-processing: Data Cleaning, Data Integration and Transformation and Data Reduction. Discretization and Concept Hierarchy Generation. Data Mining Primitives Languages and System Architectures, Concept Description, Characterization and Comparison Analytical, Characterization. Data Warehouse and OLTP Technology for Data Mining: Differences between Operational Database Systems & Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Data Cube Technology

Unit III

Mining Association Rules in Large Databases: Association Rule Mining: Market Basket Analysis, Basic Concepts, Mining Single Dimensional Boolean Association Rules from Transactional Databases: The Apriori Algorithm, Generating Association Rules from Frequent Items, Improving the Efficiency of Apriori, other Algorithms & their Comparison, Mining Multilevel Association Rules, Multidimensional Association Rules, Constraint Based Association Rule Mining.

Unit IV

Classification & Prediction and Cluster Analysis: Issues Regarding Classification & Prediction, Different Classification Methods, Prediction, Cluster Analysis, Major Clustering Methods, Currently Available Tools.

Unit V

Introduction to data warehousing, need and significance, challenges & issues in warehousing, difference between data mining & warehousing, case studies- stock market, supermarket etc. , implementation of current applications involving data mining.

RECOMMENDED BOOKS:

1. Data Mining: Concepts and Techniques, Han and Kamber, Morgan Kaufmann Publications.
2. Data Mining Techniques, A. K. Pujari, Universities Press Pvt. Ltd.
3. Data Warehousing in the Real World, Sam Anahory, Pearson Publication.

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COURSE OUTCOMES

After completing the course, the student will be able to:

CO1: explain fundamental concepts of data mining and data warehousing.

CO2: classify database systems and data models of data warehouses.

CO3: compare methods for storing & retrieving data from different data sources.

CO4: apply data mining techniques for knowledge extraction from large amounts of data.

CO5: predict trends to make informed decisions.

CO6: develop real world applications using data mining techniques.

CO-PO Mapping Matrix														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	3	2	2	2	1	1	1	1	3	1	1
CO2	3	3	3	3	3	3	2	1	1	2	1	3	2	2
CO3	3	3	3	3	3	3	2	2	2	1	2	3	2	2
CO4	3	3	3	3	3	3	3	3	3	2	3	3	3	3
CO5	3	3	3	3	3	3	3	2	2	2	2	3	3	3
CO6	3	3	3	3	3	3	3	3	3	2	3	3	3	3

Centre for Artificial Intelligence
INFORMATION SECURITY (OC-1)

COURSE OBJECTIVES

- To provide conceptual understanding of information security principles, issues, challenges and mechanisms.
- To understand encryption techniques for securing data in transit across data networks.

Unit-I

Security: Principles and Attacks, Basic Number Theory, Fundamentals of Cryptography, Steganography, Cryptanalysis, Code Breaking, Block Ciphers and Steam Ciphers, Substitution Ciphers, Transposition Ciphers, Caesar Cipher, Play-Fair Cipher, Hill Cipher

Unit-II

Cryptography: Symmetric Key Cryptography, Public Key Cryptography, Principles of Public Key Cryptosystem, Classical Cryptographic Algorithms: RC4, RSA, Distribution of Public Keys and Key Management, Diffie-Hellman Key Exchange.

Unit-III

Hash Functions: Hash Functions, One Way Hash Function, SHA (Secure Hash Algorithm). Authentication: Requirements, Functions, Kerberos, Message Authentication Codes, Digital Signatures, Digital Certificates.

Unit -IV

IP Web Security Overview: SSL (Secure Socket Layer), TLS (Transport Layer Security), SET (Secure Electronic Transaction). IDS (Intrusion detection system), Firewalls: Types, Functionality and Polices.

Unit -V

Phishing: Attacks and its Types, Buffer Overflow Attack, Session Hijacking, Hacker: Hacking and Types of Hackers, FootPrinting, Scanning: Types: Port, Network, Vulnerability), Sniffing in Shared and Switched Networks, Sniffing Detection Prevention, Spoofing.

RECOMMENDED BOOKS

1. Cryptography and Network Security, William Stallings, Pearson Education.
2. Cryptography and Network Security, Atul Kahate, McGraw Hill Education.
3. Incident Response and Computer Forensics, Kevin Mandia, Chris Prosise, Tata McGraw Hill.

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COURSE OUTCOMES

After completion of the course students would be able to:

CO1: determine symmetric and public key cryptography, classical algorithms, and basic number theory.

CO2: explain the working of various cryptographic algorithms.

CO3. apply firewall, IDS, and security protocols like SSL, TLS, and SET.

CO4: build secure systems using digital signatures, message authentication, and certificates.

CO5: examine the strengths and weaknesses of IP and web security.

CO6: select strategies for detecting and preventing attacks like sniffing, spoofing, and hacking.

CO-PO Mapping Matrix														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	2	2	3	1			1	1	2	2	3	2
CO2	3	3	2	2	3				1	1	2	2	3	2
CO3	3	3	3	2	3	1	1	1	2	2	2	3	3	3
CO4	3	3	3	3	3	2		1	1	2	2	3	3	3
CO5	3	3	2	2	3	2	1	1		2	2	3	3	3
CO6	3	3	3	3	3	3	1	1	1	2	3	3	3	3

ANNEXURE - V

Curricula feedback from various stakeholders, its analysis and impact for the course taught in Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning during Jan.-June 2025 session

Action Taken on Student Feedback of Course Curriculum: Jan-June 2025

- Based on the feedback data received from total **238** students (4th and 6th semester of AIML, AIDS and AIR) for the academic session Jan-June 2024, following points have been analysed:
    - It has been observed that, the majority of the students of AIML, AIDS and AIR (4th and 6th semester) are strongly agreed, some of the students are agreed and only few of them have strongly disagreed with the syllabus/ content that they have studied.

Some students have suggested the following changes in the course curriculum:

i. There is a need to remove regression /classification from Artificial Intelligence & Machine Learning course as we have already studied these things in the previous semesters.

ii. There should be one practical courses related to Generative AI which is more profitable to meet current need.

iii. Course content of AI for Robotics and Image processing needs to be updated.

iv. The above mentioned suggestions were analysed by respective course committees and the actions taken for
each is given in the below table.

Centre for Artificial Intelligence

COURSE CURRICULUM FEEDBACK (by Students on MOODLE)

(Responses to Student Feedback Comments)

Branch/ Semester	Subject Name	Student Feedback (Comments)		Response to student comments/ Analysis
AIR 6th Sem	Artificial Intelligence & Machine Learning (2240623)	**Mention the course / contents which in your opinion is outdated & needs to be removed.**	Regression /Classification	This topic is useful in understanding the basic concept of Machine learning
		Is any new course required to meet current needs?	Generative AI	The course is already been offered in VII semester
	AI for Robotics (2240621)	**Name course / contents which needs to be updated.**	Types of robots and actuators	After a discussion with the members of course committee, the course has been updated as per the student suggestions
AIR 4th Sem	Robot Kinematics (2240424)	**Is any new course required to meet current needs?**	Engineering mathematics	Already part of syllabus
AIML 6th Sem	Image Processing (2280622)	**Name course / contents which needs to be updated.**	Color image processing	The suggestions have been forwarded to the relevant course committee for further action.
		Is any new course required to meet current needs?	Computer vision	The suggestions have been forwarded to the relevant course committee for further action

Centre for Artificial Intelligence

Course-wise Analysis of Curriculum Feedback by Students for

Artificial intelligence and Robotics

(Average value of responses (on a scale of 1 to 5) 5: Strongly Agree, 4:Agree, 3:Neutral, 2:Disagree, 1:Strongly disagree)

AIR 6th Semester							
Subject code/name	**1 .The course is well designed**	**2. The units are balanced**	**3. The learning material was available to you**	**4. The content was clear and easy to understand**	**5.The course was relevant and updated for present needs**	**6.The course meets your career expectations**	**7. The course will be useful to meet your higher studies/future aspirations.**
AI for Robotics (2240621)	3.96	3.96	3.84	3.87	4	3.90	4
Image Processing (2240622)	4.35	4.38	4.35	4.35	4.41	4.35	4.38
Artificial Intelligence & Machine Learning (2240623)	4.77	4.68	4.72	4.77	4.54	4.59	4.72
Intellectual Property Rights (IPR) (1000007)	4.36	4.26	4.47	4.42	4.42	4.42	4.36

AIR 6th Semester								
Parameter(Average Grading)				**Excellent (%)**	**Very Good (%)**	**Good (%)**	**Average (%)**	**Below Average (%)**
Subject Code	**Subject Name**	**Semester**	**Faculty Name**					
2240621	AI in Robotics	**VI**	Dr. Pawan Dubey	31.70	39.73	21.43	4.91	2.23
2240622	Image Processing	**VI**	Dr. Tej Singh	62.56	25.12	16.26	2.46	0.49
2240623	Artificial Intelligence & Machine Learning	**VI**	Dr. Sunil Kumar Shukla	74.68	20.78	3.25	1.3	0
1000007	Intellectual Property Rights (IPR)	**VI**	Mr. Ramnaresh Sharma	63.91	17.29	12.78	6.02	0

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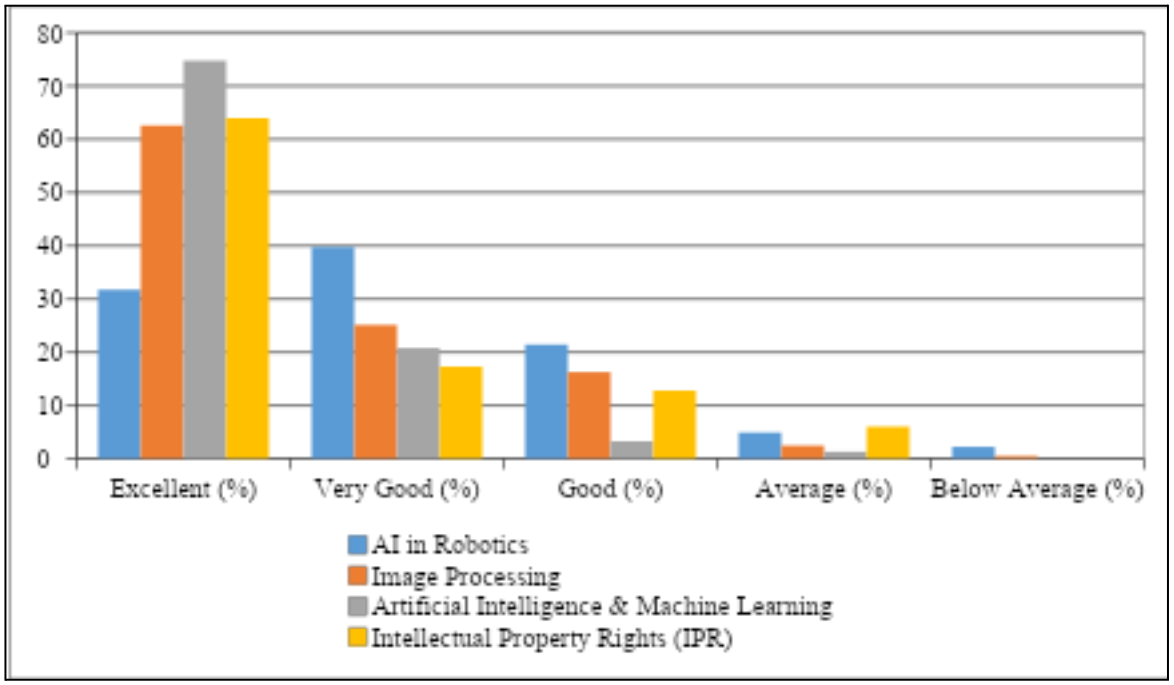

AIR 6th Semester

AIR 4th Semester							
Subject code/name(no. of student attempted feedback)	**1 .The course is well designed**	**2. The units are balanced**	**3. The learning material was available to you**	**4. The content was clear and easy to understand**	**5.The course was relevant and updated for present needs**	**6.The course meets your career expectations**	**7. The course will be useful to meet your higher studies/future aspirations.**
Computer Networks (3240422)	3.89	4.03	4	3.96	4.10	4.07	4.28
Control Systems (3240423)	3.6	3.6	3.8	3.7	3.6	3.6	3.6
Database Management System (3240424)	4.36	4.49	4.49	4.51	4.51	4.53	4.53
Sensor Technology (3240425)	3.66	3.82	3.75	3.66	3.84	3.80	3.84

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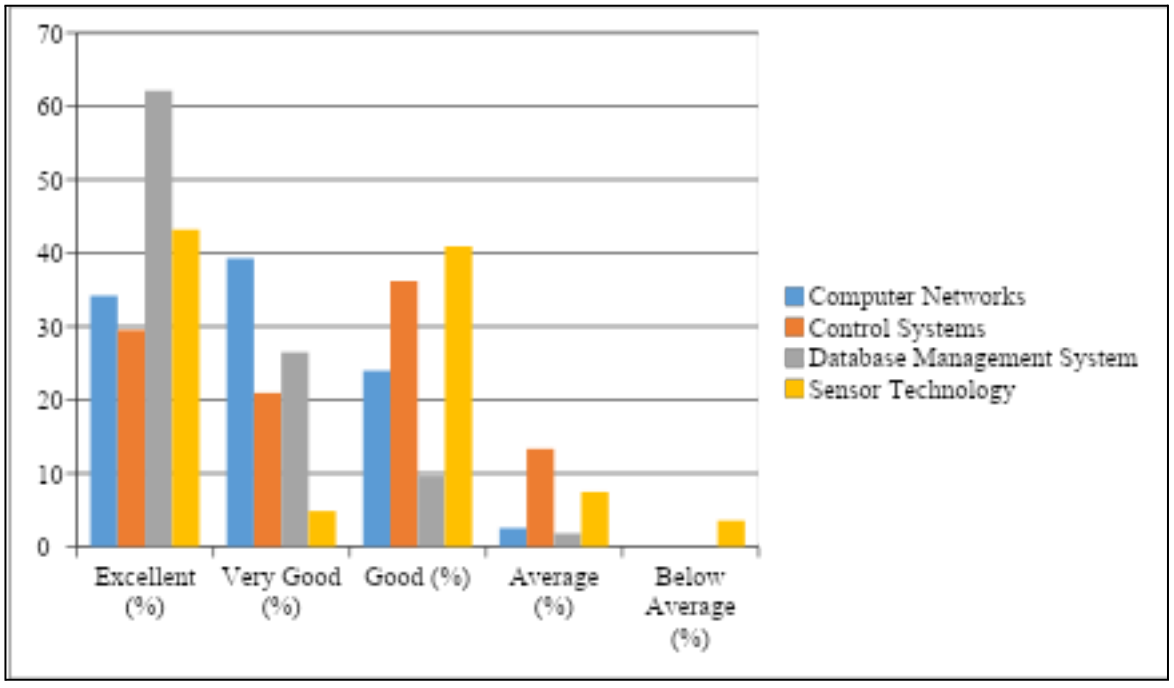
AIR 4th Semester								
Parameter(Average Grading)				Excellent (%)	Very Good (%)	Good (%)	Average (%)	Below Average (%)
Subject Code	Subject Name	Semester	Faculty Name					
3240422	Computer Networks (3240422)	IV	Dr. Bhagat S. Raghuwanshi	34.18	39.29	23.98	2.55	0.00
3240423	Control Systems (3240423)	IV	Dr. Rahul Kumar	29.52	20.95	36.19	13.33	0.00
3240424	Database Management System (3240424)	IV	Dr. Shubha Mishra	62.08	26.49	9.61	1.82	0.00
3240425	Sensor Technology (3240425)	IV	Dr. Neeraj Mishra	43.18	4.87	40.91	7.47	3.57



AIR 4th Semester

Centre for Artificial Intelligence

Course-wise Analysis of Curriculum Feedback by Students for

Artificial intelligence and Machine Learning

(Average value of responses (on a scale of 1 to 5) 5:Strongly Agree, 4:Agree, 3:Neutral, 2:Disagree, 1:Strongly disagree)

AIML 6th Semester							
Subject code/name(no. of student attempted feedback)	**1 .The course is well designed**	**2. The units are balanced**	**3. The learning material was available to you**	**4. The content was clear and easy to understand**	**5.The course was relevant and updated for present needs**	**6.The course meets your career expectations**	**7. The course will be useful to meet your higher studies/future aspirations.**
Natural Language Processing (2280621)	4.03	4.14	4.17	4.26	4.23	4.17	4.23
Image Processing (2280622)	4.35	4.41	4.35	4.38	4.41	4.26	4.35

AIML 6th Semester								
Parameter(Average Grading)				**Excellent (%)**	**Very Good (%)**	**Good (%)**	**Average (%)**	**Below Average (%)**
Subject Code	**Subject Name**	**Semester**	**Faculty Name**					
2280621	Natural Language Processing	**VI**	Dr. Shweta Chauhan	48.98	25.71	20.00	4.49	0.82
2280622	Image Processing (2280622	**VI**	Dr. Tej Singh	68.47	29.56	18.72	3.45	0.49

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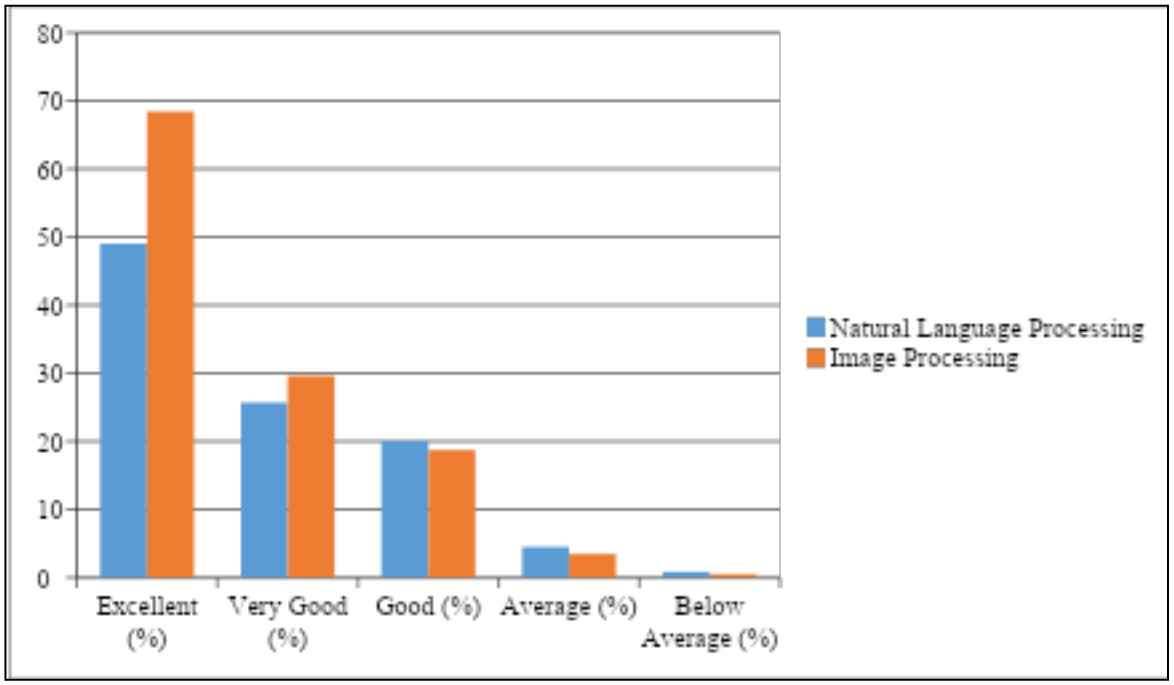

AIML 6th Semester

AIML 4th Semester							
Subject code/name(no. of student attempted feedback)	**1 .The course is well designed**	**2. The units are balanced**	**3. The learning material was available to you**	**4. The content was clear and easy to understand**	**5.The course was relevant and updated for present needs**	**6.The course meets your career expectations**	**7. The course will be useful to meet your higher studies/future aspirations.**
Software Engineering (3280423)	3.84	4.04	4.02	4.02	4.07	4.13	4.13
Cloud Computing and Virtualization (3280424)	4	4.02	4.12	4.11	4	4.02	4.13
Information Security (3280425)	3.7	3.4	3.5	3.4	3.5	3.6	3.1

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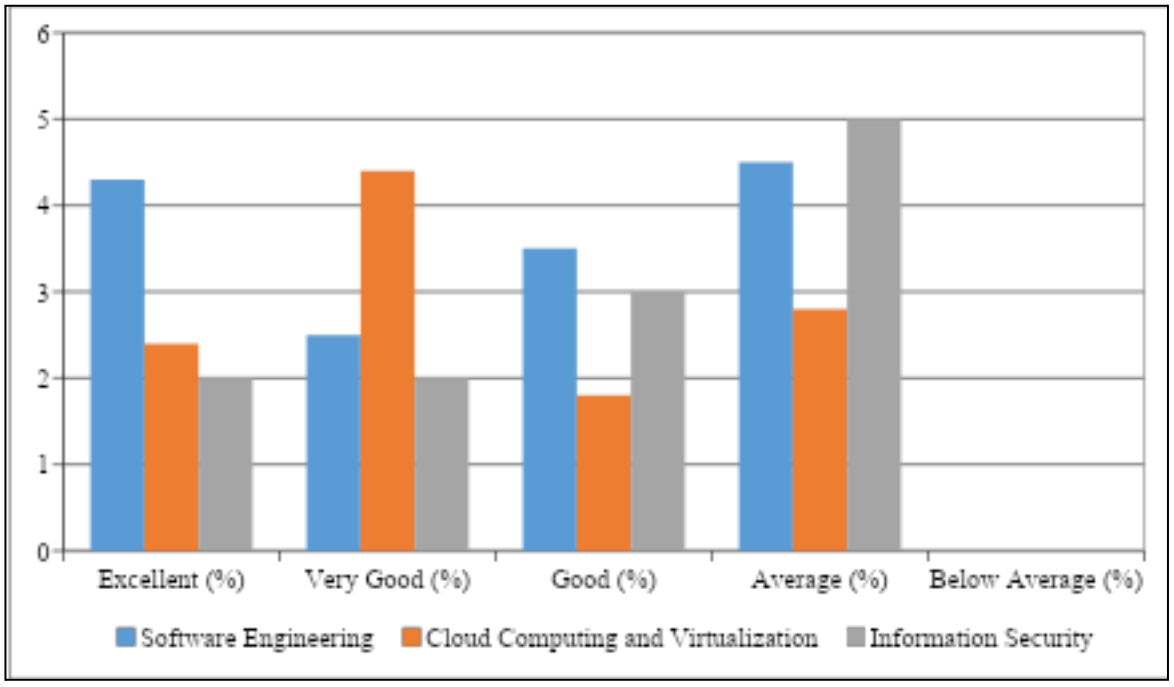
AIML 4th Semester								
Parameter(Average Grading)				Excellent (%)	Very Good (%)	Good (%)	Average (%)	Below Average (%)
Subject Code	Subject Name	Semester	Faculty Name					
3280423	Software Engineering	IV	Dr. Shubha Mishra	36.83	32.38	28.57	2.22	0
3280424	Cloud Computing and Virtualization	IV	Dr. Sumit Dhariwal	43.83	26.62	21.43	8.12	0
3280425	Information Security	IV	Ms. Pooja Tripathi	35	34	27	4	0



AIML 4th Semester

Centre for Artificial Intelligence

Course-wise Analysis of Curriculum Feedback by Students for

Artificial intelligence and Data Science

(Average value of responses (on a scale of 1 to 5) 5:Strongly Agree, 4:Agree, 3:Neutral, 2:Disagree, 1:Strongly disagree)

AIDS 6th Semester							
Subject code/name(no. of student attempted feedback)	**1 .The course is well designed**	**2. The units are balanced**	**3. The learning material was available to you**	**4. The content was clear and easy to understand**	**5.The course was relevant and updated for present needs**	**6.The course meets your career expectations**	**7. The course will be useful to meet your higher studies/future aspirations.**
Natural Language Processing (2270621)	4.15	4.15	4.3	4.35	4.25	4.3	4.25
Image Processing (2270622)	4.31	4.37	4.31	4.34	4.37	4.31	4.34
Deep Learning (2270623)	4.80	4.80	4.80	4.50	4.80	4.70	4.80

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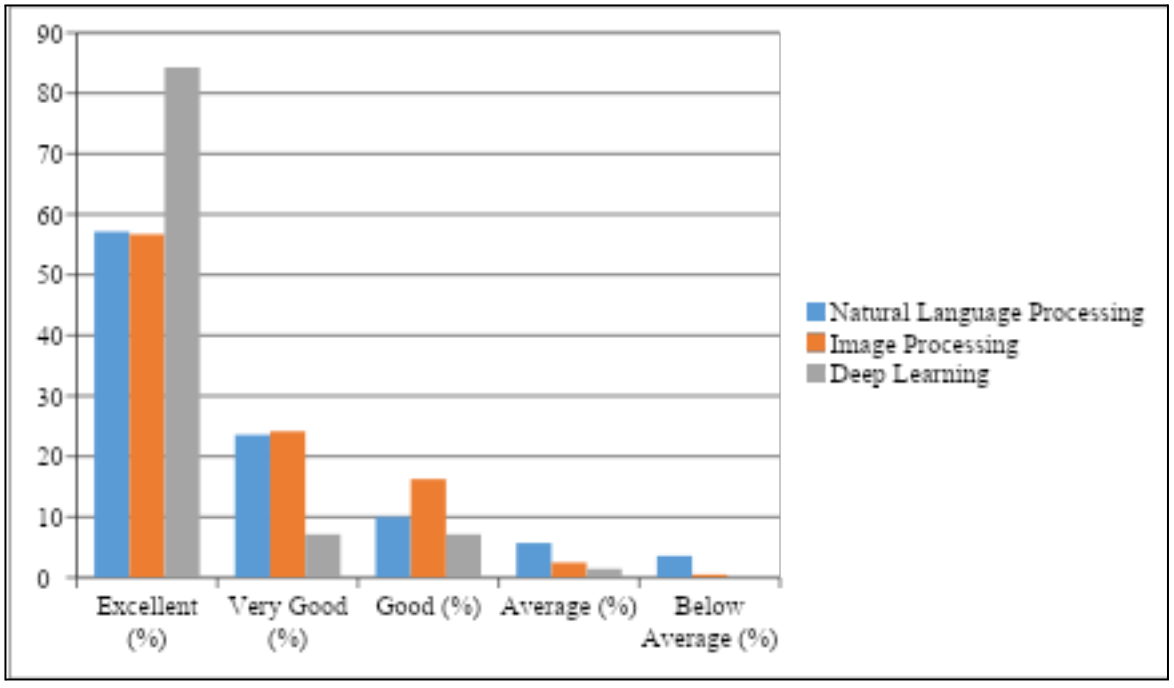
AIDS 6th Semester								
Parameter(Average Grading)				Excellent (%)	Very Good (%)	Good (%)	Average (%)	Below Average (%)
Subject Code	Subject Name	Semester	Faculty Name					
2270621	Natural Language Processing	VI	Dr. Shweta Chauhan	57.14	23.57	10.00	5.71	3.57
2270622	Image Processing	VI	Dr. Tej Singh	56.65	24.14	16.26	2.46	0.49
2270623	Deep Learning	VI	Dr. Abhishek Bhatt	84.29	7.14	7.14	1.43	0.00



AIDS 6th Semester

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AIDS 4th Semester							
Subject code/name(no. of student attempted feedback)	**1 .The course is well designed**	**2. The units are balanced**	**3. The learning material was available to you**	**4. The content was clear and easy to understand**	**5.The course was relevant and updated for present needs**	**6.The course meets your career expectations**	**7. The course will be useful to meet your higher studies/future aspirations.**
Software Engineering (3270423)	4.55	4.55	4.33	4.11	4	3.55	3.88
Cloud Computing and Virtualization (3270424)	4.26	4.21	4.21	4.16	4.21	4.26	4.26
Information Security (3270425)	4.07	4.17	4.03	4.14	3.93	3.97	3.90

AIDS 4th Semester								
Parameter(Average Grading)				**Excellent (%)**	**Very Good (%)**	**Good (%)**	**Average (%)**	**Below Average (%)**
Subject Code	**Subject Name**	**Semester**	**Faculty Name**					
3270423	Software Engineering	IV	Ms. Pooja Tripathi	36	33	27	4	0
3270424	Cloud Computing and Virtualization	IV	Dr. Sumit Dhariwal	48.87	30.83	14.29	6.02	0.00
3270425	Information Security	IV	Mrs. Geetika Hazra	47.29	17.73	26.11	8.37	0.49

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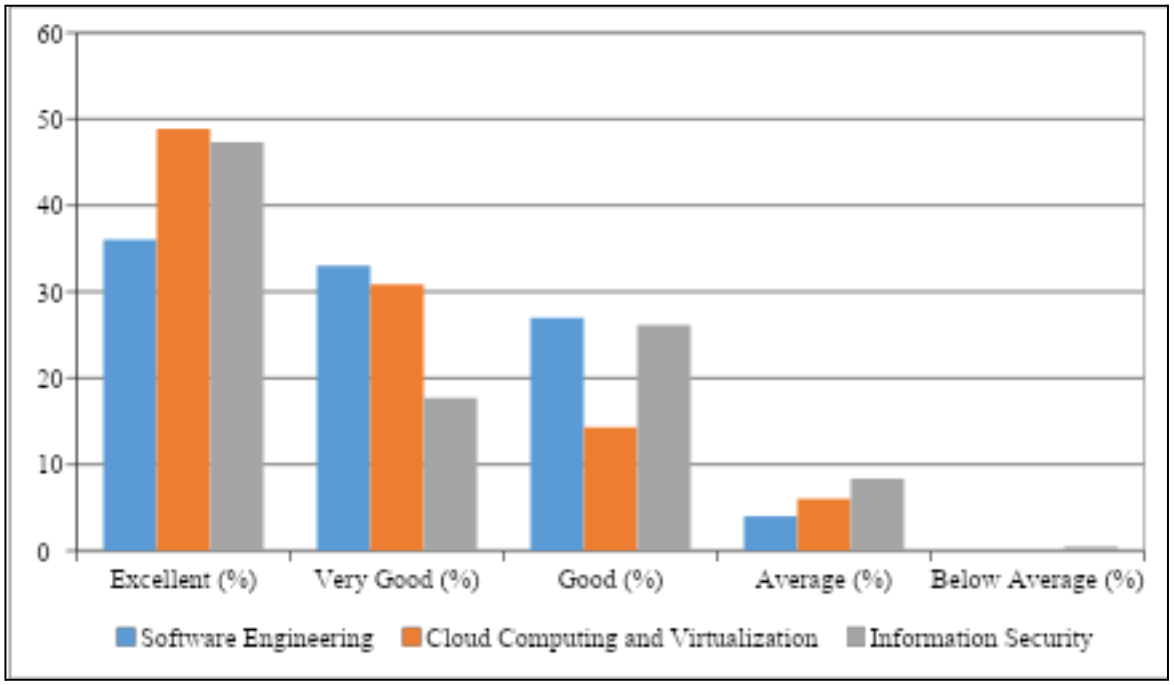

AIDS 4th Semester

ANNEXURE - VI

PO attainment, CO-PO mapping matrix and Action to be Taken to improve PO attainment level for batch admitted in 2021-22 of Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning

Centre for Artificial Intelligence

CO-PO mapping matrix - IT(AIR) Batch admitted in 2021-22

			CO Attainment			CO-PO Matrix													
Course Code and Name		**Course Outcome Statements**	**Direct Attainment**	**Indirect Attainment**	**Total Attainment**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
Introduction to Artificial Intelligence (240101)	CO1	define basic concepts of Artificial Intelligence	2.54	2.80	2.62	3	2	2	1			1	1	1	3	2	1	2	3
	CO2	relate various computer components used in Artificial Intelligence	2.71	2.87	2.76	2	3	3	2	2		2		2	2	2	2	2	2
	CO3	identify different logical and reasoning techniques used in AI	2.96	2.66	2.87	3	2	2	2	1			1	1	1	1	2	2	2
	CO4	analyze the general approach of optimization, intelligent agent and expert system	2.76	2.59	2.71	2	3	2	2	2				2	2	1	2	1	3
	CO5	analyze the general approach of machine learning	2.76	2.80	2.77	3	3	2	2	1	1	1		2	1	2	2	3	2
	CO6	build AI enabled intelligent procedures for solving real world problems	2.78	2.88	2.81	3	2	2	1	1	2		1	2		2	2	2	2
Introduction to Computer Programming (230102)	CO1	Identify situations where computational methods and computers would be useful.	2.30	2.50	2.36	3	3	2	3	2	2	1		2			1	3	3
	CO2	Describe the basic principles of imperative and structural programming.	2.40	2.69	2.49	2	2	3	3	2	1		1			2	1	2	1
	CO3	Develop a pseudo-code and flowchart for a given problem.	2.59	2.78	2.65	3	3	2	2	3	2			2	2		3	3	2
	CO4	Analyze the problems and choose suitable programming techniques to develop solutions.	2.40	2.69	2.49	2	2	3	3	3	2	2	1	1			3	3	2
	CO5	Design, implement, debug and test programs.	2.50	2.88	2.61	3	3	3	2	2	3		3	3	2	3	1	2	2
	CO6	Design computer programs to solve real world problems.	2.53	2.56	2.54	3	2	2	3	2	3		2	3	2	2	3	3	3
Energy Environment, Ecology & Society (100015)	CO1	describe the various types of energy systems and their roles in societal and environmental contexts.	2.26	2.39	2.30	3	3	3	3	2	2	1	2	1			2	3	2
	CO2	analyze the environmental consequences of energy production and consumption, including pollution and climate change.	2.12	2.33	2.18	2	2	3	2	2	3	2			2	2	1	3	3
	CO3	evaluate renewable energy technologies and strategies for sustainable development in comparison to conventional energy systems.	2.26	2.39	2.30	3	3	2	3	3	2	3	2	2		1	3	2	3
	CO4	apply ecological principles to assess the impact of human activities on ecosystems and biodiversity.	2.47	2.22	2.40	2	3	3	3	3	3	1		2	2		3	3	2
	CO5	design sustainable energy and environmental management practices that balance ecological integrity and societal needs.	2.30	2.16	2.26	3	2	3	2	2	3	3	3	3	2	3	1	3	2
	CO6	reflect on the ethical and social responsibilities associated with energy use and environmental stewardship to propose actionable solutions.	2.30	2.33	2.31	3	3	2	3	2	3		2	3	2	2	3	3	3
Basic Electrical & Electronics Engineering (100022)	CO1	Solve dc & ac circuits by applying fundamental laws & theorems	1.99	2.10	2.02	3	3	2	1			1		1	3	2	1	3	2
	CO2	Compare the behavior of electrical and magnetic circuits for given input	1.86	2.05	1.92	2	3	3	2	2	2	2	1	2	2	2	2	2	3

Centre for Artificial Intelligence

CO-PO mapping matrix - IT(AIR) Batch admitted in 2021-22

Course Code and Name		Course Outcome Statements	CO Attainment			CO-PO Matrix													
			Direct Attainment	Indirect Attainment	Total Attainment	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
	CO3	Explain the working principle, construction, applications of rotating electrical machines	1.99	2.10	2.02	3	3	2	2	1				1	1	1	2	2	1
	CO4	Explain the working principle, constructional details, losses & applications of single-phase transformer	2.17	1.95	2.10	3	3	2	2	2	1	2		2	2	1	2	3	2
	CO5	Select the logic gates for various applications in digital electronic circuits	2.03	1.90	1.99	2	3	2	2	1	1	1		2	1	2	2	2	2
	CO6	Explain characteristics of Diode and Transistor	2.03	2.05	2.04	3	2	2	1	1	2		1	2		2	2	3	3
Linear Algebra (250100)	CO1	determine the solution of Matrix	2.19	2.31	2.23	3	3	3	1	1	2			2		2	2	3	2
	CO2	find the analytical solution of algebraic structures	2.05	2.26	2.11	2	3	3	2	1	1	1	1	2	1	2	2	2	3
	CO3	express the vector space	2.19	2.31	2.23	3	2	2	1	1	2	1		2		2	2	2	1
	CO4	acquire the knowledge of Linear transformation	2.39	2.15	2.32	2	3	2	2	1	2	1		3		3	3	3	2
	CO5	illustrate the concept of Inner product spaces	2.23	2.09	2.19	3	3	3	2	3	2			3		3	3	2	2
Digital Logic Design (230201)	CO1	Illustrate various number systems, Binay codes and its application in digital design.	2.07	2.20	2.11	3	3	2	1		2	2		1	3	2	1	2	2
	CO2	Identify the logic functions, circuits, truth tables and also apply the laws of Boolean algebra to simplify circuits and expressions.	1.95	2.15	2.01	3	3	3	2	2		2		2	2	2	2	3	23
	CO3	Develop the formal procedures for the analysis and design of combinational circuits.	2.07	2.20	2.11	3	3	2	2	1				1	1	1	2	2	2
	CO4	Analyse sequential circuit's components and their usability in digital circuits.	2.27	2.04	2.20	3	3	2	2	2				2	2	1	2	1	2
	CO5	Compare the concept of memories, programmable devices and digital ICs.	2.12	1.99	2.08	3	3	2	2	1	1	2		2	1	2	2	3	2
	CO6	Design and analyze circuits for digital arithmetic.	2.03	2.15	2.07	3	2	2	1	1	2		1	2		2	2	2	2
Data Structures (240202)	CO1	describe the basics of algorithms and their performance criteria.	2.59	2.75	2.64	3	3	3	1	1	2		2	2	1	2	2	2	2
	CO2	explain the working of linear/non-linear data structures.	2.44	2.68	2.51	2	3	3	2	1	1			2	2	2	2	2	3
	CO3	identify the appropriate data structure to solve specific problems.	2.59	2.75	2.64	3	2	2	1	1	2	1	1	2		2	2	2	2
	CO4	decompose complex data structures, such as trees and graphs, into simpler components.	2.83	2.55	2.75	2	3	2	2	1	2			3	1	3	3	3	2
	CO5	evaluate the time/space complexities of data structures & their applications.	2.65	2.49	2.60	3	3	3	2	3	2		2	3		3	3	3	3
	CO6	design optimal algorithmic solutions for various real-world problems.	2.65	2.68	2.66	3	2	3	2	1	2			2	1	2	2	2	2
Object Oriented Programming and Methodology (240203)	CO1	describe fundamental principles of object-oriented programming.	2.28	2.42	2.32	3	3	3	3	3	3	1	1	1	1	1	3	1	1
	CO2	explain the benefits of object-oriented design.	2.14	2.36	2.21	3	3	3	3	3	2	2	1	1	1	2	3	2	2

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CO-PO mapping matrix - IT(AIR) Batch admitted in 2021-22

			CO Attainment			CO-PO Matrix													
Course Code and Name		**Course Outcome Statements**	**Direct Attainment**	**Indirect Attainment**	**Total Attainment**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
(240203)	CO3	develop well-structured, modular programs that leverage classes, objects, and inheritance to enhance code maintainability and reusability.	2.28	2.42	2.32	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	CO4	inspect the programs for the identification and correction of errors and exceptions.	2.50	2.25	2.43	3	3	3	3	3	3	3	3	3	1	2	3	3	2
	CO5	apply standard template libraries for efficient and generic programming.	2.33	2.19	2.29	3	3	3	3	3	3	2	3	3	1	3	3	3	3
	CO6	design effective solutions for real world problems using object-oriented principles.	2.33	2.36	2.34	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Sensor Technology (220202)	CO1	Explain fundamentals of Sensors & Transducers	2.37	2.51	2.41	3	3	3	3	2	2	1	2	1			2	3	3
	CO2	Describe physical principles of sensing	2.23	2.45	2.30	2	2	3	2	2	3				2		1	1	2
	CO3	Compare various sensor materials and technology used in designing sensors	2.37	2.51	2.41	3	3	2	3	3	2		2	2			3	3	
	CO4	Select appropriate sensor for given application	2.59	2.33	2.51	2	3	3	3	3	3			2	2		3	3	2
	CO5	Recognize the latest trends in the field of sensor	2.42	2.27	2.38	3	2	3	2	2	3	1	3	3	2	3	1	2	2
	CO6	Recognize the latest trends in the field of sensor	0.00	0.00	0.00	3	3	2	3	2	3	1	2	3	2	2	3	3	3
Technical Language (100016)	CO1	explain key technical terms and concepts relevant to their field of study.	2.08	2.21	2.12	3	3	3	2		2								
	CO2	analyze technical documents, such as manuals, specifications, and reports, to extract essential information.	1.96	2.16	2.02	3	2			2	2	1	1	2	3	1	2	2	2
	CO3	construct clear and concise technical communication, including reports, emails, and presentations.	2.08	2.21	2.12	2	3	2	2	3	2	1	2	2	2	2	3	2	3
	CO4	create technical documents such as user guides, project proposals, and research papers, adhering to standard formats and conventions.	2.28	2.04	2.21	3	3	2		2		2		3	3	2	2	3	2
	CO5	evaluate the clarity, accuracy, and effectiveness of technical communication produced by themselves and others.	2.13	2.00	2.09	3	2	2	3	2		1	2		3			2	2
	CO6	apply technical language and communication strategies effectively in professional scenarios, such as interviews, meetings, and collaborative projects.	2.13	2.16	2.14	2	3	2	2	1	2	2		2	1	2	2	2	2
Design & Analysis of Algorithms (240301)	CO1	I am able to demonstrate a familiarity with major algorithms and data structures.	1.90	2.01	1.93	3	2	3	3	2	2	2			2	2	3	3	3
	CO2	I am able to apply important algorithmic design paradigms and methods of analysis.	1.78	1.96	1.83	2	3	3	2	3	3		2		3	3	3	3	3
	CO3	I am able to analyze the asymptotic performance of algorithms.	1.90	2.01	1.93	3	3	3	3	3	3			2	2	2	2	2	2
	CO4	I am able to compare different design techniques to develop algorithms for computational problems.	2.07	1.86	2.01	3	2	3	3	2	3	1		3	3	2	3	3	2

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CO-PO mapping matrix - IT(AIR) Batch admitted in 2021-22

			CO Attainment			CO-PO Matrix													
Course Code and Name		**Course Outcome Statements**	**Direct Attainment**	**Indirect Attainment**	**Total Attainment**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
	CO5	I am able to design algorithms using greedy strategy, divide and conquer approach, dynamic programming, backtracking and branch n bound approach.	1.94	1.81	1.90	3	2	2	3	3	3		2		2	3	3	3	3
	CO6	I am able to understand the hardness and different classes of hardness. Further, design approximate solutions for computationally hard problems.	1.94	1.96	1.95	3	2	2	3	2	2	2	2				2	2	2
Operating System (240302)	CO1	tell the basic concept of operating systems.	2.72	2.19	2.56	3	2	3	3	2	2				2	2	3	3	3
	CO2	explain the working procedure of the operating system.	2.32	2.08	2.25	2	3	2	2	3	3	1	2		3	3	3	3	3
	CO3	analyze the various operating system problems and issues.	2.63	2.19	2.50	3	3	3	3	3	3	1	1	2	2	2	2	2	2
	CO4	develop the solutions for various operating system problems and issues.	2.78	2.03	2.56	2	2	3	3	2	3	3		3	3		3	3	2
	CO5	measure the performance of various scheduling and allocation techniques.	2.65	2.24	2.53	3	3	2	3	3	3		2		2	3	3	3	3
	CO6	test the working of various scheduling and allocation techniques.	2.76	2.13	2.57	3	2	2	3	2	2	2	2	1		2	2	2	2
Computer Networks and Protocols (240303)	CO1	I am able to explain the fundamental concepts of computer network.	2.26	2.39	2.30	3	2	3	3	2	2	2			2	2	3	3	3
	CO2	I am able to illustrate the basic taxonomy & terminologies of computer network protocols	2.12	2.33	2.18	2	3	3	2	3	3	3	2		3	3	3	3	3
	CO3	I am able to develop a concept for understanding advance computer network.	2.26	2.39	2.30	3	3	3	3	3	3	3		2	2	2	2	2	2
	CO4	I am able to build the skill of IP addressing and routing mechanism.	2.47	2.22	2.40	3	2	3	3	2	3			3	3	2	3	3	2
	CO5	I am able to predict the performance of computer network in congestion and internet.	2.30	2.16	2.26	3	2	2	3	3	3		2		2	3	3	3	3
	CO6	I am able to construct the network environment for implementation of computer networking concept.	2.30	2.33	2.31	3	2	2	3	2	2		2				2	2	2
Database Management System (240304)	CO1	I am able to demonstrate the concepts of different type of database system	2.30	2.13	2.25	3	2	3	3	2	2	1			2	2	3	3	3
	CO2	I am able to apply relational algebra concepts to design database system	2.30	1.99	2.21	2	3	3	2	3	3	1	2	2	3	3	2	3	3
	CO3	I am able to make use of queries to design and access database system.	2.25	1.99	2.17	3	3	3	3	3	3			2	2	2	2	2	2
	CO4	I am able to analyze the evaluation of transaction processing and concurrency control	1.81	1.99	1.86	3	2	3	3	2	3		2	3	3	2	3	3	2
	CO5	I am able to determine the optimize database for real world applications.	1.96	2.07	1.99	3	2	2	3	3	3		2		2	3	3	3	3
	CO6	I am able to design a database system for a real world application	2.25	2.02	2.18	3	2	2	3	2	2	2	2				2	2	2
Probability and	CO1	Interpret the theory of Probability and its distributions	2.26	1.62	2.07	3	2	3	3	2	2	2			2	2	3	2	3

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CO-PO mapping matrix - IT(AIR) Batch admitted in 2021-22

Course Code and Name		Course Outcome Statements	CO Attainment			CO-PO Matrix													
			Direct Attainment	Indirect Attainment	Total Attainment	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
Random Process (250106)	CO2	Evaluate the Skewness, Kurtosis, curve fitting, correlation and regression.	2.30	1.48	2.05	2	3	3	2	3	3		2		3	3	3	3	2
	CO3	Analyze the test of hypothesis	2.47	1.48	2.17	3	3	3	3	3	3			2	2	2	2	2	2
	CO4	Acquire the knowledge of random variables.	1.08	1.48	1.20	3	2	3	3	2	3			3	3	2	3	3	2
	CO5	Determine the random process	2.17	1.59	2.00	3	2	2	3	3	3		2		2	3	3	2	3
Design and Analysis of Algorithm (240301)	CO1	demonstrate a familiarity with major algorithms and data structures.	2.14	2.51	2.25	3	2	3	3	2	2	2			2	2	3	3	3
	CO2	apply important algorithmic design paradigms and methods of analysis.	2.02	2.45	2.15	2	3	3	2	3	3		2		3	3	3	3	3
	CO3	analyze the asymptotic performance of algorithms.	2.14	2.51	2.25	3	3	3	3	3	3			2	2	2	2	2	2
	CO4	compare different design techniques to develop algorithms for computational problems.	2.34	2.33	2.34	3	2	3	3	2	3	1		3	3	2	3	3	2
	CO5	design algorithms using greedy strategy, divide and conquer approach, dynamic programming, backtracking and branch n bound approach.	2.19	2.27	2.21	3	2	2	3	3	3		2		2	3	3	3	3
	CO6	understand the hardness and different classes of hardness. Further, design approximate solutions for computationally hard problems.	2.11	1.92	2.05	3	2	2	3	2	3	2	1				2	3	2
Operating System (240302)	CO1	tell the basic concept of operating systems.	1.93	2.26	2.03	3	2	3	3	2	2				2	2	3	3	3
	CO2	explain the working procedure of the operating system.	1.81	2.21	1.93	2	3	2	2	3	3	1	2		3	3	3	3	3
	CO3	analyze the various operating system problems and issues.	1.93	2.26	2.03	3	3	3	3	3	3	1	1	2	2	2	2	2	2
	CO4	develop the solutions for various operating system problems and issues.	2.11	2.09	2.10	2	2	3	3	2	3	3		3	3		3	3	2
	CO5	measure the performance of various scheduling and allocation techniques.	1.97	2.04	1.99	3	3	2	3	3	3		2		2	3	3	3	3
	CO6	test the working of various scheduling and allocation techniques.	1.97	2.21	2.04	3	2	2	3	2	2	2	2	1		2	2	2	2
Computer Networks and Protocols (240303)	CO1	explain the fundamental concepts of computer network.	2.19	2.53	2.29	3	2	3	3	2	2	2			2	2	3	3	3
	CO2	illustrate the basic taxonomy & terminologies of computer network protocols	2.32	2.38	2.34	2	3	3	2	3	3	3	2		3	3	3	3	3
	CO3	develop a concept for understanding advance computer network.	2.70	2.46	2.63	3	3	3	3	3	3	3		2	2	2	2	2	2
	CO4	build the skill of IP addressing and routing mechanism.	2.53	2.50	2.52	3	2	3	3	2	3			3	3	2	3	3	2
	CO5	predict the performance of computer network in congestion and internet.	2.67	2.46	2.61	3	2	2	3	3	3		2		2	3	3	3	3
	CO6	construct the network environment for implementation of computer networking concept.	2.37	2.50	2.41	3	2	2	3	2	2		2				2	2	2

Centre for Artificial Intelligence

CO-PO mapping matrix - IT(AIR) Batch admitted in 2021-22

			CO Attainment			CO-PO Matrix													
Course Code and Name		**Course Outcome Statements**	**Direct Attainment**	**Indirect Attainment**	**Total Attainment**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
Database Management System (240304)	CO1	demonstrate the concepts of different type of database system	2.26	2.39	2.30	3	2	3	3	2	2	1			2	2	3	3	3
	CO2	apply relational algebra concepts to design database system	2.12	2.33	2.18	2	3	3	2	3	3	1	2	2	3	3	2	3	3
	CO3	make use of queries to design and access database system.	2.26	2.39	2.30	3	3	3	3	3	3			2	2	2	2	2	2
	CO4	analyze the evaluation of transaction processing and concurrency control	2.47	2.22	2.40	3	2	3	3	2	3		2	3	3	2	3	3	2
	CO5	determine the optimize database for real world applications.	2.30	2.16	2.26	3	2	2	3	3	3		2		2	3	3	3	3
	CO6	design a database system for a real world application	2.30	2.33	2.31	3	2	2	3	2	2	2	2				2	2	2
Database Management System Lab (270305)	CO1	construct a database schema for a given problem domain.	2.32	2.30	2.31	3	2	3	3	2	3	3		3	3	2	3	1	2
	CO2	apply integrity constraints on a database schema using a state-of-the-art RDBMS.	2.27	2.25	2.26	2	2	2	3	3	3	2	2		2	3	3	2	2
	CO3	apply SQL queries using DDL and DML to design and access database systems.	2.32	2.43	2.35	3	2	2	3	2	2		2				2	2	2
	CO4	make use of operators and functions used in query.	2.24	2.37	2.28	3	2	2	1	2	2			2		3	2	1	2
	CO5	distinguish Tables and Views for database systems.	2.10	2.31	2.16	2	2	2	2	2		2	2	2	2	3	3	2	2
	CO6	develop a small project for a real world scenario	2.24	2.37	2.28	2	3	2	1	2	1	1	2	2		3	2	2	2
Python Programming Lab (240305)	CO1	describe the fundamental syntax, data structures, and core concepts of Python programming.	2.55	2.55	2.55	3	2	3	3	2	2				2	2	3	3	3
	CO2	develop Python programs to solve computational problems using appropriate control structures, functions, and libraries.	2.21	2.21	2.21	2	3	3	2	3	3		2		3	3	3	3	3
	CO3	analyze and debug Python code to identify and resolve logical and runtime errors.	2.01	2.01	2.01	3	3	3	3	3	3			2	2	2	2	2	2
	CO4	build Python applications incorporating modules like file handling, exception handling, and object-oriented programming concepts.	1.94	1.94	1.94	3	2	3	3	2	3	2		3	3	2	3	3	2
	CO5	evaluate the performance of Python programs based on computational efficiency and resource utilization.	1.50	1.50	1.50	3	2	2	3	3	3	2	2		2	3	3	3	3
	CO6	implement algorithms such as sorting, searching, and recursion using Python to solve real-world problems.	1.73	1.73	1.73	3	2	2	3	2	2	2	2				2	2	2
Computer architecture and Microprocessor (240401)	CO1	demonstrate the computer architecture and microprocessor for defining basic component and functional units.	2.60	3.00	2.72	3	2	3	3	2	2	2			2	2	3	1	1
	CO2	develop the fundamental concept to understand the working of computer architecture and microprocessor.	2.70	3.00	2.79	2	3	3	2	3	3	3	2		3	3	3	1	1
	CO3	explain the basic concept of input output and memory organization.	2.60	2.80	2.66	3	2	2	3	1	3	2		2	2	2	3	2	2

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			Direct Attainment	Indirect Attainment	Total Attainment	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
	CO4	develop the skill of writing assembly language programming.	2.30	2.90	2.48	3	2	3	3	2	3	3		3	3	2	3	1	2
	CO5	build a system using peripheral devices and controllers for 8086 microprocessors.	2.80	2.80	2.80	3	2	2	3	3	3	2	2		2	3	3	2	2
	CO6	apply the concept of computer architecture and microprocessor in solving real world problems.	2.50	3.00	2.65	3	2	2	3	2	2	2	2				2	2	2
Cloud computing (240402)	CO1	describe cloud computing fundamentals.	2.24	2.37	2.28	1	2	2	1	2	1	1	1	2		3	2	1	2
	CO2	explain architecture, infrastructure and delivery models.	2.10	2.31	2.16	2	2	2	1	2	1	1	2	2	2	3	3	2	2
	CO3	apply suitable virtualization concepts based on problem characteristics.	2.24	2.37	2.28	2	3	2	1	2	1	1	2	2		3	2	2	2
	CO4	choose appropriate programming models for a specific cloud computing application.	2.44	2.20	2.37	3	2	2	1	3	1	1	1	2	2	3	3	2	2
	CO5	analyze various security issues in cloud computing.	2.28	2.14	2.24	2	3	3	1	2	1	2	1	2		3	2	2	3
	CO6	create a secure and efficient cloud computing environment.	2.28	2.31	2.29	2	2	3	2	1	2			2	1	2	2	2	2
Machine Learning and optimization (240404)	CO1	Summarize different kind of machine learning algorithms.	2.02	1.89	1.98	3	2	3	3	2	2	2			2	2	3	3	3
	CO2	Demonstrate a familiarity with major optimzation algorithms.	1.89	1.84	1.88	2	3	3	2	3	3	3	2		3	3	3	3	3
	CO3	Apply optimization algorithms to solve real world problems.	2.02	1.89	1.98	3	3	3	3	3	3	3		2	2	2	2	2	2
	CO4	Formulation of design problems as methematical programming problems.	2.20	1.76	2.07	3	2	3	3	2	3	3			3	2	3	3	2
	CO5	Examine supervised and unsupervised learning methods for real-life problems.	2.05	1.71	1.95	3	2	2	3	3	3	2	2		2	3	3	3	3
	CO6	Deploy machine learning models for real time problems.	2.05	1.84	1.99	3	2	2	3	2	2	2	2				2	2	2
Software Engineering (240403)	CO1	explain the concepts of software engineering.	2.21	2.88	2.41	3	3	2	1	2	1	1	2	2		3	2	2	3
	CO2	analyze and design software for real world problems.	2.50	2.88	2.61	2	2	2	1	2	2	2	1	2	2	3	3	2	2
	CO3	compare the techniques for software project management & estimation.	1.44	2.69	1.82	2	3	2	1	2	1	1	1	2		3	2	3	3
	CO4	choose an appropriate software development model for a real-life software project.	1.44	2.88	1.87	3	2	2	1	3	1	1	2	2	2	3	3	2	2
	CO5	design software using modern tools and technologies.	1.15	2.69	1.61	2	3	3	1	2	1	2	1	2		3	2	2	3
	CO6	test the software through different approaches.	1.25	2.88	1.74	2	2	3	2	1	2			2	3	2	2	3	2
Network & Web Security (240505)	CO1	determine symmetric and public key cryptography, classical algorithms, and basic number theory.	2.22	2.08	2.18	3	3	3	3	3	2	1	1	2	1	2	3	2	3
	CO2	explain the working of various cryptographic algorithms.	2.07	2.04	2.06	3	3	3	3	2	1		2	1	1	2	3	1	2

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	CO3	apply firewall, IDS, and security protocols like SSL, TLS, and SET.	2.22	2.08	2.18	3	3	3	3	2	2	1	1	2	1	2	3	2	3
	CO4	build secure systems using digital signatures, message authentication, and certificates.	2.42	1.93	2.27	3	3	3	3	1	1		2	1	1	1	2	1	3
	CO5	examine the strengths and weaknesses of IP and web security.	2.26	1.88	2.15	3	3	3	3	1	2	1	1	1	2	1	2	1	2
	CO6	select strategies for detecting and preventing attacks like sniffing, spoofing, and hacking.	2.26	2.04	2.19	3	2	2	1	3	1		2	2	2	3	3	2	2
Design and Thinking Lab (240406)	CO1	design IoT-based systems by integrating sensors, actuators, and communication modules to address real-world challenges.	2.30	2.40	2.33	3	2	2	1	2	2		2	2		3	2	1	2
	CO2	implement IoT communication protocols such as MQTT, HTTP, and CoAP to enable device-to-device and device-to-cloud interactions.	2.40	1.92	2.26	2	2	2	1	2	1		1	2		2	3	2	2
	CO3	analyze data collected from IoT sensors using software tools to extract meaningful insights and patterns.	2.59	2.21	2.48	2	3	2	1	2	1	2	2	2	1	3	2	2	2
	CO4	develop applications that leverage IoT technologies for domains like smart homes, healthcare, or industrial automation.	2.88	1.92	2.59	3	2	2	1	3	1		1	2	2	3	3	2	2
	CO5	evaluate the performance, scalability, and reliability of IoT systems under various operational conditions.	2.02	2.40	2.13	2	3	3	1	2	1	3	1	2		3	2	2	3
	CO6	apply authentication, encryption, and other cybersecurity measures to safeguard IoT devices and data.	2.02	2.40	2.13	3	2	3	2	1	2	3		2	1	2	2	2	2
Robotics System and Control (240504)	CO1	Illustrate different basic terms related to Robotics and their function	2.30	3.00	2.51	3	2	3	3	2	2	2			2	2	3	2	3
	CO2	summarize the Fundamentals of robot kinematics and control system	2.60	3.00	2.72	2	3	3	2	3	3	3	2		3	3	2	3	3
	CO3	classify the different kind of sensor and actuators used in robotics	1.50	2.80	1.89	3	3	3	3	3	3	3		2	2	2	2	2	2
	CO4	explain the basics of trajectory planning in robotics and its end effectors	1.50	3.00	1.95	3	2	3	3	2	3			3	3	2	3	3	2
	CO5	know about the Robot vision and, motion plnning and robot applications	1.20	2.80	1.68	3	2	2	3	3	3	1	2		2	3	3	3	3
	CO6	describe the concept of algorithm for inteligent system and internet of robotics	1.30	3.00	1.81	3	2	2	3	2	2		2	1	1		2	2	2
Data Science using Python (240502)	CO1	define the concepts and importance of data science.	2.69	2.88	2.75	3	3	2	3	2	2		2		1		2	3	2
	CO2	describe and investigate the data.	2.88	2.88	2.88	2	3	3	3	2	2	1		1		2	1	3	3
	CO3	implement descriptive and inferential statistics approach on real world data	2.78	2.11	2.58	3	3	2	3	3	2		2	2	2		3	2	3
	CO4	develop real world solutions using supervised and unsupervised learning methods.	2.59	2.11	2.45	3	2	3	3	3	2		2	2	2		3	3	2

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	CO5	evaluate the best performing algorithms based on performance metrics.	1.92	2.11	1.98	3	3	3	2	2	3	3	3	3	2	3	1	2	2
	CO6	examine the stability of machine learning based models.	2.11	2.02	2.08	3	3	2	3	2	3	3	2	3	2	2	3	3	3
Theory of Computation (240503)	CO1	Explain the basic concepts of switching and finite automata theory & language	2.40	2.50	2.43	3	2	3	3	2	2	2			2	2	3	2	2
	CO2	Relate practical problems to language,automata, computability and complexity	2.50	2.00	2.35	2	3	3	2	3	3	3	2		3	3	3	2	2
	CO3	Construct abstract model of computing and check their power to recognize the language	2.70	2.30	2.58	3	3	3	3	3	3	3		2	2	2	2	2	2
	CO4	Analyze the grammar,its types, simplification and normal form	3.00	2.00	2.70	3	2	3	3	2	3	3		3	3	2	3	2	2
	CO5	Interpret rigorously formal mathematical mothods to prove properties of languages, grammars and automata	2.10	2.50	2.22	3	2	2	3	3	3	2	2		2	3	3	2	2
	CO6	Devlop and overview of how automata theory, languages and computation are applicable in engineering applications	2.10	2.50	2.22	3	2	2	3	2	2	2	2		1		2	2	2
Discrete Structures (240501)	CO1	explain the concepts of set theory, propositional logic, graph theory, discrete numeric function and algebraic structure.	2.88	2.88	2.88	3	3	3	1	1	2		2	2	1	2	2	2	2
	CO2	apply mathematical reasoning and logical thinking to solve problems	2.59	2.88	2.68	2	3	3	2	1	1			2	1	2	2	2	2
	CO3	determine the solutions of problems pertaining to computer sciences using graph theory concepts.	2.50	2.88	2.61	3	2	2	1	1	2	2	1	2		2	2	2	2
	CO4	solve counting problems using combinatorial analysis.	2.88	2.88	2.88	2	3	2	2	1	2			3		3	3	2	2
	CO5	solve real-world problems by translating practical problems into mathematical formulations	2.78	2.88	2.81	3	3	3	2	3	2	3	2	3		3	3	2	2
	CO6	formulate and design original mathematical proofs.	2.50	2.88	2.61	3	2	3	2	1	2			2	1	2	2	2	2
Soft Computing Techniques (240505)	CO1	Define basic concepts of neural network and fuzzy systems	2.69	2.88	2.75	2	2	1	2	2		2	2		2		3	2	2
	CO2	Compare solutions by applying various soft computing approaches on a given problem	2.50	2.88	2.61	2	2	3	1	2					1	1	3	2	1
	CO3	Develop and train different supervised and unsupervised learning	2.40	2.88	2.54	3	2		2			1		2	2		3	1	2
	CO4	Classify various nature inspired algorithms according to their application aspect	2.30	2.88	2.47	2	3	2	2		1		1	3	2	2	2	2	2
	CO5	compare the efficiency of various hybrid systems	2.21	2.88	2.41	3	1	3	3	2	2			2				2	2
	CO6	design a soft computing models for solving real world problems	1.92	2.88	2.21	2	2	1		2		2	2		2	3	2	2	2
Disaster	CO1	Identify disaster prevention and mitigation approaches.	2.50	2.30	2.44	2	2	1	2			2		2	1		3	2	

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Management (1000006)	CO2	Classify global and national disasters, their trends and profiles.	2.10	2.40	2.19		3			1	2		2					3	1
	CO3	Determine the impacts of various disasters.	2.30	2.10	2.24	3	2		2			1				1			2
	CO4	Apply Disaster Risk Reduction in management.	2.00	2.00	2.00						1		1	3	2	2	2	2	1
	CO5	Infer the linkage between disasters, environment and development.	2.00	2.00	2.00		1	3	3	2	2			2				1	1
Image Processing (240602)	CO1	describe the fundamentals of image processing.	2.44	2.29	2.40	3	2	3	3	2	2	2			2	2	3	1	1
	CO2	classify image enhancement techniques in both spatial and frequency domains	2.28	2.24	2.27	2	3	3	2	3	3	3	2		3	3	3	1	1
	CO3	apply image segmentation for object and boundary detection.	2.44	2.29	2.40	3	3	3	3	3	3	3		2	2	2	2	2	2
	CO4	analyze the causes for image degradation and image restoration.	2.66	2.13	2.50	3	2	3	3	2	3	3		3	3	2	3	1	2
	CO5	evaluate image compression techniques.	2.49	2.07	2.36	3	2	2	3	3	3	2	2		2	3	3	2	2
	CO6	implement novel image filtering techniques.	2.49	2.24	2.42	3	2	2	3	2	2	2	2				2	2	2
Artificial Intelligence & Machine Learning (240603)	CO1	describe the fundamental concepts of Artificial Intelligence and Machine Learning.	2.59	2.75	2.64	3	2	3	3	2	2	2			2	2	3	1	1
	CO2	design heuristics driven search solutions for real-world problems.	2.44	2.68	2.51	2	3	3	2	3	3	3	2		3	3	3	1	1
	CO3	identify machine learning based real world problem.	2.59	2.75	2.64	3	3	3	3	3	3	3		2	2	2	2	2	2
	CO4	design Artificial Intelligence enabled intelligent systems for solving real world problems.	2.83	2.55	2.75	3	2	3	3	2	3	3		3	3	2	3	1	2
	CO5	analyze Artificial Intelligence and machine learning algorithms.	2.65	2.49	2.60	3	2	2	3	3	3	2	2		2	3	3	2	2
	CO6	evaluate the performance of Artificial Intelligence and machine learning techniques.	2.65	2.68	2.66	3	2	2	3	2	2	2	2		1		2	2	2
AI for Robotics (240601)	CO1	explain the foundational principles of artificial intelligence (AI) and their applications in robotic systems.	2.30	3.00	2.51	3	3	3	3	2	2	1	2	1		1	2	3	1
	CO2	apply machine learning algorithms to enable robotic systems to perceive, learn, and adapt to dynamic environments.	2.60	3.00	2.72	2	2	3	2	2	3				2		1	1	2
	CO3	design robotic systems that integrate AI techniques such as computer vision, natural language processing, and decision-making algorithms.	1.50	2.90	1.92	3	3	2	3	3	2		2	2		1	3	3	1
	CO4	analyze the behavior of AI-driven robots to evaluate their performance in tasks like navigation, manipulation, and autonomous decision-making.	1.50	3.00	1.95	2	3	3	3	3	3			2	2		3	3	2
	CO5	evaluate the ethical and societal implications of using AI in robotics, including considerations like privacy, security, and job displacement.	1.20	2.40	1.56	3	2	3	2	2	3	3	3	3	2	3	1	2	2

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	CO6	create innovative AI-driven solutions for real-world robotic applications in fields such as healthcare, manufacturing, and autonomous vehicles.	1.30	2.90	1.78	3	3	2	3	2	3	3	2	3	2	2	3	3	3
Humanoid Robotics (240732)	CO1	define the technical aspects of various types of humanoid robot.	2.80	2.70	2.77	3	3	3	1	2	2		2	2	1	2	2	3	3
	CO2	explain the details of mechanism and design of humanoid robots.	2.90	2.90	2.90	3	3	3	2	1	1	1		2	2	2	2	2	3
	CO3	interpret the ZMP and the dynamics of humanoid robots.	2.80	2.90	2.83	3	2	2	1	1	2		2	2		2	2	2	2
	CO4	examine the Biped walking pattern.	2.80	2.70	2.77	3	3	2	2	1	2	1		3		3	3	3	2
	CO5	determine the whole-body motion of a humanoid robot.	2.70	2.70	2.70	3	3	3	2	3	2		2	3		3	3	3	3
	CO6	develop the trends of humanoid robots in society.	2.50	2.50	2.50	3	2	3	2	1	2			2	1	2	2	2	2
Universal Human Values & Professional Ethics (1000008)	CO1	to become more aware of their surroundings, society, social problems and their sustainable solutions.	2.40	2.21	2.34	3	2	3	3	2	2	2			2	2	3	2	3
	CO2	to become sensitive to their commitment towards what they believe in (humane values. humane relationships and humane society).	2.02	2.30	2.10	2	3	3	2	3	3	3	2		3	3	2	3	3
	CO3	to apply what they have learnt to their own self in different day-to-day settings in real life.	2.21	2.02	2.15	3	3	3	3	3	3	3		2	2	2	2	2	2
	CO4	to sustain human relationships and human nature in mind.	1.73	1.92	1.79	3	2	3	3	2	3			3	3	2	3	3	2
	CO5	to have better critical ability.	1.92	1.82	1.89	3	2	2	3	3	3	1	2		2	3	3	3	3
	CO6	to negotiate living in harmony with self and others.	2.02	1.38	1.83	3	2	2	3	2	2		2	1	1		2	2	2
Robot Operating System (240731)	CO1	demonstrate knowledge of operating system dedicated to Robot	2.80	3.00	2.86	3	3	3	1	1	2	3	2	2	1	2	2	2	2
	CO2	understand various case studies of ROS application	2.50	3.00	2.65	2	3	3	2	1	1	2	1	2	1	2	2	2	3
	CO3	apply spatial transformation to obtain forward and inverse kinematics through programming	2.00	2.90	2.27	3	2	2	1	1	2	3	2	2		2	2	2	2
	CO4	solve robot dynamics problems, generate joint trajectory for path planning and Programming	2.90	2.80	2.87	2	3	2	2	1	2	3	3	3		3	3	3	2
	CO5	apply working principle of various ROS debugging process	2.20	2.50	2.29	3	3	3	2	3	2	2	2	3		3	3	3	3
	CO6	appreciate applications of robots in industry.	2.50	3.00	2.65	3	2	3	2	1	2	2	3	2	1	2	2	2	2
Creative Problem Solving (240702)	CO1	analyze complex, real-world problems to identify key challenges and constraints using systematic reasoning.	1.99	2.10	2.02	3	3	3	3	3	2		1	2			1	3	3
	CO2	apply diverse problem-solving frameworks and methodologies to develop viable solutions for identified challenges.	1.86	2.05	1.92	2	2	3	3	2	1		1			2	1	3	2

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	CO3	evaluate multiple solutions for a given problem based on feasibility, sustainability, and ethical considerations.	1.99	2.10	2.02	3	3	2	2	3	2			2	2		3	3	1
	CO4	create original and innovative solutions by synthesizing interdisciplinary knowledge and leveraging creative thinking techniques.	2.17	1.95	2.10	2	2	3	3	3	2	2	1	1			3	3	2
	CO5	demonstrate the ability to work collaboratively in teams, employing effective communication and decision-making strategies to address complex issues.	2.03	1.90	1.99	3	3	3	2	2	3		3	3	2	3	1	2	2
	CO6	reflect on the problem-solving process to identify areas for improvement and propose enhancements for future iterations.	2.03	2.05	2.04	3	2	2	3	2	3	3	2		2	2	3	3	3
Internship/ Project (240703)	CO1	apply the principles of engineering, mathematics, and science to design and execute a comprehensive project or solve industry-specific problems.	2.19	2.31	2.23	3	2	2	3	3	3	2	1	3	1	1	3	2	2
	CO2	analyze complex engineering challenges, identifying root causes and constraints to develop effective solutions.	2.05	2.26	2.11	3	3	3	3	3	2	2	1		2	2	3	2	2
	CO3	design and develop innovative and practical solutions or prototypes that address identified problems while adhering to professional standards.	2.19	2.31	2.23	3	2	2	3	3	3	3	2		3	3	3	2	3
	CO4	evaluate the efficiency, sustainability, and impact of their project solutions using appropriate testing methods and performance metrics.	2.39	2.15	2.32	3	3	3	3	3	3		1	3		2	3	3	2
	CO5	demonstrate effective communication skills by preparing detailed technical reports, delivering presentations, and articulating ideas clearly to diverse audiences.	2.23	2.09	2.19	3	3	2	3	3	3	2	2	1	2	2	3	2	3
	CO6	identify areas for personal and professional growth and propose strategies for lifelong learning.	2.23	2.26	2.24	3	3	3	1	3	3	2	1	2		2	3	3	2
			PO/PSO Target			**2.05**	**1.87**	**1.91**	**1.8**	**1.65**	**1.73**	**1.48**	**1.36**	**1.62**	**1.53**	**1.72**	**1.84**	**1.74**	**1.75**
						70% of Average CO-PO Mapping of each PO													

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Course-wise Direct PO attainment of IT(AIR) Batch admitted in 2021-22

S.No.	Course Code & Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
1	Introduction to Artificial Intelligence (240101)	2.76	2.75	2.76	2.77	2.77	2.8	2.73	2.77	2.76	2.71	2.75	2.77	2.76	2.74
2	Introduction to Computer Programming (230102)	2.53	2.53	2.52	2.51	2.53	2.53	2.44	2.56	2.54	2.6	2.56	2.54	2.52	2.51
3	Energy Environment, Ecology & Society (100015)	2.29	2.3	2.29	2.3	2.3	2.29	2.27	2.29	2.31	2.29	2.26	2.31	2.29	2.29
4	Basic Electrical & Electronics Engineering (100022)	2.02	2.01	2.01	2.01	2.01	2	2.01	1.98	2.01	2.01	2.01	2.01	2.02	2.01
5	Linear Algebra (250100)	2.21	2.21	2.21	2.21	2.21	2.23	2.22	2.11	2.22	2.11	2.22	2.22	2.22	2.2
6	Digital Logic Design (230201)	2.1	2.1	2.09	2.1	2.1	2.09	2.07	2.07	2.09	2.1	2.08	2.09	2.08	2.04
7	Data Structures (240202)	2.63	2.63	2.63	2.63	2.63	2.64	2.64	2.62	2.64	2.61	2.64	2.64	2.64	2.62
8	Object Oriented Programming and Methodology (240203)	2.32	2.32	2.32	2.32	2.32	2.32	2.33	2.33	2.33	2.32	2.32	2.32	2.32	2.32
9	Sensor Technology (220202)	1.95	1.96	2.1	1.96	2.07	1.95	1.6	1.86	1.76	1.8	1.43	1.87	1.94	1.8
10	Technical Language (100016)	2.11	2.12	2.13	2.11	2.11	2.1	2.13	2.09	2.13	2.11	2.14	2.12	2.12	2.12
11	Design & Analysis of Algorithms (240301)	1.93	1.92	1.93	1.93	1.92	1.92	1.95	1.89	1.98	1.92	1.91	1.92	1.92	1.92
12	Operating System (240302)	2.5	2.48	2.5	2.51	2.48	2.48	2.51	2.46	2.54	2.47	2.47	2.49	2.49	2.48
13	Computer Networks and Protocols (240303)	2.3	2.28	2.29	2.3	2.28	2.29	2.26	2.25	2.36	2.29	2.28	2.29	2.29	2.28
14	Database Management System (240304)	2.11	2.12	2.11	2.11	2.11	2.1	2.21	2.06	2.05	2.09	2.1	2.1	2.1	2.12
15	Probability and Random Process (250106)	1.89	1.93	1.89	1.89	1.94	1.89	2.07	2.03	1.59	1.85	1.92	1.88	1.85	1.92
16	Design and Analysis of Algorithm (240301)	2.21	2.21	2.22	2.21	2.21	2.21	2.19	2.16	2.3	2.24	2.23	2.22	2.21	2.21
17	Operating System (240302)	2.02	2.01	2.03	2.03	2.01	2.02	2.05	1.99	2.07	2.02	2	2.02	2.02	2.01
18	Computer Networks and Protocols (240303)	2.47	2.47	2.46	2.47	2.48	2.48	2.43	2.45	2.56	2.47	2.48	2.46	2.46	2.46
19	Database Management System (240304)	2.3	2.28	2.29	2.3	2.28	2.29	2.28	2.29	2.31	2.29	2.28	2.3	2.29	2.28

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Course-wise Direct PO attainment of IT(AIR) Batch admitted in 2021-22

S.No.	Course Code & Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
20	Database Management System Lab (270305)	2.28	2.28	2.28	2.28	2.28	2.3	2.26	2.27	2.27	2.26	2.26	2.27	2.27	2.28
21	Python Programming Lab (240305)	1.98	2.01	2.04	1.98	1.97	1.97	1.72	1.81	1.97	2.05	2.01	2.01	2.01	2.01
22	Computer architecture and Microprocessor (240401)	2.68	2.69	2.68	2.68	2.7	2.68	2.68	2.75	2.55	2.68	2.71	2.69	2.69	2.67
23	Cloud computing (240402)	2.28	2.27	2.27	2.27	2.28	2.27	2.26	2.25	2.27	2.27	2.27	2.27	2.27	2.27
24	Machine Learning and optimization (240404)	1.98	1.97	1.97	1.98	1.97	1.97	1.97	1.94	1.98	1.97	1.96	1.97	1.97	1.97
25	Software Engineering (240403)	2.03	2	1.96	1.97	2.02	2.05	2.08	2.09	2.01	2.03	2.03	2.04	1.98	2
26	Network & Web Security (240505)	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.18	2.17	2.17	2.17	2.18	2.18
27	Design and Thinking Lab (240406)	2.33	2.32	2.29	2.29	2.36	2.3	2.22	2.37	2.32	2.45	2.34	2.34	2.32	2.31
28	Robotics System and Control (240504)	2.06	2.12	2.14	2.06	2.09	2.09	2.28	2.07	1.91	2.15	2.16	2.08	2.1	2.14
29	Data Science using Python (240502)	2.43	2.45	2.45	2.48	2.46	2.39	2.15	2.33	2.28	2.32	2.27	2.44	2.47	2.46
30	Theory of Computation (240503)	2.42	2.42	2.44	2.42	2.41	2.43	2.44	2.26	2.65	2.45	2.43	2.42	2.42	2.42
31	Discrete Structures (240501)	2.74	2.76	2.75	2.75	2.76	2.75	2.73	2.8	2.76	2.72	2.76	2.76	2.75	2.75
32	Soft Computing Techniques (240505)	2.5	2.51	2.5	2.54	2.5	2.43	2.49	2.48	2.48	2.51	2.36	2.54	2.5	2.49
33	Disaster Management (1000006)	2.32	2.24	2.11	2.19	2.06	2.08	2.37	2.13	2.13	2.15	2.08	2.26	2.18	2.13
34	Image Processing (240602)	2.4	2.38	2.39	2.4	2.38	2.39	2.39	2.35	2.46	2.38	2.37	2.39	2.39	2.4
35	Artificial Intelligence & Machine Learning (240603)	2.64	2.62	2.63	2.64	2.62	2.63	2.63	2.59	2.7	2.63	2.62	2.63	2.63	2.64
36	AI for Robotics (240601)	2.04	2.07	2.1	2.07	2.05	2.06	1.79	1.9	1.84	2	1.81	2.02	2.02	2.02
37	Humanoid Robotics (240732)	2.75	2.76	2.74	2.73	2.74	2.73	2.84	2.77	2.74	2.77	2.74	2.74	2.75	2.75
38	Universal Human Values & Professional Ethics (1000008)	2.01	2.03	2.04	2.01	2.02	2.01	2.15	1.94	1.92	2.02	2.05	2.02	2	2.04

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Course-wise Direct PO attainment of IT(AIR) Batch admitted in 2021-22

S.No.	Course Code & Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
39	Robot Operating System (240731)	2.58	2.62	2.6	2.61	2.52	2.59	2.61	2.62	2.6	2.72	2.6	2.6	2.6	2.58
40	Creative Problem Solving (240702)	2.02	2.01	2.01	2.02	2.02	2.02	2.06	2.01	2.02	2.02	1.98	2.04	2.02	2.02
PO Attainment Direct		**2.28**	**2.28**	**2.28**	**2.28**	**2.28**	**2.27**	**2.27**	**2.25**	**2.26**	**2.28**	**2.25**	**2.28**	**2.28**	**2.27**

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Indirect PO attainment of IT(AIR) Batch admitted in 2021-22

Feedback response from Batch 2021-22 [Sample size: 53]

Category	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
1/Below Average/ Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	Number of Responses
2/Average/ Moderate	2	0	1	1	1	3	2	3	2	5	3	3	3	3	
3/Good/ Adequate	13	13	11	15	11	10	12	8	10	9	11	7	8	4	
4/Very Good/ Substantial	18	19	22	12	19	18	15	18	15	19	15	19	17	25	
5/Excellent/ Highly Substantial	20	21	19	25	22	22	24	24	25	20	24	24	25	21	
PO Attainment Level	**2.43**	**2.49**	**2.47**	**2.49**	**2.50**	**2.47**	**2.49**	**2.51**	**2.49**	**2.41**	**2.48**	**2.52**	**2.52**	**2.52**	

PO Attainment Level	Excellent (3)	Very Good (2)	Good (1)
PO Attainment Percentage	70.00	60.00	50.00

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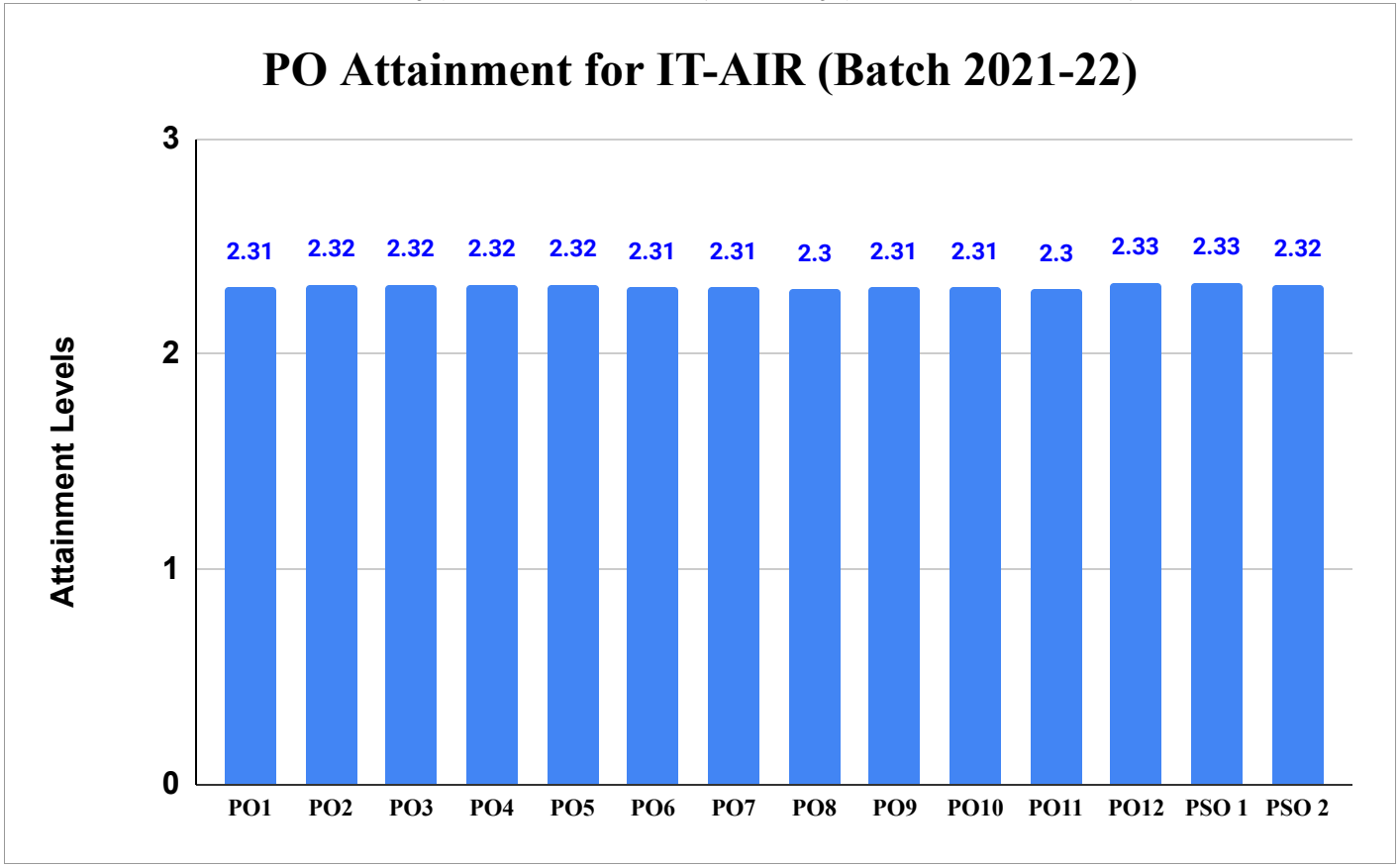
PO attainment of IT(AIR) Batch admitted in 2021-22

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
PO Attainment Direct	2.28	2.28	2.28	2.28	2.28	2.27	2.27	2.25	2.26	2.28	2.25	2.28	2.28	2.27
PO Attainment Indirect	2.43	2.49	2.47	2.49	2.50	2.47	2.49	2.51	2.49	2.41	2.48	2.52	2.52	2.52
PO Attainment	2.31	2.32	2.32	2.32	2.32	2.31	2.31	2.3	2.31	2.31	2.3	2.33	2.33	2.32

PO Attainment = 80% of (PO Attainment Direct) + 20% of (PO Attainment Indirect)



Centre for Artificial Intelligence

Action Taken Report for PO attainment of IT(AIR) Batch admitted in 2021-22

POs	Target Level	Attainment Level	Observations
PO1 Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.			
PO1	2.05	**2.31**	Target achieved
Actions: **Organized regular workshops and seminars on foundational and advanced engineering topics.** **Regularly revised the curriculum to keep pace with advancements in engineering and technology.**			
PO2 Problem analysis: Identity, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.			
PO2	1.87	**2.32**	Target achieved
Actions: **Included assessments with real-world problem statements requiring analytical skills.** **Introduced assignments where multiple solutions are possible, emphasizing creativity.**			
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 public health and safety, and the cultural, societal, and environmental considerations.			
PO3	1.91	**2.32**	Target achieved
Actions: **Mandated internships in relevant industries to expose students to practical challenges and solutions.** **Each lab course had skill based mini projects, ensuring hands-on experience in applying engineering based solutions to various problems related to public health, safety, culture, society, and environment.**			
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.			
PO4	1.8	**2.32**	Target achieved
Actions: **Students were encouraged to participate in technical competitions right from the beginning of the course.** **Lab Projects, Minor and Major projects, on real world problems and having focus on research, at different stages of the programme helped students to investigate different real world complex problems.**			
PO5 Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.			
PO5	1.65	**2.32**	Target achieved
Actions: **Robotics lab., High performance computing lab, IoT lab and other related resources were developed in the institute to help students to use modern engineering and IT tools.**			

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Action Taken Report for PO attainment of IT(AIR) Batch admitted in 2021-22

POs	Target Level	Attainment Level	Observations
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.			
PO6	1.73	**2.31**	Target achieved
Actions: **Participation in NSS camps and Social Services, through different technical as well as cultural Clubs available at the institute, enabled students to realise various societal problems and possibility of engineering solutions.**			
PO7 Environment and sustainability: Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.			
PO7	1.48	**2.31**	Target achieved
Actions: **Students are encouraged to develop mini projects to address social issues.** **Different expert lectures were organized to highlight and address environmental and sustainability issues in engineering.** **Techno-social visits have been organised for students.**			
PO8 Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.			
PO8	1.36	**2.3**	Target achieved
Actions: **Components on professional ethics and human values have been included in the induction training programme, also different courses like Universal Human Values and Professional Ethics have been introduced as audit courses at different semesters.**			
PO9 Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.			
PO9	1.62	**2.31**	Target achieved
Actions: **Students are motivated to organize the team activities like Group Quiz, Social/Technical Quiz etc.** **Students are encouraged to participate in events like seminar, workshop, projects, hands-on training etc. organized by Professional body activities to improve their interpersonal skills**			
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.			
PO10	1.53	**2.31**	Target achieved
Actions: **The documentation, in the form of reports and presentations for the Lab courses, Mini Projects, Minor Projects and Major Project/Internships has helped students to enhance their communication skills and present their ideas effectively.**			
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.			

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Action Taken Report for PO attainment of IT(AIR) Batch admitted in 2021-22

POs	Target Level	Attainment Level	Observations
PO11	1.72	**2.3**	Target achieved
Actions: **Students are encouraged to participate in technical competitions right from the beginning of the course to acquire project management skills.** **Also a course on project management and financing is included as a mandatory audit course in the curriculum.**			
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.			
PO12	1.84	**2.33**	Target achieved
Actions: **Departmental elective courses offered from SWAYAM/NPTEL platform, and mandatory Internships has helped students to acquire life long learning skills.**			
PSO-1 Apply artificial intelligence approaches to design and develop diverse control circuits for robotic solutions			
PSO1	1.74	**2.33**	Target achieved
Actions: **Various courses were added in the curriculum related to application of AI in robotics technology like Humanoid robot, Robot Operating Systems, Robot Kinematics etc.** **Students are encouraged to enroll in different workshops/seminars related to the field.**			
PSO-2 Design & implement solutions for robotics applications by applying the concept of data communication, sensors , virtual reality and Internet of Things.			
PSO2	1.75	**2.32**	Target achieved
Actions: **There are various labs in the department like robot modelling and simulation, AR-VR lab, IoT lab, which emphasize students to learn the concepts of robotics and AI applications.**			

Centre for Artificial Intelligence

CO-PO mapping matrix - AI&DS Batch admitted in 2021-22

			CO Attainment			CO-PO Matrix													
Course Code and Name		**Course Outcome Statements**	**Direct Attainment**	**Indirect Attainment**	**Total Attainment**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
Introduction to Artificial Intelligence & Data Science (270101)	CO1	explain basic concepts of Artificial Intelligence	2.65	2.92	2.73	3	2	2	1	2	1	1	1	1	3	2	1	2	3
	CO2	define the basic operations and applications related to various kinds of data.	2.82	2.99	2.87	2	3	3	2	2		2		2	2	2	2	2	2
	CO3	describe various types of data and identify appropriate describing methodology for each.	3.08	2.77	2.99	3	2	2	2	1			1	1	1	1	2	2	2
	CO4	implement mathematical sampling and estimation techniques on data for information extraction.	2.88	2.70	2.83	2	3	2	2	2	1		1	2	2	1	2	1	3
	CO5	analyze feature engineering concepts for different applications.	2.88	2.92	2.89	3	3	2	2	1	1	1		2	1	2	2	3	2
	CO6	illustrate data science tools and techniques.	2.90	3.00	2.93	3	2	2	1	1	2		1	2		2	2	2	2
Introduction to Computer Programming (270102)	CO1	Identify situations where computational methods and computers would be useful.	2.40	2.60	2.46	3	3	2	3	2	2	1		2	1		1	3	3
	CO2	Describe the basic principles of imperative and structural programming.	2.50	2.80	2.59	2	2	3	3	2	1		1			2	1	2	1
	CO3	Develop a pseudo-code and flowchart for a given problem.	2.70	2.90	2.76	3	3	2	2	3	2			2	2	1	3	3	2
	CO4	Analyze the problems and choose suitable programming techniques to develop solutions.	2.50	2.80	2.59	2	2	3	3	3	2	2	1	1			3	3	2
	CO5	Design, implement, debug and test programs.	2.60	3.00	2.72	3	3	3	2	2	3		3	3	2	3	1	2	2
	CO6	Design computer programs to solve real world problems.	2.64	2.67	2.65	3	2	2	3	2	3		2	3	2	2	3	3	3
Energy Environment, Ecology & Society (100015)	CO1	describe the various types of energy systems and their roles in societal and environmental contexts.	2.35	2.49	2.39	3	3	3	3	2	2	1	2	1			2	2	2
	CO2	analyze the environmental consequences of energy production and consumption, including pollution and climate change.	2.21	2.43	2.28	2	2	3	2	2	3	2			2	2	1	2	3
	CO3	evaluate renewable energy technologies and strategies for sustainable development in comparison to conventional energy systems.	2.35	2.49	2.39	3	3	2	3	3	2	3	2	2		1	3	2	2
	CO4	apply ecological principles to assess the impact of human activities on ecosystems and biodiversity.	2.57	2.31	2.49	2	3	3	3	3	3	1		2	2		3	3	2
	CO5	design sustainable energy and environmental management practices that balance ecological integrity and societal needs.	2.40	2.25	2.36	3	2	3	2	2	3	3	3	3	2	3	1	3	3
	CO6	reflect on the ethical and social responsibilities associated with energy use and environmental stewardship to propose actionable solutions.	2.40	2.43	2.41	3	3	2	3	2	3		2	3	2	2	3	2	2
Basic Electrical & Electronics Engineering (100022)	CO1	Solve dc & ac circuits by applying fundamental laws & theorems	2.07	2.19	2.11	3	3	2	1		2	1		1	3	2	1	3	2
	CO2	Compare the behavior of electrical and magnetic circuits for given input	1.94	2.14	2.00	2	3	3	2	2	2	2	1	2	2	2	2	2	3

Centre for Artificial Intelligence

CO-PO mapping matrix - AI&DS Batch admitted in 2021-22

			CO Attainment			CO-PO Matrix													
Course Code and Name		**Course Outcome Statements**	**Direct Attainment**	**Indirect Attainment**	**Total Attainment**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
	CO3	Explain the working principle, construction, applications of rotating electrical machines	2.07	2.19	2.11	3	3	2	2	1				1	1	1	2	3	2
	CO4	Explain the working principle, constructional details, losses & applications of single-phase transformer	2.26	2.03	2.19	3	3	2	2	2		1	1	2	2	1	2	3	2
	CO5	Select the logic gates for various applications in digital electronic circuits	2.11	1.98	2.07	2	3	2	2	1	1	1		2	1	2	2	3	3
	CO6	Explain characteristics of Diode and Transistor	2.11	2.14	2.12	3	2	2	1	1	2		1	2		2	2	2	2
Linear Algebra (250100)	CO1	determine the solution of Matrix	2.28	2.41	2.32	3	3	3	1	1	2			2		2	2	3	3
	CO2	find the analytical solution of algebraic structures	2.14	2.35	2.20	2	3	3	2	1	1	1	1	2	1	2	2	2	2
	CO3	express the vector space	2.28	2.41	2.32	3	2	2	1	1	2	1		2		2	2	3	2
	CO4	acquire the knowledge of Linear transformation	2.49	2.24	2.42	2	3	2	2	1	2	1		3		3	3	3	3
	CO5	illustrate the concept of Inner product spaces	2.32	2.18	2.28	3	3	3	2	3	2			3		3	3	2	2
Digital Logic Design (270201)	CO1	Illustrate various number systems, Binay codes and its application in digital design.	2.16	2.29	2.20	3	3	2	1	2		1		1	3	2	1	3	3
	CO2	Identify the logic functions, circuits, truth tables and also apply the laws of Boolean algebra to simplify circuits and expressions.	2.03	2.24	2.09	3	3	3	2	2	2	2		2	2	2	2	2	1
	CO3	Develop the formal procedures for the analysis and design of combinational circuits.	2.16	2.29	2.20	3	3	2	2	1			2	1	1	1	2	2	2
	CO4	Analyse sequential circuit's components and their usability in digital circuits.	2.36	2.13	2.29	3	3	2	2	2			2	2	2	1	2	1	2
	CO5	Compare the concept of memories, programmable devices and digital ICs.	2.21	2.07	2.17	3	3	2	2	1	1	2		2	1	2	2	3	2
	CO6	Design and analyze circuits for digital arithmetic.	2.11	2.24	2.15	3	2	2	1	1	2		1	2		2	2	2	2
Data Structures (270202)	CO1	describe the basics of algorithms and their performance criteria.	2.70	2.86	2.75	3	3	3	1	1	2		2	2	1	2	2	2	2
	CO2	explain the working of linear/non-linear data structures.	2.54	2.79	2.62	2	3	3	2	1	1			2	2	2	2	2	3
	CO3	identify the appropriate data structure to solve specific problems.	2.70	2.86	2.75	3	2	2	1	1	2	1	1	2		2	2	2	2
	CO4	decompose complex data structures, such as trees and graphs, into simpler components.	2.95	2.66	2.86	2	3	2	2	1	2			3	1	3	3	3	2
	CO5	evaluate the time/space complexities of data structures & their applications.	2.76	2.59	2.71	3	3	3	2	3	2		2	3		3	3	3	3
	CO6	design optimal algorithmic solutions for various real-world problems.	2.76	2.79	2.77	3	2	3	2	1	2			2	1	2	2	2	2
Object Oriented Programming and Methodology (270203)	CO1	describe fundamental principles of object-oriented programming.	2.38	2.52	2.42	3	3	3	3	3	3	1	2	1	3	1	3	1	1
	CO2	explain the benefits of object-oriented design.	2.23	2.46	2.30	3	3	3	3	3	2	2	1	2	1	2	3	2	2

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CO-PO mapping matrix - AI&DS Batch admitted in 2021-22

			CO Attainment			CO-PO Matrix													
Course Code and Name		**Course Outcome Statements**	**Direct Attainment**	**Indirect Attainment**	**Total Attainment**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
(270203)	CO3	develop well-structured, modular programs that leverage classes, objects, and inheritance to enhance code maintainability and reusability.	2.38	2.52	2.42	3	3	3	2	3	2	3	2	1	2	3	3	3	3
	CO4	inspect the programs for the identification and correction of errors and exceptions.	2.60	2.34	2.52	3	3	2	3	2	1	3		3	1	2	3	3	2
	CO5	apply standard template libraries for efficient and generic programming.	2.43	2.28	2.39	3	3	3	3	3	3	2	3			3	3	3	3
	CO6	design effective solutions for real world problems using object-oriented principles.	2.43	2.46	2.44	3	3	3	3	3	1	2			3	3	3	3	3
Probability and Random Process (250106)	CO1	Interpret the theory of Probability and its distributions	2.47	2.61	2.51	3	2	3	3	2	2	2			2	2	3	2	3
	CO2	Evaluate the Skewness, Kurtosis, curve fitting, correlation and regression.	2.32	2.55	2.39	2	3	3	2	3	3		2		3	3	3	3	2
	CO3	Analyze the test of hypothesis	2.47	2.61	2.51	3	3	3	3	3	3			2	2	2	2	2	2
	CO4	Acquire the knowledge of random variables.	2.70	2.43	2.62	3	2	3	3	2	3			3	3	2	3	3	2
	CO5	Determine the random process	2.52	2.36	2.47	3	2	2	3	3	3		2		2	3	3	2	3
Technical Language (100016)	CO1	explain key technical terms and concepts relevant to their field of study.	1.98	2.09	2.01	3	2	3	3	2	2	2			2	2	3	3	3
	CO2	analyze technical documents, such as manuals, specifications, and reports, to extract essential information.	1.85	2.04	1.91	2	3	3	2	3	3		2		3	3	3	3	3
	CO3	construct clear and concise technical communication, including reports, emails, and presentations.	1.98	2.09	2.01	3	3	3	3	3	3			2	2	2	2	2	2
	CO4	create technical documents such as user guides, project proposals, and research papers, adhering to standard formats and conventions.	2.16	1.94	2.09	3	2	3	3	2	3	1		3	3	2	3	3	2
	CO5	evaluate the clarity, accuracy, and effectiveness of technical communication produced by themselves and others.	2.02	1.89	1.98	3	2	2	3	3	3		2		2	3	2	3	3
	CO6	apply technical language and communication strategies effectively in professional scenarios, such as interviews, meetings, and collaborative projects.	2.02	2.04	2.03	3	2	2	3	2	2	2	2		2	2	2	2	2
Discrete Structure (270301)	CO1	explain the concepts of set theory, propositional logic, graph theory, discrete numeric function and algebraic structure.	2.83	2.28	2.67	3	2	3	3	2	2	2		1	2	2	3	3	3
	CO2	apply mathematical reasoning and logical thinking to solve problems	2.42	2.17	2.35	2	3	3	2	3	3		2		3	3	3	3	3
	CO3	determine the solutions of problems pertaining to computer sciences using graph theory concepts.	2.74	2.28	2.60	3	3	3	3	3	3			2	2	2	2	2	2
	CO4	solve counting problems using combinatorial analysis.	2.90	2.11	2.66	3	2	3	3	2	3	1		3	3	2	3	3	2
	CO5	solve real-world problems by translating practical problems into mathematical formulations	2.76	2.33	2.63	3	2	2	3	3	3		2		2	3	3	3	3

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	CO6	formulate and design original mathematical proofs.	2.88	2.22	2.68	3	2	2	3	2	2	2	2				2	2	2
Design & Analysis of Algorithms (270302)	CO1	demonstrate a familiarity with major algorithms and data structures.	2.35	2.49	2.39	3	2	3	3	2	2	2			2	2	3	3	3
	CO2	apply important algorithmic design paradigms and methods of analysis.	2.21	2.43	2.28	2	3	3	2	3	3		2		3	3	3	3	3
	CO3	analyze the asymptotic performance of algorithms.	2.35	2.49	2.39	3	3	3	3	3	3			2	2	2	2	2	2
	CO4	compare different design techniques to develop algorithms for computational problems.	2.57	2.31	2.49	3	2	3	3	2	3	1		3	3	2	3	3	2
	CO5	design algorithms using greedy strategy, divide and conquer approach, dynamic programming, backtracking and branch n bound approach.	2.40	2.25	2.36	3	2	2	3	3	3		2		2	3	3	3	3
	CO6	understand the hardness and different classes of hardness. Further, design approximate solutions for computationally hard problems.	2.40	2.43	2.41	3	2	2	3	2	2	2	2				2	2	2
Operating System (270303)	CO1	tell the basic concept of operating systems.	2.40	2.22	2.35	3	2	3	3	2	2				2	2	3	3	3
	CO2	explain the working procedure of the operating system.	2.40	2.07	2.30	2	3	2	2	3	3	1	2		3	3	3	3	3
	CO3	analyze the various operating system problems and issues.	2.34	2.07	2.26	3	3	3	3	3	3	1	1	2	2	2	2	2	2
	CO4	develop the solutions for various operating system problems and issues.	1.89	2.07	1.94	2	2	3	3	2	3	3		3	3		3	3	2
	CO5	measure the performance of various scheduling and allocation techniques.	2.04	2.16	2.08	3	3	2	3	3	3		2		2	3	3	3	3
	CO6	test the working of various scheduling and allocation techniques.	2.34	2.10	2.27	3	2	2	3	2	2	2	2	1		2	2	2	2
Computer Networks and Protocols (270304)	CO1	explain the fundamental concepts of computer network.	2.35	1.69	2.15	3	2	3	3	2	2	2			2	2	3	3	3
	CO2	illustrate the basic taxonomy & terminologies of computer network protocols	2.40	1.54	2.14	2	3	3	2	3	3	3	2		3	3	3	3	3
	CO3	develop a concept for understanding advance computer network.	2.57	1.54	2.26	3	3	3	3	3	3	3		2	2	2	2	2	2
	CO4	build the skill of IP addressing and routing mechanism.	1.13	1.54	1.25	3	2	3	3	2	3			3	3	2	3	3	2
	CO5	predict the performance of computer network in congestion and internet.	2.26	1.66	2.08	3	2	2	3	3	3		2		2	3	3	3	3
	CO6	construct the network environment for implementation of computer networking concept.	2.40	1.51	2.13	3	2	2	3	2	2		2				2	2	2
Database Management System (270305)	CO1	demonstrate the concepts of different type of database system	2.23	2.61	2.34	3	2	3	3	2	2	1			2	2	3	3	3
	CO2	apply relational algebra concepts to design database system	2.10	2.55	2.24	2	3	3	2	3	3	1	2	2	3	3	2	3	3

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	CO3	make use of queries to design and access database system.	2.23	2.61	2.34	3	3	3	3	3	3			2	2	2	2	2	2
	CO4	analyze the evaluation of transaction processing and concurrency control	2.44	2.43	2.44	3	2	3	3	2	3		2	3	3	2	3	3	2
	CO5	determine the optimize database for real world applications.	2.28	2.36	2.30	3	2	2	3	3	3		2		2	3	3	3	3
	CO6	design a database system for a real world application	1.77	1.98	1.83	3	2	2	3	2	2	2	2				2	2	2
Database Management System Lab (270305)	CO1	construct a database schema for a given problem domain.	2.78	2.56	2.71	3	2	3	3	2	3	3		3	3	2	3	1	2
	CO2	apply integrity constraints on a database schema using a state-of-the-art RDBMS.	2.47	2.60	2.51	2	2	2	3	3	3	2	2		2	3	3	2	2
	CO3	apply SQL queries using DDL and DML to design and access database systems.	2.35	2.49	2.39	3	2	2	3	2	2		2				2	2	2
	CO4	make use of operators and functions used in query.	2.21	2.43	2.28	3	2	2	1	2	2			2		3	2	1	2
	CO5	distinguish Tables and Views for database systems.	2.35	2.49	2.39	2	2	2	2	2		2	2	2	2	3	3	2	2
	CO6	develop a small project for a real world scenario	2.57	2.31	2.49	2	3	2	1	2	1	1	2	2		3	2	2	2
Python Programming Lab (270306)	CO1	describe the fundamental syntax, data structures, and core concepts of Python programming.	2.01	2.35	2.11	3	2	3	3	2	2				2	2	3	3	3
	CO2	develop Python programs to solve computational problems using appropriate control structures, functions, and libraries.	1.89	2.30	2.01	2	3	3	2	3	3		2		3	3	3	3	3
	CO3	analyze and debug Python code to identify and resolve logical and runtime errors.	2.01	2.35	2.11	3	3	3	3	3	3			2	2	2	2	2	2
	CO4	build Python applications incorporating modules like file handling, exception handling, and object-oriented programming concepts.	2.20	2.18	2.19	3	2	3	3	2	3	2		3	3	2	3	3	2
	CO5	evaluate the performance of Python programs based on computational efficiency and resource utilization.	2.05	2.13	2.07	3	2	2	3	3	3	2	2		2	3	3	3	3
	CO6	implement algorithms such as sorting, searching, and recursion using Python to solve real-world problems.	2.05	2.30	2.13	3	2	2	3	2	2	2	2				2	2	2
Computer architecture and Microprocessor (270401)	CO1	demonstrate the computer architecture and microprocessor for defining basic component and functional units.	2.60	3.00	2.72	3	2	3	3	2	2	2			2	2	3	1	1
	CO2	develop the fundamental concept to understand the working of computer architecture and microprocessor.	2.70	3.00	2.79	2	3	3	2	3	3	3	2		3	3	3	1	1
	CO3	explain the basic concept of input output and memory organization.	2.60	3.00	2.72	3	3	3	3	3	3	3		2	2	2	2	2	2
	CO4	develop the skill of writing assembly language programming.	2.30	2.90	2.48	3	2	3	3	2	3	3		3	3	2	3	1	2
	CO5	build a system using peripheral devices and controllers for 8086 microprocessors.	2.80	3.00	2.86	3	2	2	3	3	3	2	2		2	3	3	2	2

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Course Code and Name		**Course Outcome Statements**	**Direct Attainment**	**Indirect Attainment**	**Total Attainment**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
	CO6	apply the concept of computer architecture and microprocessor in solving real world problems.	2.50	3.00	2.65	3	2	2	3	2	2	2	2				2	2	2
Cloud computing (270402)	CO1	describe cloud computing fundamentals.	2.35	2.49	2.39	1	2	2	1	2	1	1	1	2		3	2	1	2
	CO2	explain architecture, infrastructure and delivery models.	2.21	2.43	2.28	2	2	2	1	2	1	1	2	2	2	3	3	2	2
	CO3	apply suitable virtualization concepts based on problem characteristics.	2.35	2.49	2.39	2	3	2	1	2	1	1	2	2		3	2	2	2
	CO4	choose appropriate programming models for a specific cloud computing application.	2.57	2.31	2.49	3	2	2	1	3	1	1	1	2	2	3	3	2	2
	CO5	analyze various security issues in cloud computing.	2.40	2.25	2.36	2	3	3	1	2	1	2	1	2		3	2	2	3
	CO6	create a secure and efficient cloud computing environment.	2.40	2.43	2.41	2	2	3	2	1	2			2	1	2	2	2	2
Machine Learning and optimization (270404)	CO1	Summarize different kind of machine learning algorithms.	2.66	2.66	2.66	3	2	3	3	2	2	2			2	2	3	3	3
	CO2	Demonstrate a familiarity with major optimzation algorithms.	2.30	2.30	2.30	2	3	3	2	3	3	3	2		3	3	3	3	3
	CO3	Apply optimization algorithms to solve real world problems.	2.09	2.09	2.09	3	3	3	3	3	3	3		2	2	2	2	2	2
	CO4	Formulation of design problems as methematical programming problems.	2.02	2.02	2.02	3	2	3	3	2	3	3			3	2	3	3	2
	CO5	Examine supervised and unsupervised learning methods for real-life problems.	1.56	1.56	1.56	3	2	2	3	3	3	2	2		2	3	3	3	3
	CO6	Deploy machine learning models for real time problems.	1.80	1.80	1.80	3	2	2	3	2	2	2	2				2	2	2
Software Engineering (270403)	CO1	explain the concepts of software engineering.	2.60	3.00	2.72	3	3	2	1	2	1	1	2	2		3	2	2	3
	CO2	analyze and design software for real world problems.	2.80	2.70	2.77	2	2	2	1	2	2	2	1	2	2	3	3	2	2
	CO3	compare the techniques for software project management & estimation.	2.70	2.80	2.73	2	3	2	1	2	1	1	1	2		3	2	3	3
	CO4	choose an appropriate software development model for a real-life software project.	2.70	2.90	2.76	3	2	2	1	3	1	1	2	2	2	3	3	2	2
	CO5	design software using modern tools and technologies.	2.70	2.50	2.64	2	3	3	1	2	1	2	1	2		3	2	2	3
	CO6	test the software through different approaches.	2.20	2.80	2.38	2	2	3	2	1	2			2	3	2	2	3	2
Network & Web Security (270505)	CO1	determine symmetric and public key cryptography, classical algorithms, and basic number theory.	2.33	2.47	2.37	3	3	3	3	3	2	1	1	2	1	2	3	2	3
	CO2	explain the working of various cryptographic algorithms.	2.19	2.41	2.26	3	3	3	3	2	1		2	1	1	2	3	1	2
	CO3	apply firewall, IDS, and security protocols like SSL, TLS, and SET.	2.33	2.47	2.37	3	3	3	3	2	2	1	1	2	1	2	3	2	3
	CO4	build secure systems using digital signatures, message authentication, and certificates.	2.54	2.29	2.47	3	3	3	3	1	1		2	1	1	1	2	1	3

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	CO5	examine the strengths and weaknesses of IP and web security.	2.38	2.23	2.34	3	3	3	3	1	2	1	1	1	2	1	2	1	2
	CO6	select strategies for detecting and preventing attacks like sniffing, spoofing, and hacking.	2.38	2.41	2.39	3	2	2	1	3	1		2	2	2	3	3	2	2
Design and Thinking Lab (270406)	CO1	design IoT-based systems by integrating sensors, actuators, and communication modules to address real-world challenges.	2.10	1.97	2.06	3	2	2	1	2	2		2	2		3	2	1	2
	CO2	implement IoT communication protocols such as MQTT, HTTP, and CoAP to enable device-to-device and device-to-cloud interactions.	1.97	1.92	1.96	2	2	2	1	2	1		1	2		2	3	2	2
	CO3	analyze data collected from IoT sensors using software tools to extract meaningful insights and patterns.	2.10	1.97	2.06	2	3	2	1	2	1	2	2	2	1	3	2	2	2
	CO4	develop applications that leverage IoT technologies for domains like smart homes, healthcare, or industrial automation.	2.29	1.83	2.15	3	2	2	1	3	1		1	2	2	3	3	2	2
	CO5	evaluate the performance, scalability, and reliability of IoT systems under various operational conditions.	2.14	1.78	2.03	2	3	3	1	2	1	3	1	2		3	2	2	3
	CO6	apply authentication, encryption, and other cybersecurity measures to safeguard IoT devices and data.	2.14	1.92	2.07	3	2	3	2	1	2	3		2	1	2	2	2	2
Information Retrieval (270501)	CO1	gain the basic concepts and techniques in Information Retrieval.	2.30	3.00	2.51	2	2	1	2			2		2	1		3	2	2
	CO2	explain the issues involved in representing and retrieving documents.	2.60	3.00	2.72	2	3	2	2	1	2		2			2	2	3	1
	CO3	comprehend types of text analysis, Information retrieval, IR system architecture, query processing models and probabilistic models.	1.50	2.80	1.89	2	2	2	2	1	2	1		2		2	1	2	2
	CO4	process the text data for the purpose of classification.	1.50	3.00	1.95	2	2	2	2		1		1	3	2	2	2	2	2
	CO5	apply the different evaluation strategies to the retrieved results for computing the efficiency and accuracy of the information retrieval model.	1.20	2.80	1.68	3	1	3	3	2	2			2		1	2	2	3
	CO6	perform indexing, compression, information categorization and sentiment analysis.	1.30	3.00	1.81	2		1		2		2	2		2	2	3	2	2
Data Science using Python (270502)	CO1	define the concepts and importance of data science.	2.31	2.17	2.27	3	3	3	3	2	2			2			1	3	2
	CO2	describe and investigate the data.	2.16	2.12	2.15	2	3	2	3	2	2	1		1		2	1	3	2
	CO3	implement descriptive and inferential statistics approach on real world data	2.31	2.17	2.27	3	3	2	3	3	2		2	2	2		3	2	3
	CO4	develop real world solutions using supervised and unsupervised learning methods.	2.52	2.01	2.37	3	2	3	3	3	2	1	2	2	2		3	3	2
	CO5	evaluate the best performing algorithms based on performance metrics.	2.35	1.96	2.23	3	3	3	2	2	3	3	3	3	2	3	1	2	2

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	CO6	examine the stability of machine learning based models.	2.35	2.12	2.28	3	3	2	3	2	3	3	2	3	2	2	3	3	3
Theory of Computation (270503)	CO1	Explain the basic concepts of switching and finite automata theory & language	2.40	2.50	2.43	3	2	3	3	2	2	2			2	2	3	2	2
	CO2	Relate practical problems to language,automata, computability and complexity	2.50	2.00	2.35	2	3	3	2	3	3	3	2		3	3	3	2	2
	CO3	Construct abstract model of computing and check their power to recognize the language	2.70	2.30	2.58	3	3	3	3	3	3	3		2	2	2	2	2	2
	CO4	Analyze the grammar,its types, simplification and normal form	3.00	2.00	2.70	3	2	3	3	2	3	3		3	3	2	3	2	2
	CO5	Interpret rigorously formal mathematical mothods to prove properties of languages, grammars and automata	2.10	2.50	2.22	3	2	2	3	3	3	2	2		2	3	3	2	2
	CO6	Devlop and overview of how automata theory, languages and computation are applicable in engineering applications	2.10	2.50	2.22	3	2	2	3	2	2	2	2				2	2	2
Computer Graphics & Multimedia (270504)	CO1	explore various display devices and applications of computer graphics.	2.00	2.50	2.15	3	3	3	1	1	2		2	2	1	2	2	2	2
	CO2	illustrate various scan conversion techniques like line, circle, curve and shape drawing algorithms.	2.30	2.50	2.36	2	3	3	2	1	1			2	1	2	2	2	2
	CO3	apply 2-dimensional, 3-dimensional transformations and projections on images.	2.20	2.40	2.26	3	2	2	1	1	2	2	1	2		2	2	2	2
	CO4	classify methods of image clipping and various algorithms for line and polygon clipping.	2.50	2.60	2.53	2	3	2	2	1	2			3		3	3	2	2
	CO5	apply appropriate filling algorithms, hidden surface elimination algorithm on images.	2.10	2.40	2.19	3	3	3	2	3	2	3	2	3		3	3	2	2
	CO6	summarize various color models, shading methods and multimedia system.	2.00	2.80	2.24	3	2	3	2	1	2			2	1	2	2	2	2
Soft Computing Techniques (270505)	CO1	Define basic concepts of neural network and fuzzy systems	2.80	3.00	2.86	2	2	1	2	2		2	2		1		3	2	
	CO2	Compare solutions by applying various soft computing approaches on a given problem	3.00	3.00	3.00	2	2	3	1	2					1		3	2	1
	CO3	Develop and train different supervised and unsupervised learning	2.90	2.20	2.69	3	2		2			1					3	1	2
	CO4	Classify various nature inspired algorithms according to their application aspect	2.70	2.20	2.55	2	3	2	2		1		1	3	2	2	2	2	2
	CO5	compare the efficiency of various hybrid systems	2.00	2.20	2.06	3	1	3	3	2	2			2					
	CO6	design a soft computing models for solving real world problems	2.20	2.10	2.17	2	2	1		2		2	2		2	3	2	2	2
Disaster Management (1000006)	CO1	Identify disaster prevention and mitigation approaches.	2.50	2.30	2.44	2	2	1	2			2		2	1		3	2	
	CO2	Classify global and national disasters, their trends and profiles.	2.10	2.40	2.19		3			1	2		2					3	1
	CO3	Determine the impacts of various disasters.	2.30	2.10	2.24	3	2		2			1				1		2	2

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CO-PO mapping matrix - AI&DS Batch admitted in 2021-22

Course Code and Name		Course Outcome Statements	CO Attainment			CO-PO Matrix													
			Direct Attainment	Indirect Attainment	Total Attainment	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
	CO4	Apply Disaster Risk Reduction in management.	2.00	2.00	2.00						1		1	3	2	2	2	2	
	CO5	Infer the linkage between disasters, environment and development.	2.00	2.00	2.00		1	3	3	2	2			2			3	2	2
Data Mining and Pattern Warehousing (270601)	CO1	able to understand and explain various basic concepts of data mining and data warehousing	2.50	2.50	2.50	3	3	3	3	2	2		2	2		2	2	3	2
	CO2	classify various database systems & data models/schemas of data warhouses	2.00	2.00	2.00	2	3	3	3	2	2	2		1		3	2	2	2
	CO3	able to compare various methods for storing and retreiving data from various sources/repositories.	2.00	2.30	2.09	3	3	2	3	3	2		2	2	2		3	3	3
	CO4	able to apply data mining techniques for knowledge extraction from large amount of data.	2.00	2.50	2.15	3	2	3	3	3	2		2	2	2		3	3	2
	CO5	able to analyze data for knowledge discovery & prediction using appropriate algorithms.	2.00	2.00	2.00	3	3	3	2	2	3	3	3	3	2	3	1	2	2
	CO6	able to develop real world applications using data mining techniques.	2.00	1.80	1.94	3	3	2	3	2	3	3	2	3	2	2	3	3	3
Data Mining and Pattern Warehousing Lab (270601)	CO1	perform the basic data mining operations.	2.80	3.00	2.86	3	3	3	1	1	2		2	2	1	2	2	2	2
	CO2	demonstrate the working mechanisms of data mining platforms.	2.60	2.80	2.66	2	3	3	2	1	1			2	1	2	2	2	3
	CO3	execute the multiple classification algorithms effectively.	2.50	2.17	2.40	3	2	2	1	1	2		1	2		2	2	2	2
	CO4	compare association rules and their effects on corresponding datasets.	2.40	3.00	2.58	2	3	2	2	1	2			3		3	3	3	2
	CO5	evaluate the working of existing machine learning algorithms using different datasets	2.30	2.33	2.31	3	3	3	2	3	2	1	2	3		3	3	3	3
	CO6	solve real world problems using data mining techniques.	2.00	3.00	2.30	3	2	3	2	1	2	1		2	1	2	2	2	2
Image Processing (270602)	CO1	describe the fundamentals of image processing.	2.80	3.00	2.86	3	3	3	3	2	2	1	2	1			2	3	1
	CO2	classify image enhancement techniques in both spatial and frequency domains	2.30	2.90	2.48	2	2	3	2	2	3		2	1	2	1	2	1	2
	CO3	apply image segmentation for object and boundary detection.	2.30	3.00	2.51	3	3	2	3	3	2	1	2	2		1	3	3	2
	CO4	analyze the causes for image degradation and image restoration.	2.60	2.90	2.69	2	3	3	3	3	3			2	2		3	3	2
	CO5	evaluate image compression techniques.	2.70	2.90	2.76	3	2	3	2	2	3	3	3	3	2	3	1	2	2
	CO6	implement novel image filtering techniques.	2.80	2.80	2.80	3	3	2	3	2	3	3	2	3	2	2	3	3	3
Image Processing Lab (270602)	CO1	develop the ability to write programs for color detection.	2.33	2.42	2.36	3	3	3	2	3	2	1	2	3		3	3	3	3
	CO2	analyze color information in digital images.	2.90	2.88	2.89	3	2	3	2	1	2	1		2	1	2	2	2	2
	CO3	apply image segmentation techniques to partition images into meaningful regions.	2.60	3.00	2.72	3	3	3	3	2	2	1	2	1			2	3	2

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CO-PO mapping matrix - AI&DS Batch admitted in 2021-22

			CO Attainment			CO-PO Matrix													
Course Code and Name		**Course Outcome Statements**	**Direct Attainment**	**Indirect Attainment**	**Total Attainment**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
	CO4	demonstrate competence in writing a program for object detection.	2.80	3.00	2.86	2	2	3	2	2	3		2		2	1	2	1	2
	CO5	integrate image processing techniques to interpret and respond to hand gestures.	2.60	2.80	2.66	3	3	2	3	3	2	1		2		1	3	3	2
	CO6	track movement of objects in a sequence of images	2.50	2.17	2.40	3	3	3	3	2	2	1	2	1			2	3	3
Deep Learning (270603)	CO1	illustrate the concepts of neural networks, activation functions and optimization algorithms.	2.30	2.00	2.21	3	3	3	1	1	2	1	2	2	1	2	2	2	2
	CO2	explain the principles of backpropagation and gradient descent.	2.80	2.80	2.80	2	3	3	2	1	1	1		2	1	2	2	2	3
	CO3	select an appropriate deep learning model for problem solving.	2.80	1.80	2.50	3	2	2	1	1	2	2	1	2		2	2	2	2
	CO4	evaluate the performance of deep learning models.	2.00	1.50	1.85	2	3	2	2	1	2	1		3	1	3	3	3	2
	CO5	compare the applicability of deep learning architectures across the problem domain.	2.50	2.50	2.50	3	3	3	2	3	2	1	2	3		3	2	3	3
	CO6	develop novel deep learning architectures for specific applications.	2.80	1.80	2.50	3	2	3	2	2	2	2		2	1	2	3	2	2
Deep Learning Lab (270603)	CO1	recognize the characteristics of deep learning models that are useful to solve real-world problems	2.48	2.54	2.83	3	3	3	1	2	2		2	2	1	2	2	2	2
	CO2	design Convolution Neural Network for solving various problems pertaining to image processing.	2.61	2.87	2.69	2	3	3	2		1	2		2	1	2	3	2	3
	CO3	apply multiple deep learning model variants for suitable applications.	2.78	2.94	2.83	3	2	2	1	1	2		1	2		2	2	2	2
	CO4	examine the working mechanism of different deep learning algorithms.	3.03	2.73	2.94	2	3	2	2	1		1		2	2	2	3	3	2
	CO5	assess the key computational techniques underlying deep learning models.	2.83	2.66	2.78	3	3	3	2	3	2	1	2	3		3	2	3	3
	CO6	develop autoencoders and generative models for suitable applications	2.83	2.87	2.84	3	2	3	2	1	2	1		2	1	2	2	2	2
Pattern Recognition (270732)	CO1	explain basic principle of Image processing	2.40	3.00	2.58	2	2	1	2			2		2	1		3	2	2
	CO2	apply the advance processing algorithms on images	2.40	2.80	2.52	3	3	2		1	2		2					3	1
	CO3	analyze the basic potential of image processing	2.50	2.90	2.62	2	2	2	2		2	1			2	1	2	3	2
	CO4	compare the different pattern recognition algorithms on different domain	2.60	2.90	2.69	2	1	2	2		1		1	3	2	2	2	2	2
	CO5	develop the real world application of pattern recognition	2.80	2.90	2.83	3	1	3	3	2	2			2		2	3	2	2
	CO6	design basic programming structures for image processing using python	2.70	2.80	2.73	2	2	1		2		2	2		2	2	3	2	2
Universal Human Values &	CO1	to become more aware of their surroundings, society, social problems and their sustainable solutions.	2.78	2.94	2.83	3	3	3	2	3	2	2	2	3		3	3	3	3

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CO-PO mapping matrix - AI&DS Batch admitted in 2021-22

			CO Attainment			CO-PO Matrix													
Course Code and Name		**Course Outcome Statements**	**Direct Attainment**	**Indirect Attainment**	**Total Attainment**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
Professional Ethics (1000008)	CO2	to become sensitive to their commitment towards what they believe in (humane values. humane relationships and humane society).	2.61	2.87	2.69	3	2	3	2	1	2	1		2	1	2	2	2	2
	CO3	to apply what they have learnt to their own self in different day-to-day settings in real life.	2.78	2.94	2.83	3	3	3	3	2	2		2	1	2		2	3	1
	CO4	to sustain human relationships and human nature in mind.	3.03	2.73	2.94	2	2	3	2	2	3		2	1	2	1	2	1	2
	CO5	to have better critical ability.	2.83	2.66	2.78	3	3	2	3	3	2	2	2	2		1	3	3	2
	CO6	to negotiate living in harmony with self and others.	2.83	2.87	2.84	2	3	3	3	3	3			2	2		3	3	2
AR-VR lab (270701)	CO1	create new projects and properly configure them for AR/VR application development	2.80	2.11	2.59	2	3	3	2	3	2		2	1		3	3	3	3
	CO2	develop Marker-Based and Markerless AR Applications	2.15	2.33	2.20	2	2	3	2	1	2	2		2	1	2	2	2	2
	CO3	develop and import 3D models into AR/VR environments	2.22	2.90	2.42	3	2	3	2	2	2	1	2	2			2	3	2
	CO4	integrate VR input and output hardware to enhance the user experience.	2.90	2.80	2.87	2	2	3	2	2	3		2	1	2	1	2	1	2
	CO5	develop applications that simulate real-world scenarios, such as a virtual gym or training simulations.	2.20	2.50	2.29	3	3	2	3	3	2	1	2	2		1	3	3	2
	CO6	identify areas for improvement and implement changes to optimize performance and user satisfaction.	2.50	2.18	2.40	2	3	3	3	3	3			2	2		3	2	2
Generative AI (270731)	CO1	Illustrate the basic concepts, scope and significance of generative AI.	2.50	2.90	2.62	3	3	3	3	3	2		1	2			2	3	3
	CO2	Comprehend different types of generative models and their architectures and functioning of GANs.	2.80	2.60	2.74	2	2	3	3	2	1		1			2	1	2	2
	CO3	Implement the VAEs and flow-based models.	2.40	2.70	2.49	3	3	2	2	3	2			2	2		3	3	3
	CO4	Explore advanced generative techniques like autoregressive and transformer-based models.	2.60	2.60	2.60	2	2	3	3	3	2	2	1	1			3	3	2
	CO5	Apply generative AI techniques to practical problems	2.50	2.90	2.62	3	3	3	2	2	3		3	3	2	3	1	2	2
	CO6	Analyze the ethical implications, societal impact and challenges associated with generative AI.	2.50	2.80	2.59	3	2	2	3	2	3	3	2	3	2	2	3	3	3
Internship/ Project (270703)	CO1	apply the principles of engineering, mathematics, and science to design and execute a comprehensive project or solve industry-specific problems.	2.50	2.30	2.44	3	2	2	3	3	3	2	1	3	1	1	3	2	2
	CO2	analyze complex engineering challenges, identifying root causes and constraints to develop effective solutions.	2.10	2.40	2.19	3	2	3	2	3	2	2	1	3	2	2	3	2	2
	CO3	design and develop innovative and practical solutions or prototypes that address identified problems while adhering to professional standards.	2.30	2.10	2.24	3	3	1	3	2	3	2	1	3	2	2	2	3	3

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CO-PO mapping matrix - AI&DS Batch admitted in 2021-22

Course Code and Name		Course Outcome Statements	CO Attainment			CO-PO Matrix													
			Direct Attainment	Indirect Attainment	Total Attainment	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
	CO4	evaluate the efficiency, sustainability, and impact of their project solutions using appropriate testing methods and performance metrics.	2.00	2.00	2.00	2	3	2	3	2	2	2	1	3	2	2	3	2	2
	CO5	demonstrate effective communication skills by preparing detailed technical reports, delivering presentations, and articulating ideas clearly to diverse audiences.	2.00	2.00	2.00	3	2	2	3	1	1	2	2	3	1	3	1	3	3
	CO6	identify areas for personal and professional growth and propose strategies for lifelong learning.	2.00	2.00	2.00	3	3	2	2	3	2	3	1	3	2	2	2	3	3
		PO/PSO Target				**2.01**	**1.87**	**1.89**	**1.73**	**1.59**	**1.62**	**1.35**	**1.32**	**1.59**	**1.44**	**1.67**	**1.81**	**1.75**	**1.7**
						70% of Average CO-PO Mapping of each PO													

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Course-wise Direct PO attainment of AI&DS Batch admitted in 2021-22

S.No.	Course Code & Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
1	Introduction to Artificial Intelligence & Data Science (270101)	2.88	2.87	2.87	2.88	2.85	2.86	2.84	2.87	2.88	2.83	2.87	2.88	2.88	2.86
2	Introduction to Computer Programming (270102)	2.63	2.63	2.63	2.61	2.64	2.64	2.55	2.66	2.65	2.67	2.68	2.65	2.63	2.62
3	Energy Environment, Ecology & Society (100015)	2.39	2.4	2.39	2.4	2.39	2.39	2.37	2.38	2.4	2.38	2.35	2.41	2.39	2.38
4	Basic Electrical & Electronics Engineering (100022)	2.11	2.1	2.09	2.1	2.1	2.07	2.07	2.1	2.1	2.1	2.09	2.1	2.1	2.09
5	Linear Algebra (250100)	2.31	2.31	2.3	2.31	2.3	2.32	2.31	2.2	2.31	2.2	2.31	2.31	2.32	2.32
6	Digital Logic Design (270201)	2.18	2.19	2.18	2.19	2.19	2.13	2.15	2.23	2.18	2.19	2.17	2.18	2.18	2.19
7	Data Structures (270202)	2.74	2.74	2.74	2.74	2.74	2.76	2.75	2.73	2.75	2.72	2.75	2.75	2.75	2.73
8	Object Oriented Programming and Methodology (270203)	2.42	2.42	2.41	2.42	2.41	2.4	2.42	2.39	2.43	2.43	2.42	2.42	2.42	2.42
9	Probability and Random Process (250106)	2.51	2.49	2.5	2.51	2.49	2.5	2.51	2.43	2.58	2.5	2.49	2.5	2.5	2.5
10	Technical Language (100016)	2.01	2	2.01	2.01	2	2	2.03	1.97	2.06	2.01	2	2.01	2	2
11	Discrete Structure (270301)	2.61	2.58	2.59	2.61	2.58	2.59	2.67	2.55	2.64	2.57	2.57	2.59	2.59	2.59
12	Design & Analysis of Algorithms (270302)	2.39	2.38	2.39	2.39	2.38	2.39	2.42	2.35	2.45	2.38	2.37	2.39	2.39	2.38
13	Operating System (270303)	2.21	2.2	2.2	2.19	2.2	2.19	2.13	2.22	2.1	2.17	2.24	2.19	2.19	2.21
14	Computer Networks and Protocols (270304)	2	2.03	1.99	2	2.04	1.99	2.19	2.12	1.66	1.93	2	1.98	1.98	2.03
15	Database Management System (270305)	2.25	2.26	2.27	2.25	2.26	2.27	2.06	2.2	2.35	2.33	2.32	2.27	2.27	2.26
16	Database Management System Lab (270305)	2.46	2.46	2.48	2.49	2.47	2.5	2.55	2.45	2.49	2.56	2.46	2.48	2.46	2.46
17	Python Programming Lab (270306)	2.11	2.1	2.11	2.11	2.1	2.1	2.13	2.07	2.16	2.1	2.09	2.1	2.1	2.1
18	Computer architecture and Microprocessor (270401)	2.7	2.71	2.7	2.7	2.72	2.71	2.7	2.77	2.58	2.7	2.73	2.71	2.72	2.69
19	Cloud computing (270402)	2.39	2.38	2.39	2.39	2.39	2.39	2.38	2.37	2.39	2.39	2.39	2.39	2.38	2.38

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S.No.	Course Code & Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
20	Machine Learning and optimization (270404)	2.06	2.09	2.12	2.06	2.05	2.05	2.08	1.89	2.09	2.13	2.09	2.09	2.09	2.09
21	Software Engineering (270403)	2.68	2.67	2.64	2.63	2.7	2.64	2.72	2.73	2.67	2.6	2.68	2.68	2.65	2.67
22	Network & Web Security (270505)	2.37	2.36	2.36	2.36	2.36	2.36	2.36	2.37	2.37	2.37	2.36	2.36	2.37	2.37
23	Design and Thinking Lab (270406)	2.06	2.05	2.06	2.06	2.06	2.06	2.06	2.05	2.06	2.11	2.06	2.06	2.05	2.05
24	Information Retrieval (270501)	2.06	2.25	2.04	2.11	1.93	2.08	2.11	2.2	2	2.01	2.05	2.12	2.14	2.01
25	Data Science using Python (270502)	2.27	2.25	2.27	2.26	2.27	2.26	2.26	2.28	2.27	2.29	2.22	2.28	2.26	2.26
26	Theory of Computation (270503)	2.42	2.42	2.44	2.42	2.41	2.43	2.44	2.26	2.65	2.47	2.43	2.42	2.42	2.42
27	Computer Graphics & Multimedia (270504)	2.27	2.29	2.28	2.31	2.26	2.28	2.22	2.19	2.3	2.25	2.3	2.3	2.29	2.29
28	Soft Computing Techniques (270505)	2.53	2.6	2.53	2.54	2.52	2.22	2.55	2.52	2.35	2.55	2.32	2.7	2.65	2.55
29	Disaster Management (1000006)	2.32	2.24	2.11	2.19	2.06	2.08	2.37	2.13	2.13	2.15	2.08	2.17	2.18	2.13
30	Data Mining and Pattern Warehousing (270601)	2.12	2.11	2.13	2.12	2.11	2.09	1.98	2.12	2.1	2.05	2.09	2.11	2.13	2.1
31	Data Mining and Pattern Warehousing Lab (270601)	2.51	2.54	2.52	2.5	2.47	2.51	2.31	2.55	2.51	2.61	2.51	2.51	2.51	2.51
32	Image Processing (270602)	2.7	2.69	2.69	2.69	2.67	2.68	2.76	2.69	2.7	2.68	2.7	2.67	2.71	2.68
33	Image Processing Lab (270602)	2.64	2.62	2.65	2.64	2.61	2.66	2.61	2.58	2.59	2.87	2.63	2.63	2.6	2.61
34	Deep Learning (270603)	2.4	2.38	2.42	2.4	2.43	2.36	2.42	2.38	2.36	2.34	2.36	2.36	2.36	2.43
35	Deep Learning Lab (270603)	2.82	2.82	2.81	2.82	2.83	2.81	2.79	2.81	2.82	2.85	2.82	2.82	2.82	2.81
36	Pattern Recognition (270732)	2.66	2.63	2.68	2.7	2.73	2.66	2.65	2.64	2.7	2.67	2.73	2.7	2.65	2.67
37	Universal Human Values & Professional Ethics (1000008)	2.81	2.82	2.82	2.82	2.83	2.83	2.78	2.85	2.81	2.84	2.8	2.82	2.81	2.82
38	AR-VR lab (270701)	2.45	2.46	2.47	2.45	2.48	2.49	2.28	2.55	2.41	2.55	2.48	2.46	2.43	2.47

Centre for Artificial Intelligence

Course-wise Direct PO attainment of AI&DS Batch admitted in 2021-22

S.No.	Course Code & Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
39	Generative AI (270731)	2.6	2.6	2.62	2.62	2.6	2.6	2.59	2.63	2.59	2.57	2.65	2.59	2.6	2.6
40	Internship/ Project (270703)	2.15	2.13	2.14	2.15	2.17	2.19	2.13	2.12	2.15	2.13	2.11	2.17	2.13	2.13
PO Attainment Direct		**2.41**	**2.41**	**2.4**	**2.4**	**2.4**	**2.39**	**2.39**	**2.39**	**2.39**	**2.41**	**2.39**	**2.41**	**2.4**	**2.4**

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Indirect PO attainment of AI&DS Batch admitted in 2021-22

Feedback response from Batch 2021-22 [Sample size: 40]

Category	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
1/Below Average/ Low	3	2	1	3	2	2	2	2	3	3	2	2	3	3	Number of Responses
2/Average/ Moderate	4	3	3	1	2	2	1	0	0	1	1	0	0	0	
3/Good/ Adequate	5	3	4	7	5	7	7	7	5	6	7	6	2	3	
4/Very Good/ Substantial	9	14	13	12	12	13	13	14	13	13	13	13	14	15	
5/Excellent/ Highly Substantial	17	18	19	17	19	16	17	17	19	17	17	19	21	19	
PO Attainment Level	**2.32**	**2.45**	**2.49**	**2.39**	**2.46**	**2.39**	**2.43**	**2.46**	**2.48**	**2.40**	**2.43**	**2.51**	**2.55**	**2.51**	

PO Attainment Level	Excellent (3)	Very Good (2)	Good (1)
PO Attainment Percentage	70.00	60.00	50.00

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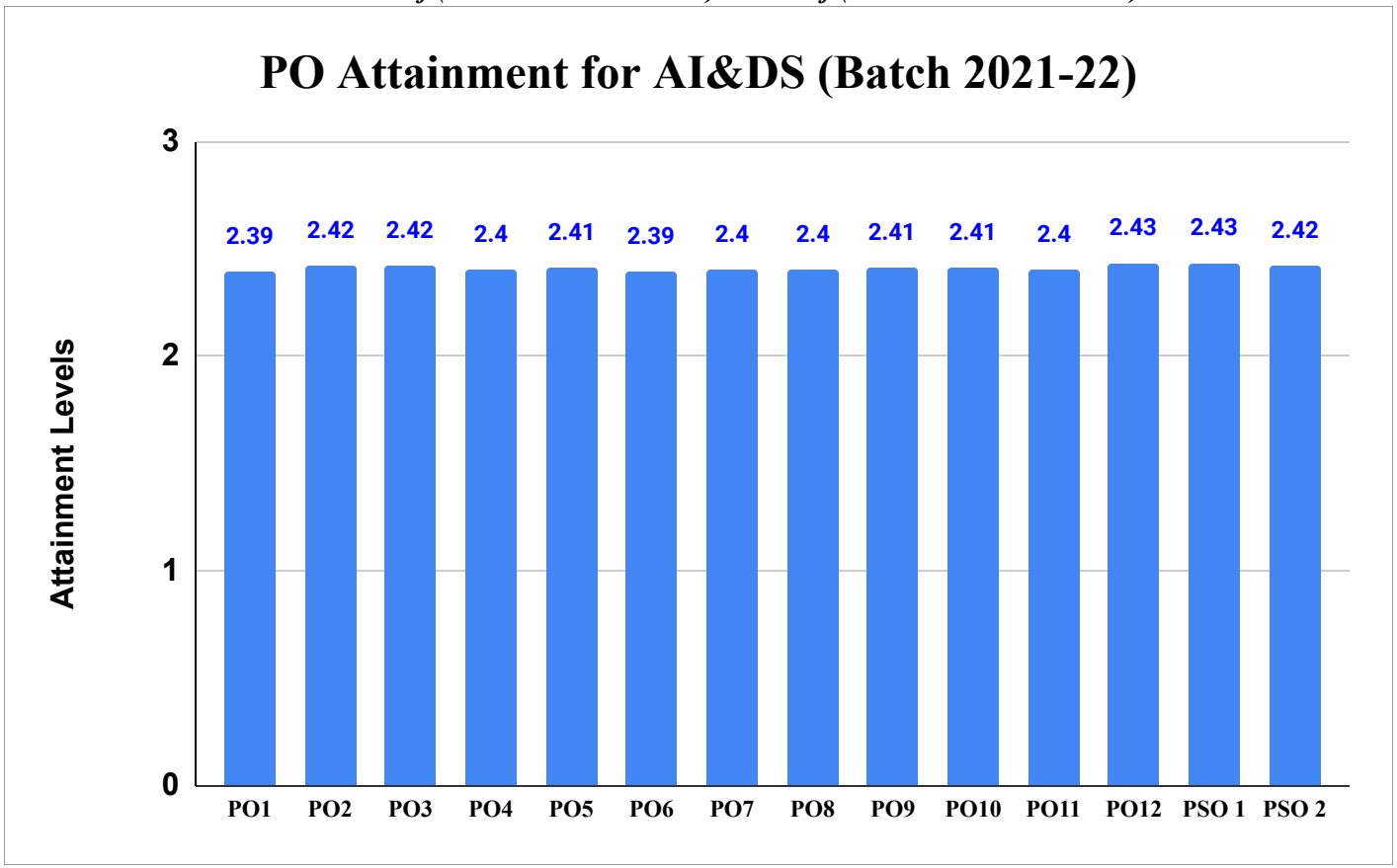
PO attainment of AI&DS Batch admitted in 2021-22

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
PO Attainment Direct	2.41	2.41	2.4	2.4	2.4	2.39	2.39	2.39	2.39	2.41	2.39	2.41	2.4	2.4
PO Attainment Indirect	2.32	2.45	2.49	2.39	2.46	2.39	2.43	2.46	2.48	2.40	2.43	2.51	2.55	2.51
PO Attainment	2.39	2.42	2.42	2.4	2.41	2.39	2.4	2.4	2.41	2.41	2.4	2.43	2.43	2.42

PO Attainment = 80% of (PO Attainment Direct) + 20% of (PO Attainment Indirect)



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Action Taken Report for PO attainment of AI&DS Batch admitted in 2021-22

POs	Target Level	Attainment Level	Observations
PO1 Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.			
PO1	2.01	**2.39**	Target achieved
Actions: **Organized regular workshops and seminars on foundational and advanced engineering topics.** **Regularly revised the curriculum to keep pace with advancements in engineering and technology.**			
PO2 Problem analysis: Identity, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.			
PO2	1.87	**2.42**	Target achieved
Actions: **Included assessments with real-world problem statements requiring analytical skills.** **Introduced assignments/projects where multiple solutions are possible, emphasizing creativity.**			
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 public health and safety, and the cultural, societal, and environmental considerations.			
PO3	1.89	**2.42**	Target achieved
Actions: **Mandated internships in relevant industries to expose students to practical challenges and solutions.** **Each lab course had skill based mini projects, ensuring hands-on experience in applying engineering based solutions to various problems related to public health, safety, culture, society, and environment.**			
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.			
PO4	1.73	**2.4**	Target achieved
Actions: **Students were encouraged to participate in technical competitions right from the beginning of the course.** **Lab Projects, Minor and Major projects, on real world problems and having focus on research, at different stages of the programme helped students to investigate different real world complex problems.**			
PO5 Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.			
PO5	1.59	**2.41**	Target achieved
Actions: **Robotics lab., High performance computing lab, IoT lab and other related resources were developed in the institute to help students to use modern engineering and IT tools.**			
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.			

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Action Taken Report for PO attainment of AI&DS Batch admitted in 2021-22

POs	Target Level	Attainment Level	Observations
PO6	1.62	**2.39**	Target achieved
Actions: **Participation in NSS camps and Social Services, through different technical as well as cultural Clubs available at the institute, enabled students to realise various societal problems and possibility of engineering solutions.**			
PO7 Environment and sustainability: Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.			
PO7	1.35	**2.4**	Target achieved
Actions: **Students are encouraged to develop mini projects to address social issues.** **Different expert lectures were organized to highlight and address environmental and sustainability issues in engineering.** **Techno-social visits have been organised for students.**			
PO8 Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.			
PO8	1.32	**2.4**	Target achieved
Actions: **Components on professional ethics and human values have been included in the induction training programme, also different courses like Universal Human Values and Professional Ethics have been introduced as audit courses at different semesters.**			
PO9 Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.			
PO9	1.59	**2.41**	Target achieved
Actions: **Students are motivated to organize the team activities like Group Quiz, Social/Technical Quiz etc.** **Students are encouraged to participate in events like seminar, workshop, projects, hands-on training etc. organized by Professional body activities to improve their interpersonal skills**			
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.			
PO10	1.44	**2.41**	Target achieved
Actions: **The documentation, in the form of reports and presentations for the Lab courses, Mini Projects, Minor Projects and Major Project/Internships has helped students to enhance their communication skills and present their ideas effectively.**			
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.			
PO11	1.67	**2.4**	Target achieved

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Action Taken Report for PO attainment of AI&DS Batch admitted in 2021-22

POs	Target Level	Attainment Level	Observations
Actions: **Students are encouraged to participate in technical competitions right from the beginning of the course to acquire project management skills.** **Also a course on project management and financing is included as a mandatory audit course in the curriculum.**			
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.			
PO12	1.81	**2.43**	Target achieved
Actions: **Departmental elective courses offered from SWAYAM/NPTEL platform, and mandatory Internships has helped students to acquire life long learning skills.**			
PSO-1 Exhibit comprehensive understanding of human cognition, artificial intelligence, and data science principles to address real-world challenges and successfully confront the evolving demands of society.			
PSO1	1.75	**2.43**	Target achieved
Actions: **Various courses were added in the curriculum related to application of AI&DS like Data Science, Data Mining, Pattern Recognition etc.** **Students are encouraged to enroll in different workshops/seminars related to the field.**			
PSO-2 Apply probability, statistics, and computing concepts to solve complex real-world problems, demonstrating the adeptness to meet the dynamic challenges.			
PSO2	1.7	**2.42**	Target achieved
Actions: **Students apply probability, statistics, and computing concepts to analyze real-world problems through projects, labs, and computational tools in various lab courses and projects like image processing, Sensor data processing for robotic applications, data prercoessing for various project works etc.**			

Centre for Artificial Intelligence

CO-PO mapping matrix - AI&ML Batch admitted in 2021-22

			CO Attainment			CO-PO Matrix													
Course Code and Name		**Course Outcome Statements**	**Direct Attainment**	**Indirect Attainment**	**Total Attainment**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
Introduction to Artificial Intelligence & Machine Learning (280101)	CO1	define basic concepts of Artificial Intelligence	2.60	2.86	2.68	3	2	2	1	2	2	1	1	1	3	2	1	2	3
	CO2	relate various computer components used in Artificial Intelligence	2.76	2.93	2.81	2	3	3	2	2		2		2	2	2	2	2	2
	CO3	identify different logical and reasoning techniques used in AI	3.02	2.71	2.93	3	2	2	2	1	1		1	1	1	1	2	2	2
	CO4	analyze the general approach of optimization, intelligent agent and expert system	2.82	2.65	2.77	2	3	2	2	2		1	2	2	2	1	2	1	3
	CO5	analyze the general approach of machine learning	2.82	2.86	2.83	3	3	2	2	1	2	1		2	1	2	2	3	2
	CO6	build AI enabled intelligent procedures for solving real world problems	2.84	2.94	2.87	3	2	2	1	1	2		1	2		2	2	2	2
Introduction to Computer Programming (280102)	CO1	Identify situations where computational methods and computers would be useful.	2.35	2.55	2.41	3	3	2	3	2	2	1	1	2	2	2	1	3	3
	CO2	Describe the basic principles of imperative and structural programming.	2.45	2.74	2.54	2	2	3	3	2	1		2		2	2	1	2	1
	CO3	Develop a pseudo-code and flowchart for a given problem.	2.65	2.84	2.71	3	3	2	2	3	2	1	1	2	2		3	3	2
	CO4	Analyze the problems and choose suitable programming techniques to develop solutions.	2.45	2.74	2.54	2	2	3	3	3	2	2	1	1	2	2	3	3	2
	CO5	Design, implement, debug and test programs.	2.55	2.94	2.67	3	3	3	2	2	3		2	3	2	3	1	2	2
	CO6	Design computer programs to solve real world problems.	2.59	2.62	2.60	3	2	2	3	2	3		2	3	2	2	3	3	3
Energy Environment, Ecology & Society (100015)	CO1	describe the various types of energy systems and their roles in societal and environmental contexts.	2.30	2.44	2.34	3	3	3	3	2	2	1	2	1	1	2	2	3	3
	CO2	analyze the environmental consequences of energy production and consumption, including pollution and climate change.	2.17	2.38	2.23	2	2	3	2	2	3	2		1	2	2	1	2	1
	CO3	evaluate renewable energy technologies and strategies for sustainable development in comparison to conventional energy systems.	2.30	2.44	2.34	3	3	2	3	3	2	3	2	2		1	3	3	2
	CO4	apply ecological principles to assess the impact of human activities on ecosystems and biodiversity.	2.52	2.26	2.44	2	3	3	3	3	3	1		2	2		3	3	2
	CO5	design sustainable energy and environmental management practices that balance ecological integrity and societal needs.	2.35	2.21	2.31	3	2	3	2	2	3	3	3	3	2	3	1	2	2
	CO6	reflect on the ethical and social responsibilities associated with energy use and environmental stewardship to propose actionable solutions.	2.35	2.38	2.36	3	3	2	3	2	3		2	3	2	2	3	3	3
Basic Electrical & Electronics Engineering (100022)	CO1	Solve dc & ac circuits by applying fundamental laws & theorems	2.03	2.15	2.07	3	3	2	1	1	2	1		1	3	2	1	3	3
	CO2	Compare the behavior of electrical and magnetic circuits for given input	1.90	2.10	1.96	2	3	3	2	2		2	1	2	2	2	2	2	1
	CO3	Explain the working principle, construction, applications of rotating electrical machines	2.03	2.15	2.07	3	3	2	2	1	1	1		1	1	1	2	3	2

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CO-PO mapping matrix - AI&ML Batch admitted in 2021-22

Course Code and Name		Course Outcome Statements	CO Attainment			CO-PO Matrix													
			Direct Attainment	Indirect Attainment	Total Attainment	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
	CO4	Explain the working principle, constructional details, losses & applications of single-phase transformer	2.21	1.99	2.14	3	3	2	2	2	2		2	2	2	1	2	3	2
	CO5	Select the logic gates for various applications in digital electronic circuits	2.07	1.94	2.03	2	3	2	2	1	1	1		2	1	2	2	2	2
	CO6	Explain characteristics of Diode and Transistor	2.07	2.10	2.08	3	2	2	1	1	2		1	2		2	2	3	3
Linear Algebra (250100)	CO1	determine the solution of Matrix	2.23	2.36	2.27	3	3	3	1	1	2			2		2	2	3	3
	CO2	find the analytical solution of algebraic structures	2.10	2.30	2.16	2	3	3	2	1	1	1	1	2	1	2	2	2	1
	CO3	express the vector space	2.23	2.36	2.27	3	2	2	1	1	2	1		2		2	2	3	2
	CO4	acquire the knowledge of Linear transformation	2.44	2.20	2.37	2	3	2	2	1	2	1		3		3	3	3	2
	CO5	illustrate the concept of Inner product spaces	2.27	2.14	2.23	3	3	3	2	3	2			3		3	3	2	2
Digital Logic Design (280201)	CO1	Illustrate various number systems, Binay codes and its application in digital design.	2.12	2.24	2.16	3	3	2	1	2	1	2	2	1	3	2	1	2	3
	CO2	Identify the logic functions, circuits, truth tables and also apply the laws of Boolean algebra to simplify circuits and expressions.	1.99	2.20	2.05	3	3	3	2	2		2		2	2	2	2	1	1
	CO3	Develop the formal procedures for the analysis and design of combinational circuits.	2.12	2.24	2.16	3	3	2	2	1	2		1	1	1	1	2	2	2
	CO4	Analyse sequential circuit's components and their usability in digital circuits.	2.31	2.09	2.24	3	3	2	2	2	1		1	2	2	1	2	1	2
	CO5	Compare the concept of memories, programmable devices and digital ICs.	2.17	2.03	2.13	3	3	2	2	1	1	2		2	1	2	2	3	2
	CO6	Design and analyze circuits for digital arithmetic.	2.07	2.20	2.11	3	2	2	1	1	2	1	1	2		2	2	2	2
Data Structures (280202)	CO1	describe the basics of algorithms and their performance criteria.	2.65	2.80	2.70	3	3	3	1	1	2		2	2	1	2	2	2	2
	CO2	explain the working of linear/non-linear data structures.	2.49	2.73	2.56	2	3	3	2	1	1	1		2	2	2	2	2	3
	CO3	identify the appropriate data structure to solve specific problems.	2.65	2.80	2.70	3	2	2	1	1	2	1	1	2		2	2	2	2
	CO4	decompose complex data structures, such as trees and graphs, into simpler components.	2.89	2.61	2.81	2	3	2	2	1	2			3	1	3	3	3	2
	CO5	evaluate the time/space complexities of data structures & their applications.	2.70	2.54	2.65	3	3	3	2	3	2	2	2	3		3	3	3	3
	CO6	design optimal algorithmic solutions for various real-world problems.	2.70	2.73	2.71	3	2	3	2	1	2			2	1	2	2	2	2
Object Oriented Programming and Methodology (280203)	CO1	describe fundamental principles of object-oriented programming.	2.33	2.47	2.37	3	3	3	3	3	3	1	1	1	1	1	3	1	1
	CO2	explain the benefits of object-oriented design.	2.19	2.41	2.26	3	2	2	3	3	2	2	1	1	1	2	3	2	2
	CO3	develop well-structured, modular programs that leverage classes, objects, and inheritance to enhance code maintainability and reusability.	2.33	2.47	2.37	3	3	3	3	3	3	1	2	3	3	3	3	3	3
	CO4	inspect the programs for the identification and correction of errors and exceptions.	2.55	2.29	2.47	3	2	2	2	3	3	1	1	3	1	2	3	3	2

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CO-PO mapping matrix - AI&ML Batch admitted in 2021-22

Course Code and Name		Course Outcome Statements	CO Attainment			CO-PO Matrix													
			Direct Attainment	Indirect Attainment	Total Attainment	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
	CO5	apply standard template libraries for efficient and generic programming.	2.38	2.23	2.34	3	3	2	3	3	3	2		3	1	3	3	3	3
	CO6	design effective solutions for real world problems using object-oriented principles.	2.38	2.41	2.39	3	2	3	3	2	3	2	2	3	3	3	3	3	3
Probability and Random Process (250106)	CO1	Interpret the theory of Probability and its distributions	2.42	2.56	2.46	3	2	3	2	3	2	2			2	2	3	2	3
	CO2	Evaluate the Skewness, Kurtosis, curve fitting, correlation and regression.	2.27	2.50	2.34	2	3	2	3	3	3	2	2		3	3	3	3	2
	CO3	Analyze the test of hypothesis	2.42	2.56	2.46	3	3	3	3	3	3		1	2	2	2	2	2	2
	CO4	Acquire the knowledge of random variables.	2.65	2.38	2.57	3	2	3	3	2	3	1	1	3	3	2	3	3	2
	CO5	Determine the random process	2.47	2.31	2.42	3	2	2	3	3	3		2		2	3	3	2	3
Technical Language (100016)	CO1	explain key technical terms and concepts relevant to their field of study.	2.13	2.25	2.17	3	3	3	2		2	1			1	1		3	3
	CO2	analyze technical documents, such as manuals, specifications, and reports, to extract essential information.	2.00	2.21	2.06	3	2			2		1		2	3		2	2	1
	CO3	construct clear and concise technical communication, including reports, emails, and presentations.	2.13	2.25	2.17	2	3	2	2	3	2	1		2	2	2	3	3	2
	CO4	create technical documents such as user guides, project proposals, and research papers, adhering to standard formats and conventions.	2.32	2.09	2.25	3	3	2		2		1		3	3	2	2	3	2
	CO5	evaluate the clarity, accuracy, and effectiveness of technical communication produced by themselves and others.	2.18	2.04	2.14	3	2		3		2		2		3	1	1	2	2
	CO6	apply technical language and communication strategies effectively in professional scenarios, such as interviews, meetings, and collaborative projects.	2.18	2.21	2.19	2	3	2	2	1	2	2	1	2	1	2	2	3	3
Discrete Structure (280301)	CO1	explain the concepts of set theory, propositional logic, graph theory, discrete numeric function and algebraic structure.	2.77	2.23	2.61	3	2	3	3	2	2	2			2	2	3	2	3
	CO2	apply mathematical reasoning and logical thinking to solve problems	2.37	2.13	2.30	2	3	3	2	3	3	3	2		3	3	2	3	3
	CO3	determine the solutions of problems pertaining to computer sciences using graph theory concepts.	2.69	2.23	2.55	3	3	3	3	3	3	3		2	2	2	2	2	2
	CO4	solve counting problems using combinatorial analysis.	2.84	2.07	2.61	3	2	3	3	2	3			3	3	2	3	3	2
	CO5	solve real-world problems by translating practical problems into mathematical formulations	2.70	2.28	2.57	3	2	2	3	3	3	1	2		2	3	3	3	3
	CO6	formulate and design original mathematical proofs.	2.82	2.18	2.63	3	2	2	3	2	2		2	1	1		2	2	2
Design & Analysis of Algorithms (280302)	CO1	demonstrate a familiarity with major algorithms and data structures.	2.30	2.44	2.34	3	2	3	3	2	2	2		1	2	2	3	3	3
	CO2	apply important algorithmic design paradigms and methods of analysis.	2.17	2.38	2.23	2	3	3	2	3	3		2		3	3	3	3	3
	CO3	analyze the asymptotic performance of algorithms.	2.30	2.44	2.34	3	3	3	3	3	3			2	2	2	2	2	2

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CO-PO mapping matrix - AI&ML Batch admitted in 2021-22

Course Code and Name		Course Outcome Statements	CO Attainment			CO-PO Matrix													
			Direct Attainment	Indirect Attainment	Total Attainment	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
	CO4	compare different design techniques to develop algorithms for computational problems.	2.52	2.26	2.44	3	2	3	3	2	3	1		3	3	2	3	3	2
	CO5	design algorithms using greedy strategy, divide and conquer approach, dynamic programming, backtracking and branch n bound approach.	2.35	2.21	2.31	3	2	2	3	3	3		2		2	3	3	3	3
	CO6	understand the hardness and different classes of hardness. Further, design approximate solutions for computationally hard problems.	2.35	2.38	2.36	3	2	2	3	2	2	2	2	1	1		2	2	2
Operating System (280303)	CO1	tell the basic concept of operating systems.	2.35	2.18	2.30	3	2	3	3	2	2	2	1	1	2	2	3	3	3
	CO2	explain the working procedure of the operating system.	2.35	2.03	2.25	2	3	2	2	3	3	1	2		3	3	3	3	3
	CO3	analyze the various operating system problems and issues.	2.29	2.03	2.21	3	3	3	3	3	3	1	1	2	2	2	2	2	2
	CO4	develop the solutions for various operating system problems and issues.	1.85	2.03	1.90	2	2	3	3	2	3	3		3	3		3	3	2
	CO5	measure the performance of various scheduling and allocation techniques.	2.00	2.12	2.04	3	3	2	3	3	3		2		2	3	3	3	3
	CO6	test the working of various scheduling and allocation techniques.	2.29	2.06	2.22	3	2	2	3	2	2	2	2	1		2	2	2	2
Computer Networks and Protocols (280304)	CO1	explain the fundamental concepts of computer network.	2.30	1.66	2.11	3	2	3	3	2	2	2			2	2	3	2	3
	CO2	illustrate the basic taxonomy & terminologies of computer network protocols	2.35	1.51	2.10	2	3	3	2	3	3	3	2		3	3	2	3	3
	CO3	develop a concept for understanding advance computer network.	2.52	1.51	2.22	3	3	3	3	3	3	3		2	2	2	2	2	2
	CO4	build the skill of IP addressing and routing mechanism.	1.11	1.51	1.23	3	2	3	3	2	3			3	3	2	3	3	2
	CO5	predict the performance of computer network in congestion and internet.	2.21	1.63	2.04	3	2	2	3	3	3	1	2		2	3	3	3	3
	CO6	construct the network environment for implementation of computer networking concept.	2.35	1.48	2.09	3	2	2	3	2	2		2	1	1		2	2	2
Database Management System (280305)	CO1	demonstrate the concepts of different type of database system	2.19	2.56	2.30	3	2	3	3	2	2	1			2	2	3	3	3
	CO2	apply relational algebra concepts to design database system	2.06	2.50	2.19	2	3	3	2	3	3	1	2	2	3	3	2	3	3
	CO3	make use of queries to design and access database system.	2.19	2.56	2.30	3	3	3	3	2	3	1		2	2	2	2	2	2
	CO4	analyze the evaluation of transaction processing and concurrency control	2.39	2.38	2.39	3	2	3	3	2	3	1	2	3	3	2	3	3	2
	CO5	determine the optimize database for real world applications.	2.23	2.31	2.25	3	2	2	3	3	3		2		2	3	3	3	3
	CO6	design a database system for a real world application	2.11	2.18	2.13	3	2	2	3	2	2	2	2				2	2	2

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Course Code and Name		Course Outcome Statements	CO Attainment			CO-PO Matrix													
			Direct Attainment	Indirect Attainment	Total Attainment	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
Database Management System Lab (280305)	CO1	construct a database schema for a given problem domain.	2.65	2.58	2.63	3	2	3	3	2	3	3		3	3	2	3	1	2
	CO2	apply integrity constraints on a database schema using a state-of-the-art RDBMS.	2.55	2.34	2.49	2	2	2	3	3	3	2	2		2	3	3	2	2
	CO3	apply SQL queries using DDL and DML to design and access database systems.	2.35	2.39	2.36	3	2	2	3	2	2		2				2	2	2
	CO4	make use of operators and functions used in query.	2.69	2.43	2.61	3	2	2	1	2	2			2		3	2	1	2
	CO5	distinguish Tables and Views for database systems.	2.35	2.49	2.39	2	2	2	2	2		2	2	2	2	3	3	2	2
	CO6	develop a small project for a real world scenario	2.57	2.31	2.49	2	3	2	1	2	1	1	2	2		3	2	2	2
Python Programming Lab (280306)	CO1	describe the fundamental syntax, data structures, and core concepts of Python programming.	1.97	2.30	2.07	3	2	3	3	2	2				2	2	3	3	3
	CO2	develop Python programs to solve computational problems using appropriate control structures, functions, and libraries.	1.85	2.25	1.97	2	3	3	2	3	3		2		3	3	3	3	3
	CO3	analyze and debug Python code to identify and resolve logical and runtime errors.	1.97	2.30	2.07	3	3	3	3	3	3			2	2	2	2	2	2
	CO4	build Python applications incorporating modules like file handling, exception handling, and object-oriented programming concepts.	2.16	2.14	2.15	3	2	3	3	2	3	2		3	3	2	3	3	2
	CO5	evaluate the performance of Python programs based on computational efficiency and resource utilization.	2.01	2.09	2.03	3	2	2	3	3	3	2	2	1	2	3	3	3	3
	CO6	implement algorithms such as sorting, searching, and recursion using Python to solve real-world problems.	2.01	2.25	2.08	3	2	2	3	2	2	2	2		1		2	2	2
Computer architecture and Microprocessor (280401)	CO1	demonstrate the computer architecture and microprocessor for defining basic component and functional units.	3.00	3.00	3.00	3	2	3	3	2	2	2		1	2	2	3	1	1
	CO2	develop the fundamental concept to understand the working of computer architecture and microprocessor.	2.60	3.00	2.72	2	3	3	2	3	3	3	2		3	3	3	1	1
	CO3	explain the basic concept of input output and memory organization.	3.00	3.00	3.00	3	3	3	3	3	3	3		2	2	2	2	2	2
	CO4	develop the skill of writing assembly language programming.	2.20	2.80	2.38	3	2	3	3	2	3	3		3	3	2	3	1	2
	CO5	build a system using peripheral devices and controllers for 8086 microprocessors.	2.90	3.00	2.93	3	2	2	3	3	3	2	2		2	3	3	2	2
	CO6	apply the concept of computer architecture and microprocessor in solving real world problems.	2.50	3.00	2.65	3	2	2	3	2	2	2	2		1		2	2	2
Cloud computing (280402)	CO1	describe cloud computing fundamentals.	2.30	2.44	2.34	1	2	2	1	2	1	1	1	2		3	2	1	2
	CO2	explain architecture, infrastructure and delivery models.	2.17	2.38	2.23	2	2	2	1	2	1	1	2	2	2	3	3	2	2
	CO3	apply suitable virtualization concepts based on problem characteristics.	2.30	2.44	2.34	2	3	2	1	2	1	1	2	2		3	2	2	2
	CO4	choose appropriate programming models for a specific cloud computing application.	2.52	2.26	2.44	3	2	2	1	3	1	1	1	2	2	3	3	2	2

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	CO5	analyze various security issues in cloud computing.	2.35	2.21	2.31	2	3	3	1	2	1	2	1	2		3	2	2	3
	CO6	create a secure and efficient cloud computing environment.	2.35	2.38	2.36	2	2	3	2	1	2	1		2	1	2	2	2	2
Machine Learning and optimization (280404)	CO1	Summarize different kind of machine learning algorithms.	2.61	2.61	2.61	3	2	3	3	2	2	2		1	2	2	3	3	3
	CO2	Demonstrate a familiarity with major optimzation algorithms.	2.25	2.25	2.25	2	3	3	2	3	3	3	2		3	3	3	3	3
	CO3	Apply optimization algorithms to solve real world problems.	2.05	2.05	2.05	3	3	3	3	3	3	3		2	2	2	2	2	2
	CO4	Formulation of design problems as methematical programming problems.	1.98	1.98	1.98	3	2	3	3	2	3	3	1		3	2	3	3	2
	CO5	Examine supervised and unsupervised learning methods for real-life problems.	1.53	1.53	1.53	3	2	2	3	3	3	2	2		2	3	3	3	3
	CO6	Deploy machine learning models for real time problems.	1.76	1.76	1.76	3	2	2	3	2	2	2	2	1	1		2	2	2
Software Engineering (280403)	CO1	explain the concepts of software engineering.	2.17	2.54	2.28	3	3	2	1	2	1	1	2	2		3	2	2	3
	CO2	analyze and design software for real world problems.	2.04	2.48	2.17	2	2	2	1	2	2	2	1	2	2	3	3	2	2
	CO3	compare the techniques for software project management & estimation.	2.17	2.54	2.28	2	3	2	1	2	1	1	1	2		3	2	3	3
	CO4	choose an appropriate software development model for a real-life software project.	2.37	2.35	2.36	3	2	2	1	3	1	1	2	2	2	3	3	2	2
	CO5	design software using modern tools and technologies.	2.21	2.29	2.23	2	3	3	1	2	1	2	1	2		3	2	2	3
	CO6	test the software through different approaches.	2.21	2.48	2.29	2	2	3	2	1	2			2	3	2	2	3	2
Network & Web Security (280405)	CO1	determine symmetric and public key cryptography, classical algorithms, and basic number theory.	2.28	2.42	2.32	3	3	3	3	3	2	1	1	2	1	2	3	2	3
	CO2	explain the working of various cryptographic algorithms.	2.15	2.36	2.21	3	3	3	3	2	1		2	1	1	2	3	1	2
	CO3	apply firewall, IDS, and security protocols like SSL, TLS, and SET.	2.28	2.42	2.32	3	3	3	3	2	2	1	1	2	1	2	3	2	3
	CO4	build secure systems using digital signatures, message authentication, and certificates.	2.49	2.24	2.42	3	3	3	3	1	1		2	1	1	1	2	1	3
	CO5	examine the strengths and weaknesses of IP and web security.	2.33	2.19	2.29	3	3	3	3	1	2	1	1	1	2	1	2	1	2
	CO6	select strategies for detecting and preventing attacks like sniffing, spoofing, and hacking.	2.33	2.36	2.34	3	2	2	1	3	1		2	2	2	3	3	2	2
Design and Thinking Lab (280406)	CO1	design IoT-based systems by integrating sensors, actuators, and communication modules to address real-world challenges.	2.06	1.93	2.02	3	2	2	1	2	2		2	2		3	2	1	2
	CO2	implement IoT communication protocols such as MQTT, HTTP, and CoAP to enable device-to-device and device-to-cloud interactions.	1.93	1.88	1.92	2	2	2	1	2	1		1	2		2	3	2	2
	CO3	analyze data collected from IoT sensors using software tools to extract meaningful insights and patterns.	2.06	1.93	2.02	2	3	2	1	2	1	2	2	2	1	3	2	2	2

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	CO4	develop applications that leverage IoT technologies for domains like smart homes, healthcare, or industrial automation.	2.24	1.79	2.11	3	2	2	1	3	1		1	2	2	3	3	2	2
	CO5	evaluate the performance, scalability, and reliability of IoT systems under various operational conditions.	2.10	1.74	1.99	2	3	3	1	2	1	3	1	2		3	2	2	3
	CO6	apply authentication, encryption, and other cybersecurity measures to safeguard IoT devices and data.	2.10	1.88	2.03	3	2	3	2	1	2	3		2	1	2	2	2	2
Information Retrieval (280501)	CO1	gain the basic concepts and techniques in Information Retrieval.	2.25	2.94	2.46	3	2	3	3	2	2	2			2	2	3	2	3
	CO2	explain the issues involved in representing and retrieving documents.	2.55	2.94	2.67	2	3	3	2	3	3	3	2		3	3	2	3	3
	CO3	comprehend types of text analysis, Information retrieval, IR system architecture, query processing models and probabilistic models.	1.47	2.74	1.85	3	3	3	3	3	3	3		2	2	2	2	2	2
	CO4	process the text data for the purpose of classification.	1.47	2.94	1.91	3	2	3	3	2	3			3	3	2	3	3	2
	CO5	apply the different evaluation strategies to the retrieved results for computing the efficiency and accuracy of the information retrieval model.	1.18	2.74	1.65	3	2	2	3	3	3	1	2		2	3	3	3	3
	CO6	perform indexing, compression, information categorization and sentiment analysis.	1.27	2.94	1.77	3	2	2	3	2	2		2	1	1		2	2	2
Data Science using Python (280502)	CO1	define the concepts and importance of data science.	2.26	3.00	2.48	3	3	3	3	2	2	1		2		1	1	3	2
	CO2	describe and investigate the data.	2.12	3.00	2.38	2	3	3	3	2	2	2				1	1	3	2
	CO3	implement descriptive and inferential statistics approach on real world data	2.26	2.60	2.36	3	3	2	3	3	2		2	2	2		3	3	3
	CO4	develop real world solutions using supervised and unsupervised learning methods.	2.47	3.00	2.63	3	2	3	3	3	2		2	2	2		3	3	2
	CO5	evaluate the best performing algorithms based on performance metrics.	2.30	2.70	2.42	3	3	3	2	2	3	3	3	3	2	3	1	2	2
	CO6	examine the stability of machine learning based models.	2.30	3.00	2.51	3	3	2	3	2	3	3	2	3	2	2	3	3	3
Theory of Computation (280503)	CO1	Explain the basic concepts of switching and finite automata theory & language	2.35	2.50	2.40	3	2	3	3	2	2	2			2	2	3	2	2
	CO2	Relate practical problems to language,automata, computability and complexity	2.45	2.00	2.32	2	3	3	2	3	3	3	2		3	3	3	2	2
	CO3	Construct abstract model of computing and check their power to recognize the language	2.65	2.30	2.55	3	3	3	3	3	3	3		2	2	2	2	2	2
	CO4	Analyze the grammar,its types, simplification and normal form	2.94	2.00	2.66	3	2	3	3	2	3	3		3	3	2	3	2	2
	CO5	Interpret rigorously formal mathematical mothods to prove properties of languages, grammars and automata	2.06	2.50	2.19	3	2	2	3	3	3	2	2		2	3	3	2	2

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Course Code and Name		**Course Outcome Statements**	**Direct Attainment**	**Indirect Attainment**	**Total Attainment**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
	CO6	Devlop and overview of how automata theory, languages and computation are applicable in engineering applications	2.06	2.50	2.19	3	2	2	3	2	2	2	2				2	2	2
Computer Graphics & Multimedia (280504)	CO1	explore various display devices and applications of computer graphics.	2.51	2.66	2.56	3	3	3	1	1	2		2	2	1	2	2	2	2
	CO2	illustrate various scan conversion techniques like line, circle, curve and shape drawing algorithms.	2.36	2.60	2.43	2	3	3	2	1	1			2	1	2	2	2	2
	CO3	apply 2-dimensional, 3-dimensional transformations and projections on images.	2.51	2.66	2.56	3	2	2	1	1	2	2	1	2		2	2	2	2
	CO4	classify methods of image clipping and various algorithms for line and polygon clipping.	2.74	2.47	2.66	2	3	2	2	1	2			3		3	3	2	2
	CO5	apply appropriate filling algorithms, hidden surface elimination algorithm on images.	2.57	2.40	2.52	3	3	3	2	3	2	3	2	3		3	3	2	2
	CO6	summarize various color models, shading methods and multimedia system.	2.57	2.60	2.58	3	2	3	2	1	2			2	1	2	2	2	2
Soft Computing Techniques (280505)	CO1	Define basic concepts of neural network and fuzzy systems	3.00	3.00	3.00	2	2	1	2	2		2	2		1		3	2	
	CO2	Compare solutions by applying various soft computing approaches on a given problem	2.80	3.00	2.86	2	2	3	1	2	1	2	1		1	1	3	2	3
	CO3	Develop and train different supervised and unsupervised learning	3.00	2.70	2.91	3	2		2			1		2	1	2	3	3	2
	CO4	Classify various nature inspired algorithms according to their application aspect	2.70	2.80	2.73	2	3	2	2		1		1	3	2	2	2	2	2
	CO5	compare the efficiency of various hybrid systems	3.00	2.80	2.94	3	1	3	3	2	2			2		2	2	3	2
	CO6	design a soft computing models for solving real world problems	2.30	3.00	2.51	2	2	1		2		2	2		2	3	2	2	2
Disaster Management (1000006)	CO1	Identify disaster prevention and mitigation approaches.	2.50	2.30	2.44	3	2	3	3	2	2	2			2	2	3	2	3
	CO2	Classify global and national disasters, their trends and profiles.	2.10	2.40	2.19	2	3	3	2	3	3	3	2		3	3	2	3	3
	CO3	Determine the impacts of various disasters.	2.30	2.10	2.24	3	3	3	3	3	3	3		2	2	2	2	2	2
	CO4	Apply Disaster Risk Reduction in management.	2.00	2.00	2.00	3	2	3	3	2	3			3	3	2	3	3	2
	CO5	Infer the linkage between disasters, environment and development.	2.00	2.00	2.00	3	2	2	3	3	3	1	2		2	3	3	3	3
Data Mining and Pattern Warehousing (280601)	CO1	able to understand and explain various basic concepts of data mining and data warehousing	2.50	2.50	2.50	3	3	3	3	2	2	2	1	2	1		1	3	2
	CO2	classify various database systems & data models/schemas of data warhouses	2.00	2.00	2.00	2	3	3	3	2	2	1		1			1	3	3
	CO3	able to compare various methods for storing and retreiving data from various sources/repositories.	2.00	2.30	2.09	3	3	2	3	3	2		2	2	2	2	3	3	2
	CO4	able to apply data mining techniques for knowledge extraction from large amount of data.	2.00	2.50	2.15	3	2	3	3	3	2		2	2	2		3	3	2

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	CO5	able to analyze data for knowledge discovery & prediction using appropriate algorithms.	2.00	2.00	2.00	3	3	3	2	2	3	3	3	3	2	3	1	2	2
	CO6	able to develop real world applications using data mining techniques.	2.00	1.80	1.94	3	3	2	3	2	3	3	2	3	2	2	3	3	3
Data Mining and Pattern Warehousing Lab (280601)	CO1	perform the basic data mining operations.	2.74	2.94	2.80	3	3	3	1	1	2		2	2	1	2	2	2	2
	CO2	demonstrate the working mechanisms of data mining platforms.	2.55	2.94	2.67	2	3	3	2	1	1	2		2	1	2	2	2	3
	CO3	execute the multiple classification algorithms effectively.	2.45	2.94	2.60	3	2	2	1	1	2	2	1	2		2	2	2	2
	CO4	compare association rules and their effects on corresponding datasets.	2.35	2.94	2.53	2	3	2	2	1	2			3		3	3	3	2
	CO5	evaluate the working of existing machine learning algorithms using different datasets	2.25	2.94	2.46	3	3	3	2	3	2	1	2	3		3	3	3	3
	CO6	solve real world problems using data mining techniques.	1.96	2.94	2.25	3	2	3	2	1	2			2	1	2	2	2	2
Image Processing (280602)	CO1	describe the fundamentals of image processing.	2.26	2.13	2.22	3	3	3	3	2	2	1	2	1			2	3	1
	CO2	classify image enhancement techniques in both spatial and frequency domains	2.13	2.08	2.12	2	2	3	2	2	3		2	1	2	1	2	1	2
	CO3	apply image segmentation for object and boundary detection.	2.26	2.13	2.22	3	3	2	3	3	2	1	2	2		1	3	3	2
	CO4	analyze the causes for image degradation and image restoration.	2.47	1.97	2.32	2	3	3	3	3	3			2	2		3	3	2
	CO5	evaluate image compression techniques.	2.30	1.92	2.19	3	2	3	2	2	3	3	3	3	2	3	1	2	2
	CO6	implement novel image filtering techniques.	2.30	2.08	2.23	3	3	2	3	2	3	3	2	3	2	2	3	3	3
Image Processing Lab (280602)	CO1	develop the ability to write programs for color detection.	2.53	2.56	2.54	3	3	3	2	3	2	1	2	3		3	3	3	3
	CO2	analyze color information in digital images.	2.26	2.39	2.30	3	2	3	2	1	2	1		2	1	2	2	2	2
	CO3	apply image segmentation techniques to partition images into meaningful regions.	2.12	2.33	2.18	3	3	3	3	2	2	1	2	1			2	3	2
	CO4	demonstrate competence in writing a program for object detection.	2.26	2.39	2.30	2	2	3	2	2	3		2		2	1	2	1	2
	CO5	integrate image processing techniques to interpret and respond to hand gestures.	2.47	2.22	2.40	3	3	2	3	3	2	1		2		1	3	3	2
	CO6	track movement of objects in a sequence of images	2.30	2.16	2.26	3	3	3	3	2	2	1	2	1			2	3	3
Deep Learning (280603)	CO1	illustrate the concepts of neural networks, activation functions and optimization algorithms.	2.49	2.34	2.45	3	3	3	1	1	2	1	2	2	1	2	2	2	2
	CO2	explain the principles of backpropagation and gradient descent.	2.33	2.28	2.32	2	3	3	2	1	1	1		2	1	2	2	2	3
	CO3	select an appropriate deep learning model for problem solving.	2.49	2.34	2.45	3	2	2	1	1	2	2	1	2		2	2	2	2
	CO4	evaluate the performance of deep learning models.	2.71	2.18	2.55	2	3	2	2	1	2	1		3	1	3	3	3	2

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	CO5	compare the applicability of deep learning architectures across the problem domain.	2.54	2.12	2.41	3	3	3	2	3	2	1	2	3		3	3	3	3
	CO6	develop novel deep learning architectures for specific applications.	2.54	2.28	2.46	3	2	3	2	1	2	2		2	1	2	2	2	2
Pattern Recognition (280732)	CO1	explain basic principle of Image processing	2.40	3.00	2.58	3	3	3	1	2	2		2	2	1	2	2	3	3
	CO2	apply the advance processing algorithms on images	2.40	2.80	2.52	3	3	3	2	1	1	1		2	2	2	2	2	3
	CO3	analyze the basic potential of image processing	2.50	2.90	2.62	3	2	2	1	1	2		2	2		2	2	2	2
	CO4	compare the different pattern recognition algorithms on different domain	2.60	2.90	2.69	3	3	2	2	1	2	1		3		3	3	3	2
	CO5	develop the real world application of pattern recognition	2.80	2.90	2.83	3	3	3	2	3	2		2	3		3	3	3	3
	CO6	design basic programming structures for image processing using python	2.70	2.80	2.73	3	2	3	2	1	2			2	1	2	2	2	2
Universal Human Values & Professional Ethics (1000008)	CO1	to become more aware of their surroundings, society, social problems and their sustainable solutions.	2.72	2.88	2.77	3	2	3	3	2	2	2		3	2	2	3	2	3
	CO2	to become sensitive to their commitment towards what they believe in (humane values. humane relationships and humane society).	2.56	2.81	2.64	2	3	3	2	3	3	3	2	1	3	3	2	3	3
	CO3	to apply what they have learnt to their own self in different day-to-day settings in real life.	2.72	2.88	2.77	3	3	3	3	3	3	3		2	2	2	2	2	2
	CO4	to sustain human relationships and human nature in mind.	2.97	2.68	2.88	3	2	3	3	2	3			3	3	2	3	3	2
	CO5	to have better critical ability.	2.77	2.61	2.72	3	2	2	3	3	3	1	2		2	3	3	3	3
	CO6	to negotiate living in harmony with self and others.	2.77	2.81	2.78	3	2	2	3	2	2		2	1	1		2	2	2
AR-VR Lab (280701)	CO1	create new projects and properly configure them for AR/VR application development	2.74	2.07	2.54	3	3	3	1	1	2	3	2	2	1	2	2	2	2
	CO2	develop Marker-Based and Markerless AR Applications	2.11	2.28	2.16	2	3	3	2	2	1	2	1	2	2	2	2	2	3
	CO3	develop and import 3D models into AR/VR environments	2.18	2.84	2.38	3	2	2	1	1	2	3	2	2		2	2	2	2
	CO4	integrate VR input and output hardware to enhance the user experience.	2.84	2.74	2.81	2	3	2	2	1	2	3	3	3		3	3	3	2
	CO5	develop applications that simulate real-world scenarios, such as a virtual gym or training simulations.	2.16	2.45	2.25	3	3	3	2	3	2	2	2	3	2	3	3	3	3
	CO6	identify areas for improvement and implement changes to optimize performance and user satisfaction.	2.45	2.14	2.36	3	2	3	2	1	2	2	2	2	1	2	2	2	2
Generative AI (280731)	CO1	Illustrate the basic concepts, scope and significance of generative AI.	2.50	2.90	2.62	3	3	3	3	3	2		1	2		2	1	3	3
	CO2	Comprehend different types of generative models and their architectures and functioning of GANs.	2.80	2.60	2.74	2	2	3	3	2	1		1			2	1	2	2

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CO-PO mapping matrix - AI&ML Batch admitted in 2021-22

Course Code and Name		Course Outcome Statements	CO Attainment			CO-PO Matrix													
			Direct Attainment	Indirect Attainment	Total Attainment	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
	CO3	Implement the VAEs and flow-based models.	2.40	2.70	2.49	3	3	2	2	3	2			2	2		3	3	3
	CO4	Explore advanced generative techniques like autoregressive and transformer-based models.	2.60	2.60	2.60	2	2	3	3	3	2	2	1	1		2	3	2	2
	CO5	Apply generative AI techniques to practical problems	2.50	2.90	2.62	3	3	3	2	2	3		3	3	2	3	1	2	2
	CO6	Analyze the ethical implications, societal impact and challenges associated with generative AI.	2.50	2.80	2.59	3	2	2	3	2	3	3	2	3	2	2	3	3	3
Internship/ Project (280703)	CO1	apply the principles of engineering, mathematics, and science to design and execute a comprehensive project or solve industry-specific problems.	2.45	2.25	2.39	3	3	3	3	3	3	2	1	3	1	1	3	2	2
	CO2	analyze complex engineering challenges, identifying root causes and constraints to develop effective solutions.	2.06	2.35	2.15	3	3	3	3	3	2	2	1	3	2	2	3	2	2
	CO3	design and develop innovative and practical solutions or prototypes that address identified problems while adhering to professional standards.	2.25	2.06	2.19	3	2	2	3	3	3	3	1	3	3	3	3	3	3
	CO4	evaluate the efficiency, sustainability, and impact of their project solutions using appropriate testing methods and performance metrics.	2.30	2.56	2.38	2	3	1	3	3	3	3	1	3	2	2	3	3	2
	CO5	demonstrate effective communication skills by preparing detailed technical reports, delivering presentations, and articulating ideas clearly to diverse audiences.	2.56	2.43	2.52	3	2	2	2	3	3	2	2	3	3	3	3	3	3
	CO6	identify areas for personal and professional growth and propose strategies for lifelong learning.	2.69	1.84	2.44	3	3	2	3	3	3	3	1	3	2	3	3	3	3
			PO/PSO Target			**2.04**	**1.89**	**1.91**	**1.74**	**1.6**	**1.66**	**1.38**	**1.29**	**1.58**	**1.44**	**1.69**	**1.79**	**1.78**	**1.73**
						70% of Average CO-PO Mapping of each PO													

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Course-wise Direct PO attainment of AI&ML Batch admitted in 2021-22

S.No.	Course Code & Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
1	Introduction to Artificial Intelligence & Machine Learning (280101)	2.82	2.81	2.81	2.82	2.79	2.81	2.78	2.8	2.82	2.77	2.81	2.83	2.82	2.8
2	Introduction to Computer Programming (280102)	2.58	2.58	2.58	2.56	2.58	2.59	2.55	2.58	2.6	2.58	2.56	2.6	2.57	2.57
3	Energy Environment, Ecology & Society (100015)	2.34	2.35	2.34	2.35	2.35	2.34	2.32	2.33	2.34	2.34	2.31	2.36	2.35	2.35
4	Basic Electrical & Electronics Engineering (100022)	2.07	2.06	2.05	2.06	2.06	2.09	2.02	2.08	2.06	2.06	2.05	2.06	2.07	2.07
5	Linear Algebra (250100)	2.26	2.26	2.25	2.26	2.25	2.27	2.27	2.16	2.27	2.16	2.27	2.27	2.27	2.27
6	Digital Logic Design (280201)	2.14	2.14	2.13	2.14	2.15	2.15	2.11	2.16	2.14	2.15	2.13	2.14	2.14	2.15
7	Data Structures (280202)	2.69	2.69	2.68	2.69	2.68	2.7	2.64	2.68	2.69	2.67	2.69	2.69	2.69	2.68
8	Object Oriented Programming and Methodology (280203)	2.37	2.37	2.37	2.36	2.37	2.37	2.35	2.37	2.38	2.37	2.37	2.37	2.37	2.37
9	Probability and Random Process (250106)	2.46	2.44	2.46	2.45	2.44	2.45	2.43	2.43	2.53	2.45	2.44	2.45	2.45	2.45
10	Technical Language (100016)	2.16	2.17	2.19	2.16	2.17	2.17	2.17	2.16	2.18	2.16	2.19	2.17	2.17	2.17
11	Language Lab (100017)														
12	Discrete Structure (280301)	2.56	2.53	2.54	2.56	2.53	2.54	2.48	2.5	2.59	2.52	2.51	2.56	2.53	2.53
13	Design & Analysis of Algorithms (280302)	2.34	2.33	2.34	2.34	2.33	2.34	2.37	2.3	2.39	2.34	2.32	2.34	2.34	2.33
14	Operating System (280303)	2.16	2.16	2.15	2.15	2.16	2.14	2.13	2.19	2.09	2.13	2.19	2.15	2.15	2.16
15	Computer Networks and Protocols (280304)	1.96	1.99	1.95	1.96	1.99	1.95	2.13	2.08	1.7	1.91	1.96	1.93	1.93	1.99
16	Database Management System (280305)	2.26	2.26	2.27	2.26	2.26	2.27	2.24	2.24	2.31	2.29	2.28	2.27	2.27	2.26
17	Database Management System Lab (280305)	2.5	2.49	2.5	2.49	2.49	2.53	2.52	2.43	2.54	2.52	2.52	2.5	2.47	2.49
18	Python Programming Lab (280306)	2.07	2.06	2.06	2.07	2.06	2.06	2.09	2.03	2.11	2.06	2.05	2.06	2.06	2.06
19	Computer architecture and Microprocessor (280401)	2.78	2.79	2.78	2.78	2.8	2.77	2.76	2.77	2.69	2.75	2.81	2.77	2.81	2.76
20	Cloud computing (280402)	2.35	2.34	2.34	2.34	2.35	2.34	2.33	2.32	2.34	2.34	2.34	2.34	2.34	2.33

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Course-wise Direct PO attainment of AI&ML Batch admitted in 2021-22

S.No.	Course Code & Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
21	Machine Learning and optimization (280404)	2.02	2.05	2.08	2.02	2.01	2.01	2.04	1.87	2.12	2.06	2.05	2.05	2.05	2.05
22	Software Engineering (280403)	2.28	2.27	2.27	2.27	2.28	2.26	2.25	2.28	2.27	2.28	2.27	2.27	2.27	2.27
23	Network & Web Security (280405)	2.32	2.32	2.32	2.31	2.31	2.31	2.31	2.32	2.32	2.32	2.31	2.31	2.32	2.33
24	Design and Thinking Lab (280406)	2.02	2.01	2.01	2.02	2.02	2.02	2.02	2.01	2.01	2.07	2.02	2.01	2.01	2.01
25	Information Retrieval (280501)	2.01	2.08	2.09	2.01	2.05	2.04	2.23	2.03	1.87	2.11	2.11	2.04	2.05	2.09
26	Data Science using Python (280502)	2.47	2.46	2.47	2.47	2.47	2.46	2.45	2.47	2.48	2.48	2.45	2.48	2.47	2.46
27	Theory of Computation (280503)	2.39	2.39	2.41	2.39	2.38	2.39	2.41	2.23	2.61	2.43	2.39	2.39	2.38	2.38
28	Computer Graphics & Multimedia (280504)	2.55	2.55	2.54	2.55	2.54	2.56	2.53	2.54	2.56	2.52	2.56	2.56	2.55	2.55
29	Soft Computing Techniques (280505)	2.84	2.81	2.84	2.9	2.83	2.87	2.81	2.77	2.84	2.75	2.76	2.84	2.84	2.8
30	Disaster Management (1000006)	2.17	2.18	2.19	2.17	2.17	2.16	2.24	2.1	2.1	2.16	2.16	2.17	2.15	2.18
31	Data Mining and Pattern Warehousing (280601)	2.12	2.11	2.13	2.12	2.11	2.09	2.09	2.09	2.1	2.1	2.01	2.09	2.12	2.09
32	Data Mining and Pattern Warehousing Lab (280601)	2.54	2.57	2.55	2.52	2.53	2.54	2.6	2.62	2.54	2.57	2.54	2.54	2.54	2.55
33	Image Processing (280602)	2.22	2.22	2.22	2.22	2.22	2.22	2.21	2.19	2.22	2.21	2.2	2.23	2.23	2.22
34	Image Processing Lab (280602)	2.33	2.33	2.33	2.32	2.35	2.33	2.34	2.32	2.38	2.3	2.42	2.35	2.34	2.34
35	Deep Learning (280603)	2.44	2.44	2.43	2.44	2.43	2.45	2.44	2.43	2.44	2.45	2.44	2.44	2.44	2.43
36	Pattern Recognition (280732)	2.66	2.66	2.66	2.67	2.69	2.67	2.61	2.68	2.68	2.59	2.68	2.68	2.67	2.66
37	Universal Human Values & Professional Ethics (1000008)	2.77	2.75	2.76	2.77	2.75	2.76	2.72	2.71	2.79	2.76	2.74	2.77	2.76	2.75
38	AR-VR Lab (280701)	2.41	2.42	2.39	2.41	2.35	2.44	2.45	2.47	2.43	2.29	2.43	2.43	2.43	2.39
39	Generative AI (280731)	2.6	2.6	2.62	2.62	2.6	2.6	2.59	2.63	2.59	2.57	2.63	2.59	2.6	2.6

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Course-wise Direct PO attainment of AI&ML Batch admitted in 2021-22

S.No.	Course Code & Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
40	Internship/ Project (280703)	2.34	2.34	2.33	2.33	2.34	2.36	2.34	2.37	2.34	2.34	2.35	2.34	2.35	2.35
PO Attainment Direct		**2.37**	**2.37**	**2.37**	**2.37**	**2.37**	**2.37**	**2.37**	**2.35**	**2.37**	**2.36**	**2.37**	**2.37**	**2.37**	**2.37**

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Indirect PO attainment of AI&ML Batch admitted in 2021-22

Feedback response from Batch 2021-22 [Sample size: 48]

Category	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
1/Below Average/ Low	3	2	1	3	2	2	2	2	3	3	2	2	3	3	Number of Responses
2/Average/ Moderate	4	3	3	1	2	2	1	0	0	1	1	0	0	0	
3/Good/ Adequate	7	4	6	8	7	8	8	8	7	7	8	7	4	5	
4/Very Good/ Substantial	16	20	17	17	16	17	17	19	17	18	18	18	18	19	
5/Excellent/ Highly Substantial	18	19	21	19	21	19	20	19	21	19	19	21	23	21	
PO Attainment Level	2.33	2.44	2.48	2.40	2.45	2.41	2.45	2.46	2.46	2.41	2.44	2.50	2.53	2.49	

PO Attainment Level	Excellent (3)	Very Good (2)	Good (1)
PO Attainment Percentage	70.00	60.00	50.00

माधव प्रौद्योगिकी एवं विज्ञान संस्थान, ग्वालियर (म.प्र.), भारत
MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR (M.P.), INDIA
Deemed University
(Declared under Distinct Category by Ministry of Education, Government of India)
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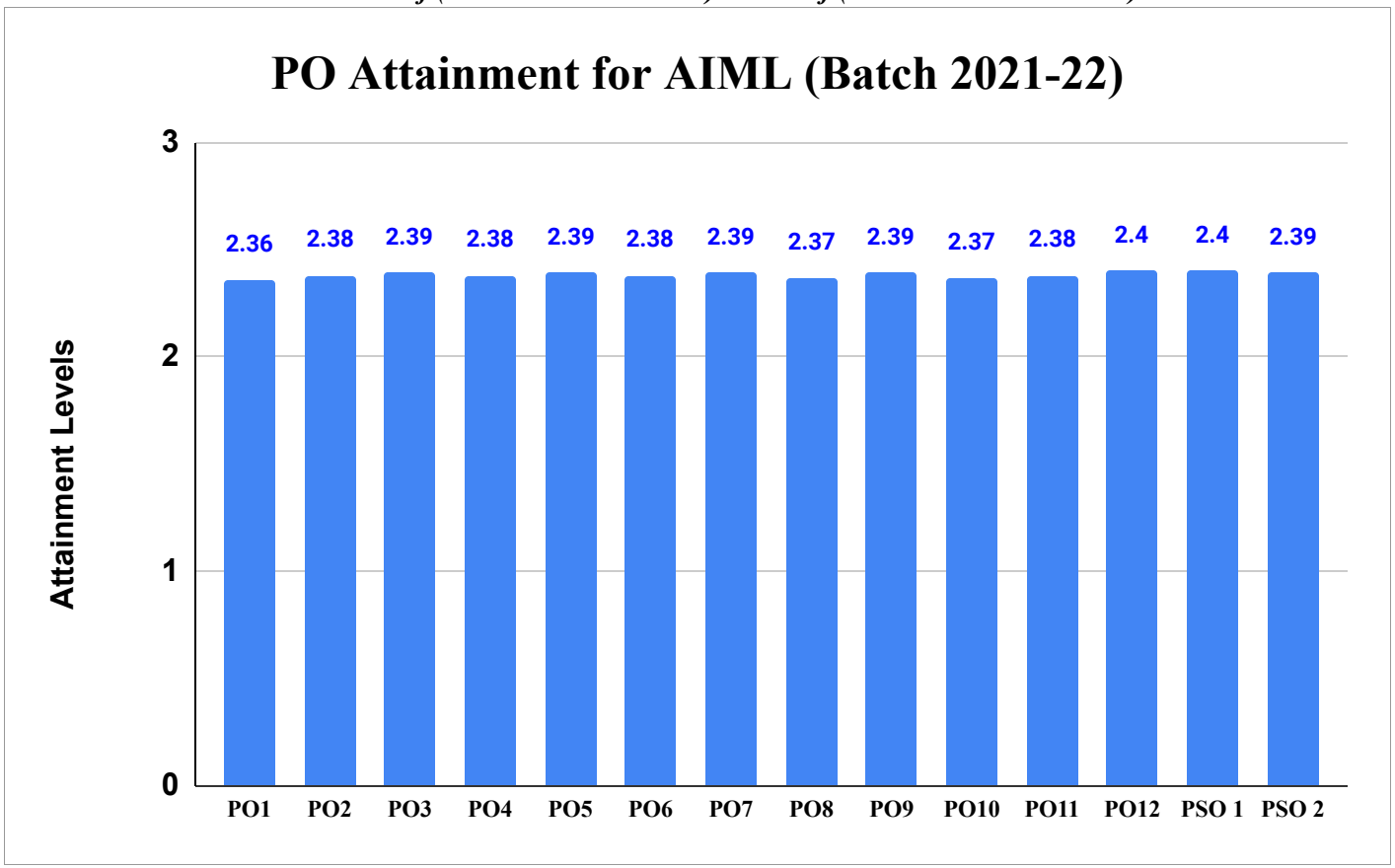
PO attainment of AI&ML Batch admitted in 2021-22

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
PO Attainment Direct	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.35	2.37	2.36	2.37	2.37	2.37	2.37
PO Attainment Indirect	2.33	2.44	2.48	2.40	2.45	2.41	2.45	2.46	2.46	2.41	2.44	2.50	2.53	2.49
PO Attainment	2.36	2.38	2.39	2.38	2.39	2.38	2.39	2.37	2.39	2.37	2.38	2.4	2.4	2.39

PO Attainment = 80% of (PO Attainment Direct) + 20% of (PO Attainment Indirect)



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Action Taken Report for PO attainment of AI&ML Batch admitted in 2021-22

POs	Target Level	Attainment Level	Observations
PO1 Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.			
PO1	2.04	**2.36**	Target achieved
Actions: **Organized regular workshops and seminars on foundational and advanced engineering topics.** **Regularly revised the curriculum to keep pace with advancements in engineering and technology.**			
PO2 Problem analysis: Identity, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.			
PO2	1.89	**2.38**	Target achieved
Actions: **Included assessments with real-world problem statements requiring analytical skills.** **Introduced assignments where multiple solutions are possible, emphasizing creativity.**			
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 public health and safety, and the cultural, societal, and environmental considerations.			
PO3	1.91	**2.39**	Target achieved
Actions: **Mandated internships in relevant industries to expose students to practical challenges and solutions.** **Each lab course had skill based mini projects, ensuring hands-on experience in applying engineering based solutions to various problems related to public health, safety, culture, society, and environment.**			
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.			
PO4	1.74	**2.38**	Target achieved
Actions: **Students were encouraged to participate in technical competitions right from the beginning of the course.** **Lab Projects, Minor and Major projects, on real world problems and having focus on research, at different stages of the programme helped students to investigate different real world complex problems.**			
PO5 Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.			
PO5	1.6	**2.39**	Target achieved
Actions: **High performance computing lab, IoT lab and other related resources were developed in the institute to help students to use modern engineering and IT tools.**			
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.			

Centre for Artificial Intelligence

Action Taken Report for PO attainment of AI&ML Batch admitted in 2021-22

POs	Target Level	Attainment Level	Observations
PO6	1.66	**2.38**	Target achieved
Actions: **Participation in NSS camps and Social Services, through different technical as well as cultural Clubs available at the institute, enabled students to realise various societal problems and possibility of engineering solutions.**			
PO7 Environment and sustainability: Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.			
PO7	1.38	**2.39**	Target achieved
Actions: **Students are encouraged to develop mini projects to address social issues.** **Different expert lectures were organized to highlight and address environmental and sustainability issues in engineering.** **Techno-social visits have been organised for students.**			
PO8 Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.			
PO8	1.29	**2.37**	Target achieved
Actions: **Components on professional ethics and human values have been included in the induction training programme, also different courses like Universal Human Values and Professional Ethics have been introduced as audit courses at different semesters.**			
PO9 Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.			
PO9	1.58	**2.39**	Target achieved
Actions: **Students are motivated to organize the team activities like Group Quiz, Social/Technical Quiz etc.** **Students are encouraged to participate in events like seminar, workshop, projects, hands-on training etc. organized by Professional body activities to improve their interpersonal skills**			
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.			
PO10	1.44	**2.37**	Target achieved
Actions: **The documentation, in the form of reports and presentations for the Lab courses, Mini Projects, Minor Projects and Major Project/Internships has helped students to enhance their communication skills and present their ideas effectively.**			
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.			
PO11	1.69	**2.38**	Target achieved

Centre for Artificial Intelligence

Action Taken Report for PO attainment of AI&ML Batch admitted in 2021-22

POs	Target Level	Attainment Level	Observations
Actions: **Students are encouraged to participate in technical competitions right from the beginning of the course to acquire project management skills.** **Also a course on project management and financing is included as a mandatory audit course in the curriculum.**			
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.			
PO12	1.79	**2.4**	Target achieved
Actions: **Departmental elective courses offered from SWAYAM/NPTEL platform, and mandatory Internships has helped students to acquire life long learning skills.**			
PSO-1 Design, analyze, and implement the solutions of the complex problems using AI & ML techniques such as pattern recognition, clustering and classification.			
PSO1	1.78	**2.4**	Target achieved
Actions: **Various courses were added in the curriculum related to application of AIML like Soft Computing Techniques, Deep Learning, Generative AI etc.** **Students are encouraged to enroll in different workshops/seminars related to the field.**			
PSO-2 Apply advanced machine learning principles to address practical real-world problems, specializing in natural language processing, computer vision, reinforcement learning, IoT, cloud computing.			
PSO2	1.73	**2.39**	Target achieved
Actions: **There are various labs in the department like AR-VR lab, IoT lab, which emphasize students to learn and apply the concepts of AIML applications.**			