



B. Tech. (Artificial Intelligence & Data Science)

Curriculum Structure as per NEP 2020

For Students Admitted in Year: 2024-25 Onwards

Institute Vision

To be a leading academic organization, creating Skilled and Ethical Human Resource by leveraging Technical Education for Sustainable Development of Society.

Institute Mission

- | | |
|-----|---|
| M1: | To produce competent technocrats to meet modern societal and industrial challenges. |
| M2: | To create ethical and skilled human resources through quality education and various extension activities and outreach programs. |
| M3: | To leverage technical expertise to solve societal issues for its sustainable development. |

Department Vision

Empowering the future through transformative education, & developing globally competent engineers, motivated entrepreneurs, leading researchers by driving innovation at the forefront of technology.

Department Mission

- | | |
|-----|--|
| M1: | To Nurture globally competent engineers through education and hands-on experience in cutting-edge technologies. |
| M2: | To create research environment to lead advancements in technology, cultivating a community of leading researchers dedicated to shaping the future. |
| M3: | To Inspire entrepreneurial spirit by fostering innovation and creativity, preparing students to thrive in the dynamic landscape of technology-driven industries. |

Programme Educational Objectives (PEO):

- | | |
|------|---|
| PEO1 | To enable graduates to pursue higher education and research and have a successful career in industries associated with Engineering. |
| PEO2 | Embrace lifelong learning to meet ever changing developments in Artificial Intelligence and Data science. |
| PEO3 | Graduates will attain entrepreneurial skills that allow them to contribute ethically to the need of society. |



Programme Outcomes (PO)	
PO1:	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2:	Problem analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3:	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4:	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5:	Engineering 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.
PO6:	The Engineer and The World: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7:	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO8:	Individual and Collaborative Teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO9:	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:	Project management and finance: Apply 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:	Life-long learning: Recognize the need for and have the preparation and ability for i. Independent and lifelong learning ii. Adaptability to new and emerging technologies and iii. Critical thinking in the broadest context of technological change.

**Program Specific Outcomes (PSO):**

PSO 1	Apply mathematical and statistical models along with suitable AI algorithms to address and solve computational tasks.
PSO 2	Apply the Data Science techniques to achieve effective insights and decision making to solve real-life problems.
PSO 3	Develop AI based software applications and solutions to meet the needs of industry and society.

Key Features of Curriculum

1	Multiple entry and exit option after every year	
2	Mandatory internship of one semester	
3	Curriculum is framed in compliance with NEP 2020 guideline	
4	Provision for learning in online mode through Swayam / NPTEL courses	
5	Opportunity for learner to choose courses of their interest in all disciplines.	
6	Curriculum focuses on Project Based Learning	
7	Flexibility of various degree options available at our institute	
	Various Degree options	Optional Exit Courses
	B. Tech. in Major discipline with Multidisciplinary Minor	Additional 08 credits in the form of skill-based courses / labs, internship, mini projects shall be offered at various levels.
	B. Tech. in Major discipline, Honors and Multidisciplinary Minor	
	B. Tech. Honors with Research and Multidisciplinary Minor	
	B. Tech. with Double Minor (Multidisciplinary and Specialization Minor)	

Note:

- Students who earn a minimum of total 174 credits will be awarded “**B. Tech in Engg. with Multidisciplinary Minor**” degree.
- Students will have the following options to earn B. Tech. in Engg. degree with MDM and Honors / Double Minor.
 - B. Tech in Engg. -Honors and Multidisciplinary Minor (with additional 18 credits):
174 +18 Credits
 - There will be four papers, one in each semester starting from the 4th semester which will be based on special self-study modules mentioned in the syllabus of all core-courses.



- c. B. Tech in Engg, Honors with Research and Multidisciplinary Minor (additional 18 credits by research): Students are expected to complete a 2-months research internship in summer after 2nd year (4 credits), 3rd year (4 credits) and work towards project after 4th year (4 credits). 2 NPTEL courses of FDP level (3 credits each) must be completed in semesters 7 and 8.

Second Year Exit: Teaching Methodology, Assessment and Evaluation

1. The students should complete two online certification courses (NPTEL) related to their programme, each of 3 credits. In addition to this, they will also need to complete 2 credits worth of two Virtual Lab work related to online certification courses. These additional 8 credits earn by students shall be based upon skill based vocational courses or internship/Apprenticeship.
2. The NPTEL courses are likely to be available online and can be completed at the student's own pace. The content will be specific to the student's field of study or programme. The skill based vocational courses shall be analogous to the Baskets/Areas provided by the concerned BoS.
3. The student must complete two virtual lab work that adds 2 credits to simulate practical or experimental learning experiences in a controlled virtual environment.
4. Examination scheme: The marks gained from the two NPTEL Courses (3 credits each) are converted to a total of 100 marks. The report for the two Virtual Lab work of 2 credits will be evaluated for 25 marks. The report should include a detailed write-up and analysis of the virtual lab experiments conducted, encompassing the methodology, results, and conclusions.
5. There may be uncertainty in availability of the NPTEL courses offered by concerned BoS as there is continuous Updation of the NPTEL courses. The students can choose equivalent NPTEL course of the required duration with prior permission from the concerned institute. The concerned institute should communicate to Concerned BoS for their permission. For NPTEL course registration, the students are required to visit to website <https://swayam.gov.in> and create their account. Log in the account and join the required course and follow the instructions to compete the course. Similarly, for Virtual Lab, the students are required to visit to website <https://www.vlab.co.in> and create their account. Log in the account and join the required lab and follow the instructions to compete the course (need to perform all listed experiments under that Lab). To fulfil the requirement of 06 credits, students can go for two courses each of 12 weeks.



Nomenclature

Abbreviation	Title	Code
BSC	Basic Science Courses	BS
ESC	Engineering Science Courses	ES
PCC	Program Core Courses	PC
PEC	Professional Elective Courses	PE
MDM	Multidisciplinary Minor	MD
OE	Open Elective	OE
SC	Skill Courses	SC
LLC	Liberal Learning Courses	--
VSEC	Vocational and Skill Enhancement Course	SE
VEC	Value Education Course	VE
AEC	Ability Enhancement Course	AE
EEMC	Entrepreneurship/Economics/Management Courses	EC
IKS	Indian Knowledge System	IK
RM	Research Methodology	RM
CEP	Community Engagement /Field Project	FP
PRO	Project	PR
OJT	Internship/On Job Training	OJT
CC	Co-curricular Courses	CC
MC	Mandatory Courses	MC
L	Lecture	L
P	Practical	P
T	Tutorial	--
T-I	Test-I	--
T-II	Test-II	--
ISE	In-Semester Evaluation	--
CIE	Continuous Internal Evaluation	--
ESE	End Semester Examination	--



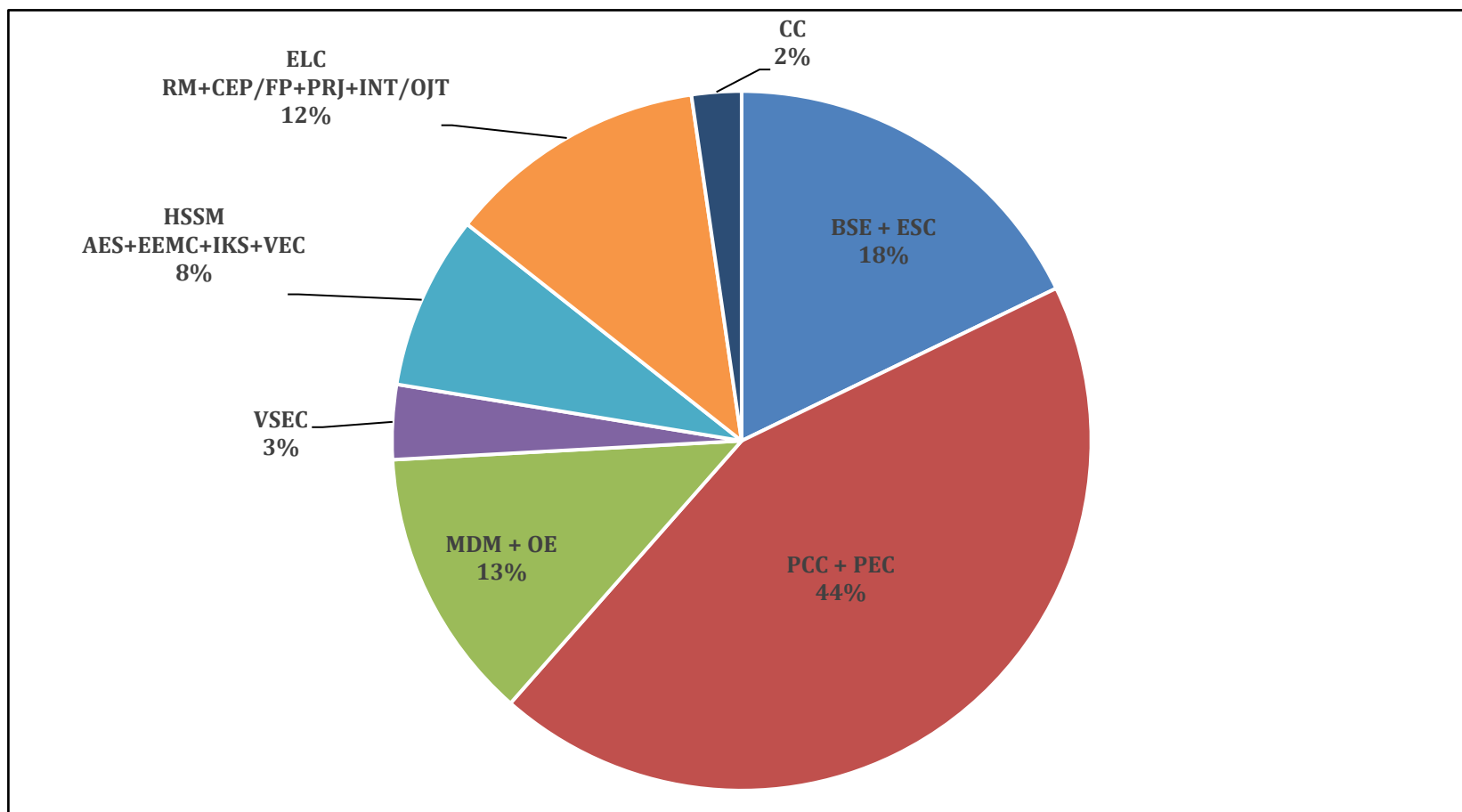
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Illustrative Semester wise Credit distribution structure for Four Year UG Engineering Programme

Semester		I		II		III		IV		V		VI		VII		VIII		Total Credits	
Category		NEP	JJM	NEP	JJM	NEP	JJM	NEP	JJM	NEP	JJM	NEP	JJM	NEP	JJM	NEP	JJM	NEP	JJM
Basic Science Course	BSC/ESC	06-08	08	08-10	08	--	--	--	--	--	--	--	--	--	--	--	--	14-18	16
Engineering Science Course		10-08	09	06-04	06	--	--	--	--	--	--	--	--	--	--	--	--	16-12	15
Programme Core Course (PCC)	Program Courses	--	--	02	03	08-10	12	08-10	10	10-12	12	08-10	10	04-06	09	04-06	--	44-56	56
Programme Elective Course (PEC)		--	--	--	--	--	--	--	--	04	04	08	07	02	06	06	03	20	20
Multidisciplinary Minor (MD M)	Multidisciplinary Courses	--	--	--	--	02	03	02	02	04	03	02	02	02	02	02	02	14	14
Open Elective (OE) Other than a particular programme		--	--	--	--	04	03	02	02	02	03	--	--	--	--	--	--	08	08
Vocational and Skill Enhancement Course (VSEC)	Skill Courses	02	01	02	01	--	--	02	02	--	--	02	02	--	--	--	--	08	06
Ability Enhancement Course (AEC -01, AEC-02)	Humanities Social Science And Management (HSSM)	02	02	--	--	--	--	02	02	--	--	--	--	--	--	--	--	04	04
Entrepreneurship/Economics/ Management Courses		--	--	--	--	02	--	02	02	--	--	--	--	--	--	--	02	04	04
Indian Knowledge System (IKS)		--	--	02	02	--	--	--	--	--	--	--	--	--	--	--	--	02	02
Value Education Course (VEC)		--	--	--	--	02	02	02	02	--	--	--	--	--	--	--	--	04	04
Research Methodology	Experiential Learning Courses	--	--	--	--	--	--	--	--	--	--	--	--	--	03	04	--	04	03
Comm. Engg. Project (CEP)/Field Project (FP)		--	--	--	--	02	02	--	--	--	--	--	--	--	--	--	--	02	02
Project		--	--	--	--	--	--	--	--	--	--	--	02	--	02	04	--	04	04
Internship/ OJT		--	--	--	--	--	--	--	--	--	--	--	--	12	--	--	12	12	12
Co-curricular Courses (CC)	Liberal Learning Courses	02	02	02	02	--	--	--	--	--	--	--	--	--	--	--	--	04	04
B. Tech with Multidisciplinary Minor		20-22	22	20-22	22	20-22	22	20-22	22	20-22	22	20-22	23	20-22	22	20-22	19	160-176	174
B. Tech with Honors and Multidisciplinary Minor		--	--	--	--	--	--	--	04	--	04	--	04	--	06	--	--	--	18
B. Tech with Emerging Minor and Multidisciplinary Minor		--	--	--	--	--	04	--	04	--	04	--	04	--	02	--	--	--	18
B. Tech. Honors with Research and Multidisciplinary Minor		--	--	--	--	--	--	--	04	--	--	--	04	--	03	--	07	--	18



Course Category-wise Credit Distribution

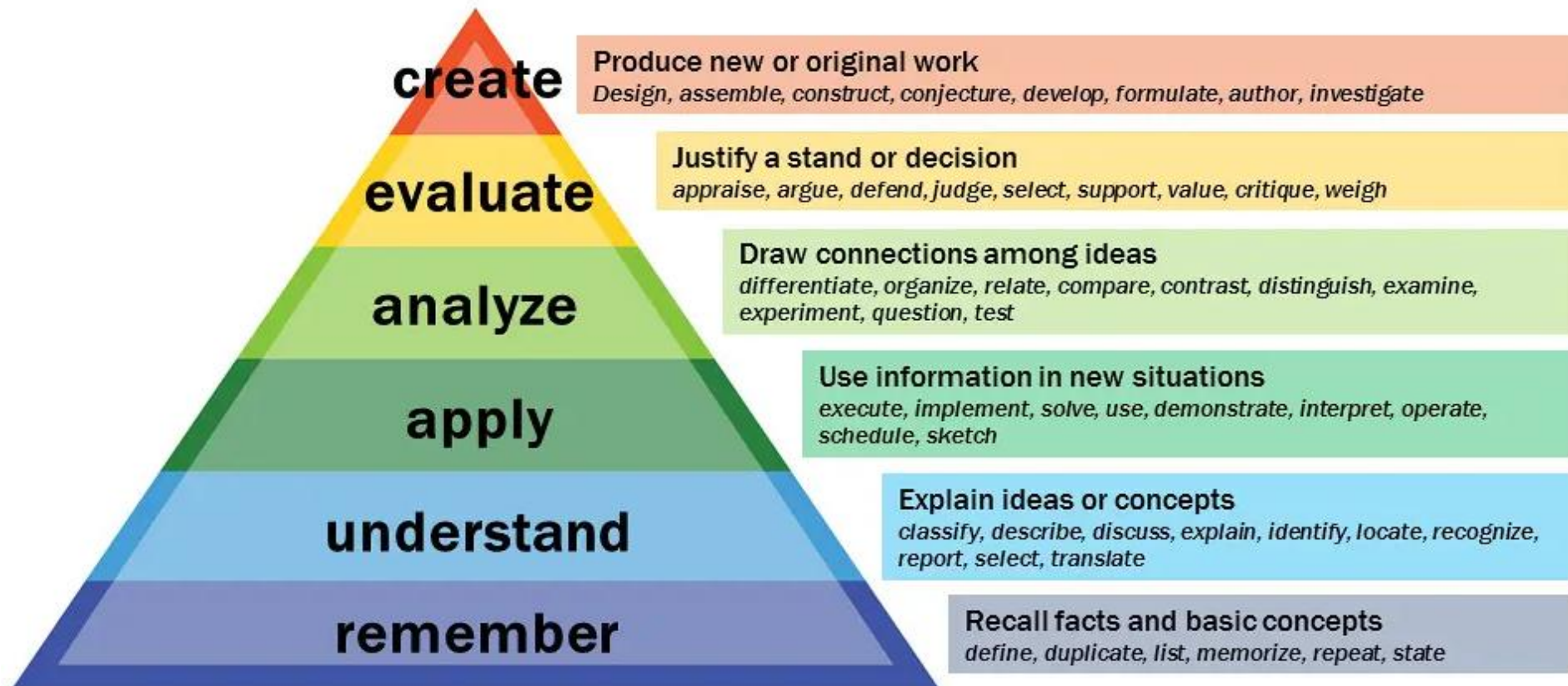




BLOOM'S TAXONOMY OF LEARNING OBJECTIVES

Bloom's Taxonomy in its various forms represents the process of learning. It was developed in 1956 by Benjamin Bloom and modified during the 1990's by a new group of cognitive psychologists, led by Lorin Anderson (a former student of Bloom's) to make it relevant to the 21st century. The revised taxonomy given below emphasizes what a learner "Can Do".

Bloom's Taxonomy





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Teaching and Evaluation Scheme for Students admitted in Academic Year 2024-25

Program: Artificial Intelligence & Data Science

S.Y. B. Tech. (Semester – III) NCrF Level: 5.0 w.e.f. 2025-26

Sr. No.	Course Code	Course Title	Course Category	Teaching scheme				Course Credits	Evaluation scheme						
									Theory			Practical		Total	
									CIE			ESE	CIE		ESE
				L	T	P	Contact Hrs/wk		T-I	T-II	ISE				
1	1ADPCL201	Statistics for Data Science	PCC	3	1	--	4	4	20	20	10	50	---	---	100
2	1ADPCL202	Computer Networks	PCC	3	--	--	3	3	20	20	10	50	---	---	100
3	1ADPCL203	Data Visualization	PCC	3	--	--	3	3	20	20	10	50	---	---	100
4	01OEL120X	Open Elective -01	OE	3	--	--	3	3	20	20	10	50	---	---	100
5	1ADMDL1201	Multi-disciplinary Minor – 01	MDM	3	--	--	3	3	20	20	10	50	---	---	100
6	1ADPCP204	Computer Networks Lab	PCC	--	--	2	2	1	---	---	---	---	25	50	75
7	1ADPCP205	Data Analytics &Visualization Lab	PCC	--	--	2	2	1					25	50	75
8	1ADFP206	Field Project	FP	--	--	4	4	2	---	---	---	---	50	50	100
9	1ADVEL207	Universal Human Values	VEC	2	--	--	2	2	--	--	--	---	50	---	50
		Total		17	01	8	24	22	120	120	60	250	100	150	800+100*
Mandatory Courses (Audit Courses)															
10	1ADMCP251	Environmental Studies	MC					--				50	50		100
11	1ADMCP252	Technical Aptitued-1	MC					--					50	--	--
12	1ADMCP253	Professional Skill Enhancement & Foreign Language	MC					--					50	--	--

	BSC/ESC		Program Courses		Multidisciplinary Courses		Vocational and Skill Enhancement Course	Humanities Social Science and Management (HSSM)				Experiential Learning Courses				Liberal Learning Courses
Course Category	BSC	ESC	PCC	PEC	MDM	OE	VSEC	AEC	Entrp /Mgmt	IKS	VEC	RM	CEP/FP	PROJ	Int /OJT	CC
Last Sem Cumulative Sum	16	15	03	--	--	--	02	02	--	02	--	--	--	--	--	04
Semester Credits	--	--	12	--	03	03	--	--	--	--	02	--	02	--	--	--
Cumulative Sum	16	15	15	--	03	03	02	02	--	02	02	--	02	--	--	04

PROGRESSIVE TOTAL CREDITS: 44 + 22 = 66



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Program: Artificial Intelligence & Data Science

S.Y. B. Tech. (Semester – IV) NCrf Level: 5.0 w.e.f. 2025-26

Sr. No.	Course Code	Course Title	Course Category	Teaching scheme				Course Credits	Evaluation scheme						
									Theory			Practical		Total	
									CIE			ESE	CIE		ESE
				L	T	P	Contact Hrs/wk		T-I	T-II	ISE				
1	1ADPCL208	Advance Data Structure	PCC	2	--	--	2	2	20	20	10	50	---	---	100
2	1ADPCL209	Database Management System	PCC	2	--	--	2	2	20	20	10	50	---	---	100
3	1ADPCL210	Discrete Mathematics and Theory of Computation	PCC	2	--	--	2	2	20	20	10	50	---	---	100
4	01OEL220X	Open Elective -02	OE	2	--	--	2	2	20	20	10	50	---	---	100
5	1ADMDL1202	Multi-disciplinary Minor - 02	MDM	2	--	--	2	2	20	20	10	50	---	---	100
6	1ADPCP211	Python Programming Lab	PCC	1	--	2	3	2	---	---	---	---	25	50	75
7	1ADPCP212	Mini Project-I	PCC	--		2	2	1	--	--	--	--	25	25	50
8	1ADPCP213	Database Management System Lab	PCC	--	--	2	2	1	---	---	---	---	25	50	75
9	1ADECL214	Human Resources Management	EEMC	2	--	--	2	2	--	--	--	--	25	--	25
10	1ADVSP215	Website Development	VSEC	1	--	2	3	2	---	---	---	---	25	--	25
11	1ADAEP216	Professional Communication	AEC	1	--	2	3	2	--	--	--	--	25	--	25
12	1ADVEL217	Human Rights	VEC	2	--	--	2	2	---	---	---	--	25	---	25
		Total		17	0	10	27	22	100	100	50	250	175	125	800
Mandatory Courses (Audit Courses)															
13	1ADMCP253	Technical Aptitued-1	MC										50		
14	1ADMCP254	Professional Skill Enhancement & Foreign Language	MC										50		

	BSC/ESC		Program Courses		Multidisciplinary Courses		Vocational and Skill Enhancement Course	Humanities Social Science and Management (HSSM)				Experiential Learning Courses				Liberal Learning Courses
Course Category	BSC	ESC	PCC	PEC	MDM	OE	VSEC	AEC	Entrp /Mgmt	IKS	VEC	RM	CEP/FP	Proj	Int /OJT	CC
Last Semester Cumulative Credits	16	15	15	--	03	03	02	02	--	02	02	--	02	--	--	04
Semester Credits	--	--	10		02	02	02	02	02	--	02	--	--	--	--	--
Cumulative Sum	16	15	25	--	05	05	04	04	02	02	04	--	02	--	--	04

PROGRESSIVE TOTAL CREDITS: 66 + 22 = 88



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Teaching and Evaluation Scheme for Students admitted in Academic Year 2024-25

Program: Artificial Intelligence & Data Science

T.Y. B. Tech. (Semester – V) NCrF Level: 5.5 w.e.f. 2026-27

Sr. No.	Course Code	Course Title	Course Category	Teaching scheme				Course Credits	Evaluation scheme						
				L	T	P	Contact Hrs/wk		Theory				Practical		Total
									CIE			ESE	CIE	ESE	
									T-I	T-II	ISE				
1	1ADPCL301	Expert Systems	PCC	3	--	--	3	3	20	20	10	50	---	---	100
2	1ADPCL302	Machine Learning	PCC	3	--	--	3	3	20	20	10	50	---	---	100
3	1ADPEL30X	Programme Elective - 01	PEC	3	--	--	3	3	20	20	10	50	---	---	100
4	01OEL330X	Open Elective -03	OE	3	--	--	3	3	20	20	10	50	---	---	100
5	1ADMDL1301	Multi-disciplinary Minor – 03	MDM	3	--	--	3	3	20	20	10	50	---	---	100
6	1ADPCP307	Machine Learning Lab	PCC	--	--	2	2	1	---	---	---	---	50	50	100
7	1ADPCP308	Java Programming Lab	PCC	2	--	4	6	4	---	---	---	---	50	50	100
8	1ADPEP3XX	Programme Elective - 01 Lab	PEC	--	--	2	2	1					25		25
9	1ADPCP313	Mini Project-II	PCC	--	--	2	2	1	---	---	---	---	25	50	75
		Total		17	0	10	27	22	100	100	50	250	150	150	800
Mandatory Courses (Audit Courses)															
10	1ADMCP351	Technical Aptitued-1	MC										50		
11	1ADMCP352	Professional Skill Enhancement & Foreign Language	MC										50		

	BSC/ESC		Program Courses		Multidisciplinary Courses		Vocational and Skill Enhancement Course	Humanities Social Science and Management (HSSM)				Experiential Learning Courses				Liberal Learning Courses
Course Category	BSC	ESC	PCC	PEC	MDM	OE	VSEC	AEC	Entrp /Mgmt	IKS	VEC	RM	CEP/FP	PROJ	Int /OJT	CC
Last Semester Cumulative Credits	16	15	25	--	05	05	04	04	02	02	04	--	02	--	--	04
Semester Credits	--	--	12	04	03	03	--	--	--	--	--	--	--	--	--	--
Cumulative Sum	16	15	37	04	08	08	04	04	02	02	04	--	02	--	--	04

PROGRESSIVE TOTAL CREDITS: 88 + 22 = 110



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Teaching and Evaluation Scheme for Students admitted in Academic Year 2024-25

Program: Artificial Intelligence & Data Science

T.Y. B. Tech. (Semester –VI) NCrf Level: 5.5 w.e.f. 2026-27

Sr. No.	Course Code	Course Title	Course Category	Teaching scheme				Course Credits	Evaluation scheme						
				L	T	P	Contact Hrs/wk		Theory			Practical		Total	
									CIE			ESE	CIE		ESE
									T-I	T-II	ISE				
1	1ADPCL314	Deep Learning	PCC	3	--	--	3	3	20	20	10	50	---	---	100
2	1ADPCL315	Design & Analysis of Algorithm	PCC	3	01	--	4	4	20	20	10	50	---	---	100
3	1ADPEL31X	Programme Elective – 02	PEC	3	--	--	3	3	20	20	10	50	---	---	100
4	1ADPEL3XX	Programme Elective – 03	PEC	3	--	--	3	3	20	20	10	50	---	---	100
5	1ADMDL1302	Multi-disciplinary Minor – 04	MDM	2	--	--	2	2	20	20	10	50	---	---	100
6	1ADPCP324	ML DevOps Laboratory	PCC	1		2	3	2					25	50	75
7	1ADPCP325	Deep Learning Lab	PCC	--	--	2	2	1	---	---	---	---	25	50	75
8	1ADPCP32X	Programme Elective – 03 Lab	PEC	--	--	2	2	1					25		25
9	1ADVSP330	Mobile App Development	VSEC	1	--	2	3	2	---	---	---	---	25		25
10	1ADPRP331	Project Phase I	PR	--	--	4	4	2	---	---	---	---	50	50	100
		Total		16	01	12	29	23	100	100	50	250	150	150	800
Mandatory Courses (Audit Courses)															
11	1ADMCP353	Technical Aptitued-1	MC										50		
12	1ADMCP354	Professional Skill Enhancement & Foreign Language	MC										50		

	BSC/ESC		Program Courses		Multidisciplinary Courses		Vocational and Skill Enhancement Course	Humanities Social Science and Management (HSSM)				Experiential Learning Courses				Liberal Learning Courses
Course Category	BSC	ESC	PCC	PEC	MDM	OE	VSEC	AEC	Entrp /Mgmt	IKS	VEC	RM	CEP/FP	PROJ	Int /OJT	CC
Last Semester Cumulative Credits	16	15	37	04	08	08	04	04	02	02	04	--	02	--	--	04
Semester Credits	--	--	10	07	02	--	02	--	--	--	--	--	--	02	--	--
Cumulative Sum	16	15	47	11	10	08	06	04	02	02	04	--	02	02	--	04

PROGRESSIVE TOTAL CREDITS: 110 + 23 = 133



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Teaching and Evaluation Scheme for Students admitted in Academic Year 2024-25

Program: Artificial Intelligence & Data Science

Final Year B. Tech. (Semester –VII) NCrf Level: 6.0 w.e.f. 2027-28

Sr. No.	Course Code	Course Title	Course Category	Teaching scheme				Course Credits	Evaluation scheme						
				L	T	P	Contact Hrs/wk		Theory				Practical		Total
									CIE			ESE	CIE	ESE	
									T-I	T-II	ISE				
1	1ADPCL401	Computer Vision	PCC	3	--	--	3	3	20	20	10	50	---	---	100
2	1ADPCL402	Data Warehousing and Data Mining	PCC	3	--	--	3	3	20	20	10	50	---	---	100
3	1ADPEL40X	Programme Elective – 04	PEC	3	--	--	3	3	20	20	10	50	---	---	100
4	1ADPEL40X	Programme Elective - 05	PEC	3	--	--	3	3	20	20	10	50	---	--	100
5	1ADMDL1401	Multi-disciplinary Minor – 05	MDM	2	--	--	2	2	20	20	10	50	-	--	100
6	1ADRML411	Research Methodology	RM	3	--	--	3	3	20	20	10	50	--	--	100
7	1ADPCP412	Full Stack Development Lab	PCC	1	--	2	3	2					25	50	75
8	1ADPCP413	Data Warehousing and Data Mining Lab	PCC	--	--	2	2	1	---	---	---	---	--	25	25
9	1ADPRP414	Project Phase-II	PR	--		4	4	2					50	50	100
		Total		18	--	6	26	22	120	120	60	300	75	125	800
Mandatory Courses (Audit Courses)															
10	1ADMCP451	Technical Aptitued-1	MC										50		
11	1ADMCP452	Professional Skill Enhancement & Foreign Language	MC										50		

	BSC/ESC		Program Courses		Multidisciplinary Courses		Vocational and Skill Enhancement Course	Humanities Social Science and Management (HSSM)				Experiential Learning Courses (ELC)				Liberal Learning Courses (LLC)
Course Category	BSC	ESC	PCC	PEC	MDM	OE	VSEC	AEC	Entrp /Mgmt	IKS	VEC	RM	CEP/FP	PROJ	Internship/ OJT	CC
Last Semester Cumulative Credits	16	15	47	11	10	08	06	04	02	02	04	--	02	02	--	04
Semester Credits	--	--	09	06	02	--	--	--	--	--	--	03	--	02	--	--
Cumulative Sum	16	15	56	17	12	08	06	04	02	02	04	03	02	04	--	04

PROGRESSIVE TOTAL CREDITS: 133 + 22 = 155



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Teaching and Evaluation Scheme for Students admitted in Academic Year 2024-25

Program: Artificial Intelligence & Data Science

Final Year B. Tech. (Semester –VIII) NCrf Level: 6.0 w.e.f. 2027-28

***Industrial Internship**

Sr. No.	Course Code	Course Title	Course Category	Teaching scheme				Course Credits	Evaluation scheme						
				L	T	P	Contact Hrs/wk		Theory			Practical		Total	
									CIE			ESE	CIE		ESE
									T-I	T-II	ISE				
1	1ADPEL41X	Programme Elective – 06 (NPTEL)	PEC	3	--	--	3	3	20	20	10	50	50	---	150
2	1ADMDL1402	Multi-disciplinary Minor – 06 (NPTEL)	MDM	2	--	--	2	2	20	20	10	50	50	--	150
3	1ADECL419	Project Management (NPTEL)	EEMC	2			2	2	20	20	10	50	50	--	150
4	1ADOJT420	Internship /OJT	OJT	--	--	--	--	12	---	---	---	---	150	200	350
		Total		07	0	--	07	19	60	60	30	150	300	200	800

L- Lecture

T-Tutorial

P-Practical

T-I - Test-I

T-II – Test –II

ISE- In Semester Evaluation

CIE - Continuous Internal Evaluation

ESE- End Semester Examination

	BSC/ESC		Program Courses		Multidisciplinary Courses		Vocational and Skill Enhancement Course	Humanities Social Science and Management (HSSM)				Experiential Learning Courses				Liberal Learning Courses
Course Category	BSC (14-18)	ESC (12-16)	PCC (44-56)	PEC (20)	MDM (14)	OE (08)	VSEC (08)	AEC (04)	Entrp /Mgmt (04)	IKS (02)	VEC (04)	RM (04)	CEP/FP (02)	Proj (04)	Int /OJT (12)	CC (04)
Last Semester Cumulative Credits	16	15	56	17	12	08	06	04	02	02	04	03	02	04	--	04
Semester Credits	--	--	--	03	02	--	--	--	02	--	--	--	--	--	12	--
Cumulative Sum	16	15	56	20	14	08	06	04	04	02	04	03	02	04	12	04

PROGRESSIVE TOTAL CREDITS: 155 + 19 = 174



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Teaching and Evaluation Scheme for Students admitted in Academic Year 2024-25

Program: Artificial Intelligence & Data Science

Final Year B. Tech. (Semester –VIII) NCrF Level: 6.0 w.e.f. 2027-28

*Research Internship

Sr. No.	Course Code	Course Title	Course Category	Teaching scheme				Course Credits	Evaluation scheme						
				L	T	P	Contact Hrs/wk		Theory			Practical		Total	
									CIE			ESE	CIE		ESE
									T-I	T-II	ISE				
1	1ADPEL41X	Programme Elective – 06 (NPTEL)	PEC	3	--	--	3	3	20	20	10	50	50	---	150
2	1ADM DL1402	Multi-disciplinary Minor – 06 (NPTEL)	MDM	2	--	--	2	2	20	20	10	50	50	--	150
3	1ADECL419	Research Writing (NPTEL)	EEMC	2			2	2	20	20	10	50	50	--	150
4	1ADOJT420	Internship /OJT	OJT	--	--	--	--	12	---	---	---	---	150	200	350
		Total		07	0	--	07	19	60	60	30	150	300	200	800

L- Lecture
T-Tutorial
P-Practical

T-I - Test-I
T-II – Test –II
ISE- In Semester Evaluation

CIE - Continuous Internal Evaluation
ESE- End Semester Examination

	BSC/ESC		ProgramCourses		Multidisciplinary Courses		Vocational and Skill Enhancement Course	Humanities Social Science and Management (HSSM)				Experiential Learning Courses				Liberal Learning Courses
Course Category	BSC (14-18)	ESC (12-16)	PCC (44-56)	PEC (20)	MDM (14)	OE (08)	VSEC (08)	AEC (04)	Entrp /Mgmt (04)	IKS (02)	VEC (04)	RM (04)	CEP/FP (02)	Proj (04)	Int /OJT (12)	CC (04)
Last Semester Cumulative Credits	16	15	56	17	12	08	06	04	02	02	04	03	02	04	--	04
Semester Credits	--	--	--	03	02	--	--	--	02	--	--	--	--	--	12	--
Cumulative Sum	16	15	56	20	14	08	06	04	04	02	04	03	02	04	12	04

PROGRESSIVE TOTAL CREDITS: 155 + 19 = 174



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Teaching and Evaluation Scheme for Students admitted in Academic Year 2024-25

Program: Artificial Intelligence & Data Science

Final Year B. Tech. (Semester –VIII) NCrF Level: 6.0 w.e.f. 2027-28

*Entrepreneurial Internship

Sr. No.	Course Code	Course Title	Course Category	Teaching scheme				Course Credits	Evaluation scheme						
				L	T	P	Contact Hrs/wk		Theory				Practical		Total
									CIE			ESE	CIE	ESE	
									T-I	T-II	ISE				
1	1ADPEL41X	Programme Elective – 06 (NPTEL)	PEC	3	--	--	3	3	20	20	10	50	50	---	150
2	1ADMDL1402	Multi-disciplinary Minor – 06 (NPTEL)	MDM	2	--	--	2	2	20	20	10	50	50	--	150
3	1ADECL419	Innovation, Business Models and Entrepreneurship (NPTEL)	EEMC	2			2	2	20	20	10	50	50	--	150
4	1ADOJT420	Internship /OJT	OJT	--	--	--	--	12	---	---	---	---	150	200	350
		Total		07	0	--	07	19	60	60	30	150	300	200	800

L- Lecture
T-Tutorial
P-Practical

T-I - Test-I
T-II – Test –II
ISE- In Semester Evaluation

CIE - Continuous Internal Evaluation
ESE- End Semester Examination

	BSC/ESC		ProgramCourses		Multidisciplinary Courses		Vocational and Skill Enhancement Course	Humanities Social Science and Management (HSSM)				Experiential Learning Courses				Liberal Learning Courses
Course Category	BSC (14-18)	ESC (12-16)	PCC (44-56)	PEC (20)	MDM (14)	OE (08)	VSEC (08)	AEC (04)	Entrp /Mgmt (04)	IKS (02)	VEC (04)	RM (04)	CEP/FP (02)	Proj (04)	Int /OJT (12)	CC (04)
Last Semester Cumulative Credits	16	15	56	17	12	08	06	04	02	02	04	03	02	04	--	04
Semester Credits	--	--	--	03	02	--	--	--	02	--	--	--	--	--	12	--
Cumulative Sum	16	15	56	20	14	08	06	04	04	02	04	03	02	04	12	04

PROGRESSIVE TOTAL CREDITS: 155 + 19 = 174



Multidisciplinary Minor (MDM)

- Students should select any one minor, excluding those offered by their parent department, from the diverse range of minors available.
- Students should complete all courses within their selected minor in order to earn credits.

MDM	MDM Name	Course Code	Course Name	SEM	Offered by Department
MDM I	Building Technology		Building Components	III	Civil Engineering
MDM II			Building Construction Material	IV	
MDM III			Building Construction	V	
MDM IV			Building Planning and Drawing	VI	
MDM V			Building Services	VII	
MDM VI			Smart Building	VIII	
MDM I	Waste Management		Municipal Solid Waste Management	III	Civil Engineering
MDM II			Plastic Waste Management	IV	
MDM III			Hazardous Waste Management	V	
MDM IV			Biomedical Waste Management	VI	
MDM V			Electronics Waste Management	VII	
MDM VI			Integrated Waste Management for Smart Cities	VIII	
MDM I	Product Design		Introduction to Product Design	III	Mechanical Engineering
MDM II			Materials and Manufacturing Process for Product Design	IV	
MDM III			CAD and Digital Prototype	V	
MDM IV			Product Life Cycle Management	VI	
MDM V			Industrial Product Development	VII	
MDM VI			Product design using value Engineering	VIII	
MDM I	Computer Aided Design and Drafting		Computer Aided Drafting	III	Mechanical Engineering
MDM II			Computer Aided Design	IV	
MDM III			Rapid Prototype and 3D Printing	V	
MDM IV			Mechatronics System Design- I	VI	
MDM V			Mechatronics System Design- II	VII	
MDM VI			Introduction to interaction design	VIII	
MDM I	Electronics System Design		Electronic Device & Design	III	Electronics and Telecommunication Engineering
MDM II			Digital Design & VLSI	IV	
MDM III			Introduction to Embedded System	V	
MDM IV			Electronics Communication I	VI	
MDM V			Electronics Product Design	VII	
MDM VI			Advance Communication System	VIII	



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MDM	MDM Name	Course Code	Course Name	SEM	Offered by Department
MDM I	Computer Communication		Computer Communication	III	Electronics and Telecommunication Engineering
MDM II			Introduction to IOT	IV	
MDM III			Introduction to Microcontroller	V	
MDM IV			Architecture & Protocols of IOT	VI	
MDM V			DBMS in Cloud	VII	
MDM VI			Design of IOT	VIII	
MDM I	Data Science & Machine learning	1ADMDL1201	Introduction to Artificial Intelligence	III	Artificial Intelligence & Data Science
MDM II		1ADMDL1202	Data analytics & Visualization	IV	
MDM III		1ADMDL1301	Machine Learning I	V	
MDM IV		1ADMDL1302	Machine Learning II	VI	
MDM V		1ADMDL1401	Deep Learning	VII	
MDM VI		1ADMDL1402	Recommender Systems (NPTEL)	VIII	
MDM I	Natural Language Processing	1ADMDL2201	Natural language Processing I	III	Artificial Intelligence & Data Science
MDM II		1ADMDL2202	Natural language Processing II	IV	
MDM III		1ADMDL2301	Generative AI	V	
MDM IV		1ADMDL2302	Text & Speech Analysis	VI	
MDM V		1ADMDL2401	Sentiment Analysis	VII	
MDM VI		1ADMDL2402	Large Language Models (NPTEL)	VIII	
MDM I	Software Engineering		Data Structure Using Python	III	Computer Science Engineering
MDM II			Object Oriented Software Development	IV	
MDM III			Software Engineering Principals & Practices	V	
MDM IV			Database Management System	VI	
MDM V			User Interface & User Experience Design	VII	
MDM VI			Software Development	VIII	
MDM I	Computational Law and Cyber Security		Cyber Laws and Ethics	III	Computer Science Engineering
MDM II			Legal Informatics	IV	
MDM III			Data Privacy and Compliance	V	
MDM IV			Cyber Forensics	VI	
MDM V			AI and Legal Decision Making	VII	
MDM VI			Network Security	VIII	



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MDM	MDM Name	Course Code	Course Name	SEM	Offered by Department
MDM I	Security Analysis		Internet technology	III	Information Technology
MDM II			Cryptography	IV	
MDM III			Cyber Security	V	
MDM IV			Web Security	VI	
MDM V			Ethical Hacking	VII	
MDM VI			Ad-hoc wireless Network	VIII	
MDM I	Software Testing		Software Engineering	III	Information Technology
MDM II			Software Testing	IV	
MDM III			Advance Software Testing	V	
MDM IV			Automation Testing	VI	
MDM V			Software Project Management	VII	
MDM VI			Software Quality Assurance	VIII	

List of Open Electives

Note: One Open Elective course is to be floated by the institute for 60 intake.

Sr. No.	SEM III Open Elective 1		SEM IV Open Elective 2		SEM V Open Elective 3		Open Elective offered by Department
	Course Code	Course Title	Course Code	Course Title	Course Code	Course Title	
1	01OEL1201	Basics of Management	01OEL2201	Environmental Impact Assessment	01OEL3301	Recourses Management	Civil
2	01OEL1202	Industrial Psychology	01OEL2202	Cognitive Psychology	01OEL3302	Psychology of learning and motivation	Mechanical
3	01OEL1203	Graphic Design	01OEL2203	Animation Film Design	01OEL3303	Digital Marketing	ETC
4	01OEL1204	Fundamentals of Investment	01OEL2204	Banking and Insurance	01OEL3304	Introduction to FINTECH	AI & DS
5	01OEL1205	Business Law	01OEL2205	Criminal Law	01OEL3305	Intellectual Property Rights (IPR) & Patenting	IT
6	01OEL1206	Human-Computer Interface	01OEL2206	Visual Story Telling	01OEL3306	Game Design & Development	CSE



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Program Elective Courses Verticals

Sr. No.	SEM	Elective No	Course Code	Software Development	Course Code	Cyber Security and Data Privacy	Course Code	Natural Language Processing	Course Code	Cloud Computing
1	V	PEC-1	1ADPEL303	Software Development Framework	1ADPEL304	Cryptography & Network Security	1ADPEL305	Natural Language Processing	1ADPEL306	Cloud Computing
2	V	PEC- 1 LAB	1ADPEP309	Software Development Framework Lab	1ADPEP310	Cryptography & Network Security Lab	1ADPEP311	Natural Language Processing Lab	1ADPEP312	Cloud Computing Lab
3	VI	PEC-2	1ADPEL316	Software Testing & Automation	1ADPEL317	Cyber Security	1ADPEL318	Large Language Models	1ADPEL319	Virtualization
4	VI	PEC-3	1ADPEL320	UI and UX Design	1ADPEL321	Cryptocurrency and Blockchain Technology	1ADPEL322	Generative AI	1ADPEL323	Cloud Service Management
5	VI	PEC-3 LAB	1ADPEP326	UI and UX Design Lab	1ADPEP327	Cryptocurrency and Blockchain Technology lab	1ADPEP328	Generative AI Lab	1ADPEP329	Cloud Service Management Lab
6	VII	PEC-4	1ADPEL403	Augmented Reality & Virtual Reality	1ADPEL404	Security and Privacy in Cloud	1ADPEL405	Text & Speech Analysis	1ADPEL406	Software Defined Network
7	VII	PEC-5	1ADPEL407	Software Project Management	1ADPEL408	Ethical Hacking	1ADPEL409	Sentiment Analysis	1ADPEL410	Storage Technologies
8	VIII	PEC-6	1ADPEL415	SWAYAM/NPTEL /Other MOOCKs related to vertical	1ADPEL416	SWAYAM/NPTEL /Other MOOCKs related to vertical	1ADPEL417	SWAYAM/NPTEL /Other MOOCKs related to vertical	1ADPEL418	SWAYAM/NPTEL /Other MOOCKs related to vertical



Direct Second Year Entry: Teaching & Evaluation Scheme

- Students admitted directly into the second year of a programme from another programme are required to complete a 2-credit entry-level course as per the prescribed curriculum.
- This course should be completed at their own pace to ensure alignment with the programme foundational requirements.
- End Semester Examination (ESE) of 70 marks will be conducted at the institute level. It is mandatory to organize the examination and evaluate the performance of such students at the institute level during the third semester ESE.
- The evaluation report must be submitted to COE office of an institution.

EXIT COURSE

After Second Year Award of UG Diploma in Major with 88 credits and an additional 8 credits from following Exit Courses				
Sr. No	Course Code	Course Title	Mode	Credits
NPTEL				
1	01ADEX251	Introduction to Artificial Intelligence	Online certification Course of total 6 credits Each Course 3 Credits	6
		Machine Learning		
VIRTUAL LAB				
2	01ADEX252	Artificial Intelligence Lab I (https://ai1-iiith.vlabs.ac.in/)	Online certification Course total 2 Credits 1 Credit each	2
		Artificial Intelligence Lab II (https://ai2-iiith.vlabs.ac.in/)		



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Teaching and Evaluation Scheme for Students admitted in Academic Year 2024-25
 Program: Artificial Intelligence & Data Science
Honors in Block Chain Technology

Sr. No.	Course Code	Course Title	Course Category	Teaching scheme				Course Credits	Evaluation scheme						
				L	T	P	Contact Hrs/wk		Theory				Practical		Total
									CIE			ESE	CIE	ESE	
									T-I	T-II	ISE				
1		Introduction to Blockchain	Honors	3	--	--	3	3	20	20	10	50	---	---	100
2		Blockchain Lab	Honors	--	--	2	2	1					50	--	50
		Total Credits for SEM IV		3		2	5	4	20	20	10	50	50	--	150
3		Blockchain Platforms and Use cases	Honors	3	1	--	4	4	20	20	10	50	---	---	100
		Total Credits for SEM V		3	1	--	4	4	20	20	10	50	--	--	100
4		Smart Contracts & Crypto Currencies	Honors	3	--	--	3	3	20	20	10	50	---	---	100
5		Smart Contracts & Crypto Currencies Lab	Honors	--	--	2	2	1	--	--	--	--	50	--	50
		Total Credits for SEM VI		3	--	2	5	4	20	20	10	50	50	--	150
6		Decentralize & Blockchain Technologies	Honors	3	1	--	4	4	20	20	10	50	---	---	100
7		Project	Honors	--	--	4	4	2				--	50	50	100
		Total Credits for SEM VII		3	1	4	8	6	20	20	10	50	50	50	200
		Total Credits for Semester IV + V + VI + VII						18	80	80	40	200	150	50	600

***To be offered as Honors for Major Disciplines as–**

1. Electronics and Telecommunication Engineering
2. Computer Science and Engineering
3. Information Technology
4. Artificial Intelligence and Data Science



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Teaching and Evaluation Scheme for Students admitted in Academic Year 2024-25

Program: Artificial Intelligence & Data Science

Emerging Minor Specialization in AR & VR

Sr. No.	Course Code	Course Title	Course Category	Teaching scheme				Course Credits	Evaluation scheme						
				L	T	P	Contact Hrs/wk		Theory				Practical		Total
									CIE			ESE	CIE	ESE	
									T-I	T-II	ISE				
1		Introduction to Augmented Reality	Emerging Minor	3	1	--	4	4	20	20	10	50	---	---	100
		Total Credits for SEM III		3	1	--	4	4	20	20	10	50	--	--	100
2		Introduction to Virtual Reality	Emerging Minor	3	1	--	4	4	20	20	10	50	---	---	100
		Total Credits for SEM IV		3	1	--	4	4	20	20	10	50	--	--	100
3		Virtual Reality in Game Development	Emerging Minor	3	1	--	4	4	20	20	10	50	---	---	100
		Total Credits for SEM V		3	1	--	4	4	20	20	10	50	---	---	100
4		Application Development using Augmented Reality and Virtual Reality	Emerging Minor	3	1	--	4	4	20	20	10	50	---	---	100
		Total Credits for SEM VI		3	1	--	4	4	20	20	10	50	---	---	100
5		Seminar/ Presentation	Emerging Minor	--	2	--	2	2				--	50	--	50
		Total Credits for SEM VII		--	2	--	2	2	--	--	--	--	50	--	50
		Total Credits for Semester III +IV + V + VI + VII						18	80	80	40	200	150	--	450

***To be offered as Emerging Minor for Major Disciplines as-**

1. Electronics and Telecommunication Engineering
2. Computer Science and Engineering
3. Information Technology
4. Artificial Intelligence and Data Science

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ARTIFICIAL INTELLIGENCE & DATA SCIENCE
TY- B.Tech - SEM-V

Expert Systems

Course Details:

Class		Third Year		Semester		V	
Course Title		Expert Systems		Course Code		1ADPCL301	
Prerequisites:							
Teaching Scheme:		Theory Hours:	03	Practical Hours:	00	Tutorial Hours:	00
		Credits:	03	Credits:	00	Credits:	00
Evaluation Scheme & Marks							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
20	20	10	50	---	---	100	

Course Objectives:

The course aims to:

Sr. No.	Course Objectives
01	To build strong conceptual foundations in knowledge-based intelligent systems
02	To develop analytical skills for representing and reasoning with knowledge
03	To promote experiential and project-based learning through laboratory work
04	To enable multidisciplinary problem-solving using expert system techniques
05	To prepare students for industry-relevant AI applications and higher studies

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
1ADPCL301.01	Explain the concepts, architecture, characteristics, and applications of expert systems.	Understand (L2)
1ADPCL301.02	Apply appropriate knowledge representation techniques to model domain knowledge for expert systems.	Apply (L3)
1ADPCL301.03	Analyze inference mechanisms and reasoning strategies for solving real-world problems using expert systems.	Analyze (L4)
1ADPCL301.04	Evaluate expert system approaches for handling uncertainty using certainty factors, Bayesian reasoning, and fuzzy logic.	Evaluate (L5)
1ADPCL301.05	Analyze the processes, tools, and methodologies used in the development, validation, and verification of expert systems.	Analyze (L4)

Course Contents				
Unit No.	Unit Title	Hours	Course Outcome No.	Bloom's Taxonomy Level
01	Foundations of Expert Systems Overview of Artificial Intelligence, Knowledge-based systems, Definition and characteristics of expert systems, History and evolution of expert systems, Components of expert systems, Applications and limitations of expert systems.	06	1ADPCL301.01	L1,L2
02	Knowledge Representation Techniques Types of knowledge, Knowledge representation issues, Production rules, Semantic networks, Frames, Predicate logic, Rule-based knowledge bases, Comparison of knowledge representation techniques.	06	1ADPCL301.02	L2,L3
03	Inference and System Architecture Architecture of expert systems, Inference engines, Forward chaining, Backward chaining, Conflict resolution strategies, Explanation facilities, Comparison of inference mechanisms, Applications of reasoning strategies.	06	1ADPCL301.03	L2, L3, L4
04	Knowledge Engineering & Development Knowledge acquisition techniques, Role of knowledge engineer, Knowledge elicitation methods, Expert system development life cycle, Expert system shells, Validation and verification of expert systems, Challenges in expert system development.	06	1ADPCL301.05	L3, L4

05	Uncertainty & Intelligent Reasoning Uncertainty in expert systems, Certainty factor model, Bayesian reasoning, Fuzzy logic and fuzzy expert systems, Comparison of uncertainty handling methods, Hybrid intelligent systems, Case studies: MYCIN, DENDRAL, XCON.	06	1ADPCL301.04	L3, L4, L5
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Text Books/Reference Books:

Sr. No	Book Type (Text/Reference)	Name of the Book	Name of the Author	Publisher	Edition	Year of Publication
1	Text	Introduction to Expert Systems, Pearson	Peter Jackson	Pearson Education	3rd Edition,	1999
2	Text	Expert Systems: Principles and Programming	Joseph C. Giarratano, Gary D. Riley	Cengage Learning	5th Edition	2018
3	Reference	Artificial Intelligence: A Modern Approach, Pearson	Russell & Norvig –	John Wiley,	3rd edition	2005
4	Reference	Artificial Intelligence: A Modern Approach	Stuart Russell, Peter Norvig	Pearson	4th Edition	2021

Online References:

Sr. No.	Website Name	URL	Units Covered
1	NPTEL	https://nptel.ac.in/courses/106105077	1,3
2	NPTEL	https://nptel.ac.in/courses/106106140	2,3,5
3	COURSERA	https://www.coursera.org/learn/introduction-to-ai	1 to 5

Examination Scheme and Guidelines:

T-I 20 Marks	Examination of 20 marks based on Units 1, 2, and 3 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
T-I 20 Marks	Examination of 20 marks based on Units 4, 5 and 6 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
ISE 10 Marks	ISE/CA -In Semester Evaluation/Continuous Assessment

ESE 50 Marks	ESE-End Semester Examination
	Que.1: MCQ's based on All Units (Carries 06 Marks)
	Que.2: based on Unit 1, 2, 3 (Carries 11 Marks)
	Que.3: based on Unit 1,2,3 (Carries 11 Marks)
	Que.4: based on Unit 4, 5, 6 (Carries 11 Marks)
	Que.5: based on Unit 4, 5, 6 (Carries 11 Marks)
Note: For Question Nos. 2, 3, 4, and 5, the subject expert should provide a minimum of one and a maximum of two internal options during paper setting.	

Machine Learning

Course Details:

Class		Third Year		Semester		V	
Course Title		Machine Learning		Course Code		1ADPCL302	
Prerequisites:							
Teaching Scheme:		Theory Hours:	3 Hrs./ week	Practical Hours:	-	Tutorial Hours:	-
		Credits:	3	Credits:	-	Credits:	-
Evaluation Scheme							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
20	20	10	50	-	-	100	

Course Objectives:

The course aims to:

Sr. No.	Course Objectives
01	To understand the foundational concepts, types, processes, architectures, and evaluation measures of Machine Learning.
02	To apply supervised and unsupervised learning algorithms, including regression, classification, decision trees, SVM, clustering, and recommendation systems.
03	To analyze and implement advanced ML techniques such as regularization, dimensionality reduction, and feature engineering for improved model performance.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
1ADPCL302.01	Understand fundamental concepts, types, challenges, and evaluation metrics of Machine Learning.	L2
1ADPCL302.02	Apply simple and multivariate regression techniques using gradient descent and feature scaling.	L3
1ADPCL302.03	Implement classification algorithms such as Logistic Regression, Naïve Bayes, KNN, and HMM.	L4
1ADPCL302.04	Analyze and construct Decision Tree, Random Forest, and SVM models for predictive analytics.	L5
1ADPCL302.05	Apply unsupervised learning methods including K-Means, Hierarchical Clustering, and Association Rule Mining.	L4
1ADPCL302.06	Utilize recommendation systems and dimensionality reduction techniques such as PCA, LDA, Isomap, and LLE for efficient data modeling.	L6

Course Contents				
Unit No.	Unit Title	Hours	Course Outcome Number	Bloom's Taxonomy Level
01	Introduction to Machine Learning Definition, Terminology, Types of Machine learning, Challenges of Machine Learning, Machine learning architecture, process, Lifecycle, Performance measures, tools and framework, Overfitting and Underfitting, The Bias-Variance Trade-off	06	1ADPCL302.01	L2
02	Regression Simple regression – Cost function, parameter learning with gradient descent, learning rate, Gradient Descent for linear regression, examples, simple regression in matrix form. Multivariate Linear Regression – Multiple features, hypothesis functions, Gradient Descent for multiple variables, Feature scaling, polynomial regression	06	1ADPCL302.02	L3
03	Classification Logistic Regression – Definition, Hypothesis representation, decision boundary, cost function, Gradient Descent for Logistic Regression. Multiclass Classification. Regularization - Over fitting & Under fitting, cost function, Regularized Linear Regression, Regularized Logistic Regression, Conditional probability and Naïve Bayes Classifier. Instance-based classifier – K-Nearest Neighbor Classifier, Bayesian Network, Hidden Markov Model.	06	1ADPCL302.03	L4

04	Decision trees and Support Vector Machine Decision trees: definition, terminology, the need, advantages, and limitations. Constructing and understanding Decision trees, common problems with Decision trees, Decision tree algorithms, random forest, examples. Support Vector Machine: What is SVM, Kernel Trick, Cost Function, Decision Trees vs. Support Vector Machine.	06	1ADPCL302.04	L5
05	Unsupervised learning Clustering, K Means clustering, Hierarchical clustering, Association Rule mining.	06	1ADPCL302.05	L4
06	Recommendation System & Dimensionality Reduction Popularity based recommender engines, Content based recommendation engines, Classification based recommendation engine, Collaborative filtering. Dimensionality Reduction, Principal Components Analysis, Factor Analysis Multidimensional Scaling, Linear Discriminant Analysis, Isomap, Locally Linear Embedding	06	1ADPCL302.06	L6

Text Books/Reference Books:

Sr. No	Book Type (Text/Reference)	Name of the Book	Name of the Author	Publisher	Edition	Year of Publication
1.	Textbook	Machine Learning with Python- an approach to applied ML	Abhishek Vijayvargia	BPB publications	1st Edition	2018
2.	Textbook	Practical Machine Learning	Sunila Gollapudi	Packt Publishing Ltd.	1st Edition	2016
3.	Textbook	Machine Learning	Tom M. Mitchell	McGraw Hill Education	1st Edition	2017
4.	Reference Book	Machine Learning for Dummies	John Paul Muller	Wiley Publication	1st Edition	2016
5.	Reference Book	Introduction to Machine Learning	Ethem Alpaydin	PHI Learning	2 nd Edition	2013

Online References:

Sr. No.	Website Name	URL	Units Covered
1	NPTL	https://nptel.ac.in/courses/106106139	1,2,3,4,5

List of Assignments/Tutorials for ISE:

Minimum 06 Assignments/Tutorials based on the curriculum.

Examination Scheme and Guidelines:

T-I 20 Marks	Examination of 20 marks based on Units 1, 2, and 3 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
T-II 20 Marks	Examination of 20 marks based on Units 4, 5 and 6 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
ISE 10 Marks	ISE/CA -In Semester Evaluation/Continuous Assessment
ESE 50 Marks	ESE-End Semester Examination
	Que.1: MCQ's based on All Units (Carries 06 Marks)
	Que.2: based on Unit 1, 2, 3 (Carries 11 Marks)
	Que.3: based on Unit 1,2,3 (Carries 11 Marks)
	Que.4: based on Unit 4, 5, 6 (Carries 11 Marks)
	Que.5: based on Unit 4, 5, 6 (Carries 11 Marks)
Note: For Question Nos. 2, 3, 4, and 5, the subject expert should provide a minimum of one and a maximum of two internal options during paper setting.	

Dr. J. J. Magdum Trust's

Dr J J Magdum College Of Engineering, Jaysingpur

ARTIFICIAL INTELLIGENCE & DATA SCIENCE

TY- B.Tech -SEM-V

Program Elective Courses-I
Software Development Framework

Course Details:

Class		Third Year		Semester		V	
Course Title		Software Development Framework		Course Code		1ADPEL303	
Prerequisites:							
Teaching Scheme:		Theory Hours:	3 Hrs./ week	Practical Hours:	-	Tutorial Hours:	-
		Credits:	3	Credits:	-	Credits:	-
Evaluation Scheme							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
20	20	10	50	-	-	100	

Course Objectives:

The course aims to:

Sr. No.	Course Objectives
01	Provide fundamental knowledge of software development frameworks, their role, benefits, limitations, and selection criteria in modern software engineering.
02	Develop the ability to analyze and apply architectural frameworks and design patterns for building scalable software systems.
03	Familiarize students with requirement analysis techniques and development frameworks for effective problem definition and solution modeling.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
1ADPEL303.1	Explain the concept, role, types, benefits, and limitations of software development frameworks and select appropriate frameworks for given applications.	L2
1ADPEL303.2	Analyze and compare different software development process models and justify the selection of a suitable model for framework-based software projects.	L4
1ADPEL303.3	Apply architectural frameworks and design patterns to design structured, scalable, and maintainable software systems.	L3
1ADPEL303.4	Analyze software requirements and model system behavior using requirement analysis frameworks, UML diagrams, and feasibility studies.	L3
1ADPEL303.5	Develop and test applications using suitable application development and testing frameworks and demonstrate continuous integration concepts.	L3
1ADPEL303.6	Evaluate software quality and reliability using quality assurance practices, deployment frameworks, version control systems.	L5

Course Contents				
Unit No.	Unit Title	Hours	Course Outcome Number	Bloom's Taxonomy Level
01	INTRODUCTION TO SOFTWARE DEVELOPMENT FRAMEWORKS Definition of Software Development Framework, Need for frameworks, Role of frameworks in software engineering, Framework vs Library, Types of frameworks, Benefits and limitations of frameworks, Overview of modern software development practices, Software development environment, Framework selection criteria.	07	1ADPEL303.1	L2
02	SOFTWARE DEVELOPMENT PROCESS & LIFE CYCLE MODELS Software Development Process, Process discipline and improvement, Tailoring the process, Software Production Process, Software Life Cycle, Overview of Software Process Models: Waterfall, Prototyping, Incremental, Spiral, RAD, Component-based Development, Comparison of process models, Model selection guidelines.	06	1ADPEL303.2	L4

03	ARCHITECTURAL FRAMEWORKS AND DESIGN PATTERNS Software architecture concepts, Layered architecture, Client–Server architecture, MVC framework, MVVM architecture, Micro-services architecture, Service-Oriented Architecture (SOA), Introduction to design patterns, Creational, Structural, and Behavioral patterns, Framework support for design patterns.	07	1ADPEL303.3	L3
04	REQUIREMENT ANALYSIS AND DEVELOPMENT FRAMEWORKS Requirement engineering process, Functional and non-functional requirements, Requirement elicitation techniques, Requirement analysis frameworks, UML diagrams (Use case, Class, Sequence), Data Flow Diagrams, Requirement validation, Requirement documentation (SRS), Feasibility study.	06	1ADPEL303.4	L4
05	APPLICATION DEVELOPMENT AND TESTING FRAMEWORKS Application development frameworks overview, Front-end frameworks (Angular, React – concepts), Back-end frameworks (Spring, Django – concepts), Mobile development frameworks (Android, Flutter – overview), Unit testing frameworks (JUnit, TestNG), Integration and system testing, Continuous Integration concepts.	06	1ADPEL303.5	L3
06	QUALITY, DEPLOYMENT, AND MAINTENANCE FRAMEWORKS Software quality models (ISO, FURPS), Software Quality Assurance (SQA), Code review frameworks, Version control systems (Git), Build and deployment frameworks, DevOps basics, Continuous Delivery, Software maintenance frameworks, Software reliability and risk management, Cleanroom methodology (overview).	06	1ADPEL303.6	L5

Text Books/Reference Books:

Sr. No	Book Type (Text/Reference)	Name of the Book	Name of the Author	Publisher	Edition	Year of Publication
1.	Textbook	Software Engineering: A Practitioner's Approach	Roger S. Pressman, Bruce R. Maxim	McGraw-Hill Education	8th Edition	2014
2.	Reference Book	Metrics and Models in Software Quality Engineering	Stephen H. Kan	Addison-Wesley	2nd Edition	2003
3.	Reference Book	Software Engineering and Project Management	K.K. Aggarwal, Yogesh Singh	New Age International Publishers	3rd Edition	2016

Online References:

Sr. No.	Website Name	URL	Units Covered
1	NPTEL	https://www.youtube.com/playlist?list=PL2ECACFE643A78F53&utm_source=chatgpt.com	1,2,3,4,5

List of Assignments/Tutorials for ISE:

Minimum 06 Assignments/Tutorials based on the curriculum.

Examination Scheme and Guidelines:

T-I 20 Marks	Examination of 20 marks based on Units 1, 2, and 3 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
T-I 20 Marks	Examination of 20 marks based on Units 4, 5 and 6 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
ISE 10 Marks	ISE/CA -In Semester Evaluation/Continuous Assessment
ESE 50 Marks	ESE-End Semester Examination
	Que.1: MCQ's based on All Units (Carries 06 Marks)
	Que.2: based on Unit 1, 2, 3 (Carries 11 Marks)
	Que.3: based on Unit 1,2,3 (Carries 11 Marks)
	Que.4: based on Unit 4, 5, 6 (Carries 11 Marks)
	Que.5: based on Unit 4, 5, 6 (Carries 11 Marks)
Note: For Question Nos. 2, 3, 4, and 5, the subject expert should provide a minimum of one and a maximum of two internal options during paper setting.	

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ARTIFICIAL INTELLIGENCE & DATA SCIENCE
TY- B.Tech -SEM-V

Program Elective Courses-I
Cryptography & Network Security

Course Details:

Class		Third Year		Semester		V	
Course Title		Cryptography & Network Security		Course Code		1ADPEL304	
Prerequisites:							
Teaching Scheme:		Theory Hours:	3 Hrs./ week	Practical Hours:	-	Tutorial Hours:	-
		Credits:	3	Credits:	-	Credits:	-
Evaluation Scheme							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
20	20	10	50	-	-	100	

Course Objectives:

The course aims to:

Sr. No.	Course Objectives
01	Understand the basic concepts of Cryptography & its importance
02	Understand various cryptographic algorithms, public-key cryptography
03	Understand the basic categories of threats to computers and networks
04	Discuss Web security and Firewalls

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
1ADPEL304.1	Explain the use of Cryptographic algorithms to ensure data protection and integrity.	L2
1ADPEL304.2	Apply the knowledge of cryptographic techniques to solve the problems on sec	L3
1ADPEL304.3	Ability to understand the current legal issues towards information security	L2
1ADPEL304.4	Develop transport level security.	L6
1ADPEL304.5	Analyze the security facilities designed to provide system security	L4
1ADPEL304.6	Analyze cyber security management practices and evaluate emerging security technologies to address modern network and information security challenges	L4. L5

Course Contents				
Unit No.	Unit Title	Hours	Course Outcome Number	Bloom's Taxonomy Level
01	Introduction to Information Security Overview: Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor machines, Steganography	06	1ADPEL304.1	L2
02	Symmetric and Asymmetric Key Cryptography Block Ciphers and the Data Encryption Standard: Block Cipher Structure, Data Encryption Standard (DES), A DES Example, Strength of DES, Block Cipher Design Principles, AES Structure, Multiple Encryption and Triple-DES Public Key Cryptography Principles of Public-Key Cryptosystems, RSA Algorithm, Other Public key Cryptosystems - Diffie-Hellman Key Exchange, ElGamal Cryptographic system	07	1ADPEL304.2	L3
03	Cryptographic Authentication Functions: Cryptographic Hash Functions: Applications of Cryptographic Hash Functions, Two Simple Hash Functions, Requirements and Security, Hash Functions Based on Cipher Block Chaining, Secure Hash Algorithm (SHA) Message Authentication Codes:	07	1ADPEL304.3	L2

	Message Authentication Requirements, Message Authentication Functions, Requirements for MAC and Security of MACs, MACs Based on Hash Functions: MAC, MACs Based on Block Ciphers: DAA and CMAC Digital Signatures: Digital Signatures, ElGamal Digital Signature Scheme, Schnorr Digital Signature Scheme, Digital Signature Standard (DSS)			
04	Internet Security Protocols Transport - Level Security Web Security Issues, Secure Sockets Layer (SSL), Transport Layer Security (TLS), HTTPS, SSH Electronic Mail Security Pretty Good Privacy (PGP), S/MIME, SET IP Security IP Security Overview, IP Security Policy, Encapsulating Security Payload	06	1ADPEL304.4	L6
05	Firewall and Intrusion detection system: Firewalls: Introduction, Types of firewall, Firewall configuration, VPN, Types of VPN IDS: Overview of IDS, IDS Components, Approaches of IDS SIEM: Introduction to SIEM, SIEM Scenario and process flow, SIEM architecture, SIEM features	06	1ADPEL304.5	L4
06	Cyber Security Management and Emerging Trends: Cyber Security Governance and Risk Management Security Policies, Standards and Compliance (ISO 27001, NIST), Cloud Security Fundamentals, Internet of Things (IoT) Security Issues, Security Challenges in Mobile and Wireless Networks, Emerging Trends: Zero Trust Security, Blockchain Security, AI in Cyber Security	07	1ADPEL304.6	L4,L5

Text Books/Reference Books:

Sr. No.	Book Type (Text/Reference)	Name of the Book	Name of the Author	Publisher	Edition
1.	Textbook	Cryptography and Network Security	William Stallings,	Pearson Education	6th Edition
2.	Textbook	Cryptography and Network Security	Atul Kahate	Mc Graw Hill	3 rd Edition
3.	Reference Book	Cryptography and Network Security:	C K Shyamala, N Harini, Dr T R Padmanabhan	Wiley India	1st Edition
4.	Reference Book	Cryptography and Network Security:	Forouzan Mukhopadhyay	Mc Graw Hill	3 rd Edition

Online References:

Sr. No.	Website Name	URL	Units Covered
1	Network Security (IIT Bombay)	https://onlinecourses.nptel.ac.in/noc25_ee54/preview?utm_source=chatgpt.com	1,2,3
2	Cyber Security and Privacy	https://onlinecourses.nptel.ac.in/noc25_cs116/preview	4,5,6

List of Assignments/Tutorials for ISE:

- Minimum 06 Assignments/Tutorials based on the curriculum.

Examination Scheme and Guidelines:

T-I 20 Marks	Examination of 20 marks based on Units 1, 2, and 3 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
T-I 20 Marks	Examination of 20 marks based on Units 4, 5 and 6 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
ISE 10 Marks	ISE/CA -In Semester Evaluation/Continuous Assessment
ESE 50 Marks	ESE-End Semester Examination
	Que.1: MCQ's based on All Units (Carries 06 Marks)
	Que.2: based on Unit 1, 2, 3 (Carries 11 Marks)
	Que.3: based on Unit 1,2,3 (Carries 11 Marks)
	Que.4: based on Unit 4, 5, 6 (Carries 11 Marks)
	Que.5: based on Unit 4, 5, 6 (Carries 11 Marks)
Note: For Question Nos. 2, 3, 4, and 5, the subject expert should provide a minimum of one and a maximum of two internal options during paper setting.	

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ARTIFICIAL INTELLIGENCE & DATA SCIENCE
TY- B.Tech -SEM-V

Program Elective Courses-I
Natural Language Processing

Course Details:

Class		Third Year		Semester		V	
Course Title		Natural Language Processing		Course Code		1ADPEL305	
Prerequisites:							
Teaching Scheme:		Theory Hours:	3 Hrs./ week	Practical Hours:	-	Tutorial Hours:	-
		Credits:	3	Credits:	-	Credits:	-
Evaluation Scheme							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
20	20	10	50	-	-	100	

Course Objectives:

The course aims to:

Sr No.	Course Objectives
01	To introduce fundamental concepts and challenges of Natural Language Processing.
02	To understand and apply N-gram-based language modelling techniques.
03	To develop knowledge of vector semantics and word embedding models.
04	To Evaluate sequential labelling techniques for POS tagging and named entity recognition.
05	To Evaluate word senses, WordNet, and word sense disambiguation methods.
06	To Analyze attention and Transformer-based models such as BERT to NLP tasks.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
1ADPEL305.1	Apply foundational NLP techniques to process and analyze textual data.	L3
1ADPEL305.2	Understand the principles of N-gram language models.	L2

1ADPEL305.3	Describe key concepts in lexical and vector semantics for evaluating semantic similarity.	L4
1ADPEL305.4	Evaluate the accuracy and performance of part-of-speech and named entity recognition systems.	L5
1ADPEL305.5	Evaluate Word Sense Induction methods for discovering new senses from large text corpora.	L5
1ADPEL305.6	Analyze the architecture and effectiveness of attention-based models and pretrained transformers.	L4

Course Contents				
Unit Number	Unit Title	Hours	Course Outcome Number	Bloom's Taxonomy Level
01	Introduction to Natural Language Processing What is Natural Language Processing? Origins of NLP, Language and Knowledge, The Challenges of NLP, Regular Expressions, Words, Corpora, Text Normalization, and Minimum Edit Distance.	06	1ADPEL305.1	L3
02	N-Gram Language Models N-Grams, Evaluating Language Models, Generalization and Zeros, Smoothing, Kneser-Ney Smoothing, Huge Language Models and Stupid Backoff, Advanced: Perplexity's Relation to Entropy.	06	1ADPEL305.2	L2
03	Vector Semantics and Embedding's Lexical Semantics, Vector Semantics, Words and Vectors, Cosine for measuring similarity, TF-IDF: Weighing terms in the vector, Pointwise Mutual Information (PMI) Applications of the TF-IDF or PPMI vector models, Word2vec, Visualizing Embedding's, Semantic properties of embedding, Bias and Embedding's, Evaluating Vector Models.	06	1ADPEL305.3	L4
04	Sequential labelling and language modelling English Word Classes, Part-of-Speech Tagging, Named Entities and Named Entity Tagging, HMM Part-of-Speech Tagging, Conditional Random Fields (CRFs), Evaluation of Named Entity Recognition.	06	1ADPEL305.4	L5
05	Word Senses and WordNet Word Senses, Relations Between Senses, WordNet: A Database of Lexical Relations, Word Sense Disambiguation, Alternate WSD algorithms and Tasks, Using Thesauruses to Improve Embedding's, Word Sense Induction.	06	1ADPEL305.5	L5
06	Attention and Transformer What is attention? Sequence-to-sequence with attention, Transformer and self-attention, Transformer-based language models, Transfer learning with pretrained language models, BERT, Other pretrained language models, Case study, Sentiment analysis with BERT.	06	1ADPEL305.6	L4

Text Books/Reference Books:

Sr. No	Book Type (Text/Reference)	Name of the Book	Name of the Author	Publisher	Edition	Year of Publication
1	Textbook	Speech and Language Processing	Daniel Jurafsky, James H. Martin	Pearson	3rd	2023
2	Textbook	Natural Language Processing with Python	Steven Bird, Ewan Klein, Edward Loper	O'Reilly	1st	2009
3	Reference Book	Foundations of Statistical Natural Language Processing	Christopher D. Manning, Hinrich Schütze	MIT Press	1st	1999
4	Reference Book	Neural Network Methods for Natural Language Processing	Yoav Goldberg	Morgan & Claypool	1st	2017
5	Reference Book	Natural Language Processing	Jacob Eisenstein	MIT Press	1st	2019

Online References:

Sr. No.	Website Name	URL	Units Covered
1	Youtube	https://youtu.be/aeOLjFe256E	1,2,3,4,5,6

List of Assignments/Tutorials for ISE:

- Minimum 06 Assignments/Tutorials based on the curriculum.

Examination Scheme and Guidelines:

T-I 20 Marks	Examination of 20 marks based on Units 1, 2, and 3 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
T-I 20 Marks	Examination of 20 marks based on Units 4, 5 and 6 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
ISE 10 Marks	ISE/CA -In Semester Evaluation/Continuous Assessment
ESE 50 Marks	ESE-End Semester Examination (Sample)
	Que.1: MCQ's based on All Units (Carries 06 Marks)
	Que.2: based on Unit 1, 2, 3 (Carries 11 Marks)
	Que.3: based on Unit 1,2,3 (Carries 11 Marks)
	Que.4: based on Unit 4, 5, 6 (Carries 11 Marks)
	Que.5: based on Unit 4, 5, 6 (Carries 11 Marks)
Note: For Question Nos. 2, 3, 4, and 5, the subject expert should provide a minimum of one and a maximum of two internal options during paper setting.	

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ARTIFICIAL INTELLIGENCE & DATA SCIENCE
TY- B.Tech -SEM-V

Program Elective Courses-I
Cloud Computing

Course Details:

Class		Third Year		Semester		V	
Course Title		Cloud Computing		Course Code		1ADPEL306	
Prerequisites:							
Teaching Scheme:		Theory Hours:	3 Hrs./ week	Practical Hours:	-	Tutorial Hours:	-
		Credits:	3	Credits:	-	Credits:	-
Evaluation Scheme							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
20	20	10	50	-	-	100	

Course Objectives:

The course aims to:

Sr No.	Course Objectives
01	Understand the basic concepts of Cloud Computing
02	Understand the Key concepts of virtualization
03	Learn to use efficiently and examine different cloud computing services
04	Study the different case studies related to cloud and implement it.
05	Elaborate the knowledge of Open-Source Cloud Architecture, Open Stack Cloud Architecture and Cloud deployment techniques.
06	Study and elaborate the different applications of cloud.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
1ADPEL306.1	Demonstrate Cloud Computing & Virtualization Concept.	L2
1ADPEL306.2	Compare Cloud Computing Platform and their Applications.	L2
1ADPEL306.3	Develop & Deploy a Application on Cloud.	L3
1ADPEL306.4	Build a Custom Virtual Private Cloud.	L3
1ADPEL306.5	Understand the applications of Cloud.	L2

Course Contents				
Unit No.	Unit Title	Hours	Course Outcome Number	Bloom's Taxonomy level
01	Introduction to Cloud Components of Cloud Computing. Cloud Types and Models: Private Cloud, Community Cloud, Public Cloud, Hybrid Clouds. Cloud Models and Deployment, Advantages over On-Premises, AWS Suite, Virtualization in AWS, XEN Hypervisor, Different Cloud Solution Providers- AWS/ Azure / GCP.	07	1ADPEL306.1	L2
02	Virtualization Introduction and benefits, Requirement for Virtualization, what is Virtualization, Benefits of Virtualization, How to Virtualize, Types of Virtualizations, Microservices, What is Container, Comparison Containers and Virtual Machines, Benefits of Docker Containers, Hands on Virtualization.	06	1ADPEL306.2	L2
03	Cloud Computing Services -I Introduction to Compute & Storage and File system, Introduction to Role manager and CloudWatch, Introduction to Load Balancer and Auto Scaling, Cloud Formation and APP Services.	07	1ADPEL306.3	L3
04	Cloud Computing Services -II Networking in Cloud, On Demand Cloud Pooling-Creation, Peering, Security Groups, Endpoints, Case Study. Implementation of Storage Bucket Creation, Versioning, Website hosting, Database Services in Cloud Aurora, DynamoDB, Redshift, Architecture, Serverless Cloud Computing, Elastic Beanstalk, Automation and Configuration and API Gateway, Organization, Global Accelerator, Backup in Cloud Migration	07	1ADPEL306.3	L3

05	Open-Source Cloud Implementation Open-Source Eucalyptus Cloud Architecture, Open Stack Cloud Architecture, Cloud Administration and Management, Bundling or Uploading Virtual machine images on the Cloud Controller, GUI Access to VM instances over SSH, Cloud deployment techniques.	06	1ADPEL306.4	L3
06	Cloud Applications Dev OPs with cloud Kubernetes Services, SNS (Simple Notification Service), Simple Email Service, Simple Queue Service, Performance Efficiency, Cost Scientific Applications in – Healthcare, Biology, Geo-Science; Business Applications	06	1ADPEL306.5	L2

Text /Reference Books

Sr. No	Book Type (Text/Reference)	Name of the Book	Name of the Author	Publisher	Edition	Year of Publication
1.	Textbook	Cloud Computing Black Book	Jayaswal, Kallakurchi, Houde, Shah	Dreamtech Press	Second	2014
2.	Textbook	Mastering Cloud Computing	Buyya R, Vecchiola C, Selvi S T,	McGraw Hill Education (India)	First	2013
3.	Reference Book	Cloud Computing - Principles and Paradigms	Buyya R, Broberg J, Goscinski A,	Wiley	First	2011

Online References:

Sr. No.	Website Name	URL	Units Covered
1	NPTL	https://onlinecourses.nptel.ac.in/noc21_cs14/preview	1,2,3,4,5,6

List of Assignments/Tutorials for ISE:

- Minimum 06 Assignments/Tutorials based on the curriculum.

Examination Scheme and Guidelines:

T-I 20 Marks	Examination of 20 marks based on Units 1, 2, and 3 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
T-II 20 Marks	Examination of 20 marks based on Units 4, 5 and 6 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
ISE 10 Marks	ISE/CA -In Semester Evaluation/Continuous Assessment

ESE 50 Marks	ESE-End Semester Examination (Sample)
	Que.1: MCQ's based on All Units (Carries 06 Marks)
	Que.2: based on Unit 1, 2, 3 (Carries 11 Marks)
	Que.3: based on Unit 1,2,3 (Carries 11 Marks)
	Que.4: based on Unit 4, 5, 6 (Carries 11 Marks)
	Que.5: based on Unit 4, 5, 6 (Carries 11 Marks)
Note: For Question Nos. 2, 3, 4, and 5, the subject expert should provide a minimum of one and a maximum of two internal options during paper setting.	

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ARTIFICIAL INTELLIGENCE & DATA SCIENCE
TY- B.Tech -SEM-V

Open Elective-03
Introduction to FINTECH

Course Details:

Class		Third Year		Semester		V	
Course Title		Introduction to FINTECH		Course Code		01OEL3304	
Prerequisites:							
Teaching Scheme:		Theory Hours:	3 Hrs./ week	Practical Hours:	-	Tutorial Hours:	-
		Credits:	3	Credits:	-	Credits:	-
Evaluation Scheme							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
20	20	10	50	-	-	100	

Course Objectives:

The course aims to:

Sr. No.	Course Objectives
01	To understand the evolution of financial systems and the transition from traditional finance to technology-driven digital finance.
02	To explain the concept, scope, and ecosystem of FinTech, including the roles of banks, NBFCs, startups, regulators, and consumers.
03	To familiarize students with digital payment systems, digital banking, neo-banks, and open banking models
04	To introduce the application of FinTech in investments, capital markets, insurance, and lending, including robo-advisory, algorithmic trading, and digital credit.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
01OEL3304.1	Explain the evolution of financial systems,	L2
01OEL3304.2	Identify and analyze digital payment systems,	L3, L4
01OEL3304.3	Illustrate online investment platforms, robo-advisory services, algorithmic trading	L2
01OEL3304.4	Explain technology-driven insurance and lending models	L2
01OEL3304.5	Explain blockchain technology, smart contracts, cryptocurrencies	L2

Course Contents				
Unit No.	Unit Title	Hours	Course Outcome Number	Bloom's Taxonomy Level
01	Fundamentals of FinTech Evolution of financial systems, Traditional finance vs digital finance, Definition, scope, and importance of FinTech, FinTech ecosystem: banks, NBFCs, startups, regulators, consumers, Role of AI, Data Science, and Cloud Computing in FinTech	06	01OEL3304.1	L2
02	Digital Payments and FinTech in Banking Digital payment systems: UPI, cards, wallets, QR payments, Payment gateways and aggregators, Core banking transformation and digital banking, Neo-banks and open banking, Application of FinTech in retail and corporate banking.	06	01OEL3304.2	L3, L4
03	FinTech in Investments and Capital Markets: Online trading and investment platforms, Robo-advisory and automated portfolio management, Algorithmic trading: concepts and benefits, Use of data analytics and machine learning in investments, Risk management and portfolio optimization (overview)	06	01OEL3304.3	L2
04	FinTech in Insurance and Lending: Insurance Tech: technology-driven insurance models, Digital underwriting and claim management, Peer-to-peer (P2P) lending and digital credit platforms, Credit scoring using alternative data, Role of AI in fraud detection and risk assessment.	06	01OEL3304.4	L2
05	Blockchain, Regulation, and Future Trends: Basics of blockchain and distributed ledger technology, Smart contracts and financial use cases, Cryptocurrencies and digital assets (conceptual overview), Regulatory framework in India (RBI, SEBI, IRDAI – overview), Cybersecurity, data privacy, and ethical issues, Future trends in FinTech	06	01OEL3304.5	L2

Text Books/Reference Books:

Sr. No	Book Type (Text/Reference)	Name of the Book	Name of the Author	Publisher	Edition
1.	Reference	The FINTECH Book	Susanne Chishti, Janos Barberis	Wiley	2016
2.	Reference	Digital Finance	Nitin Gupta	Wiley India	2020
3	Textbook	FinTech Innovation	Paolo Sironi	Wiley	2016

Online References:

Sr. No.	Course Name	URL	Units Covered
1	NPTEL Introduction to Commercial Banking and FinTech	https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_ec01	1 to 6

List of Assignments/Tutorials for ISE:

- Minimum 06 Assignments/Tutorials based on the curriculum.

Examination Scheme and Guidelines:

T-I 20 Marks	Examination of 20 marks based on Units 1, 2, and 3 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
T-I 20 Marks	Examination of 20 marks based on Units 4, 5 and 6 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
ISE 10 Marks	ISE/CA -In Semester Evaluation/Continuous Assessment
ESE 50 Marks	ESE-End Semester Examination
	Que.1: MCQ's based on All Units (Carries 06 Marks)
	Que.2: based on Unit 1, 2, 3 (Carries 11 Marks)
	Que.3: based on Unit 1,2,3 (Carries 11 Marks)
	Que.4: based on Unit 4, 5, 6 (Carries 11 Marks)
	Que.5: based on Unit 4, 5, 6 (Carries 11 Marks)
Note: For Question Nos. 2, 3, 4, and 5, the subject expert should provide a minimum of one and a maximum of two internal options during paper setting.	

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Multidisciplinary Minor- 03
Machine Learning-I

Course Details:

Class		Third Year		Semester		V	
Course Title		Machine Learning I		Course Code		1ADMDL1301	
Prerequisites:							
Teaching Scheme:		Theory Hours:	3 Hrs./ week	Practical Hours:	-	Tutorial Hours:	-
		Credits:	3	Credits:	-	Credits:	-
Evaluation Scheme							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
20	20	10	50	-	-	100	

Course Objectives:

The course aims to:

Sr No.	Course Objectives
01	To establish a comprehensive theoretical foundation of Machine Learning concepts including terminology, learning paradigms, and problem categories.
02	To cultivate mathematical understanding of regression models and parameter learning techniques using gradient descent.
03	To develop conceptual proficiency in classification techniques such as logistic regression and neural network models for multiclass learning tasks.
04	To foster analytical knowledge of tree-based, probabilistic, and instance-based Machine Learning algorithms and their comparative characteristics.
05	To introduce and strengthen understanding of unsupervised learning methods through clustering techniques and foundational concepts of reinforcement learning.
06	To familiarize learners with real-world Machine Learning applications including text analytics, recommendation systems, and time series analysis.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
1ADMDL1301.1	Explain Machine Learning concepts, learning types, system architecture, lifecycle, and performance measures.	L2
1ADMDL1301.2	Apply simple and multivariate linear regression techniques using gradient descent for prediction problems.	L3
1ADMDL1301.3	Apply logistic regression and neural network models for binary and multiclass classification tasks.	L3
1ADMDL1301.4	Implement decision trees, Naïve Bayes, and KNN algorithms for classification problems.	L3
1ADMDL1301.5	Apply clustering techniques and reinforcement learning methods to solve unsupervised and sequential decision-making problems.	L3
1ADMDL1301.6	Analyze Machine Learning applications in text processing, recommendation systems, and time series forecasting.	L4

Course Contents				
Unit Number	Unit Title	Hours	Course Outcome Number	Bloom's Taxonomy Level
01	Introduction to Machine Learning - Definition and terminology of Machine Learning - Types of learning: Supervised, Unsupervised, Semi-supervised, Reinforcement - Machine Learning problem categories - Machine learning architecture, process, and lifecycle - Performance measures - Tools and frameworks - Data visualization techniques	06	1ADMDL1301.1	L2
02	Regression - Simple Linear Regression - Hypothesis function - Cost function - Parameter learning using Gradient Descent - Learning rate - Examples - Simple regression in matrix form - Multivariate Linear Regression - Multiple features - Hypothesis function - Polynomial regression	06	1ADMDL1301.2	L3
03	Classification – Logistic Regression and Neural Networks - Classification overview - Logistic Regression - Hypothesis representation - Decision boundary - Cost function - Gradient descent	06	1ADMDL1301.3	L3

	• Multiclass classification • Neural Networks ○ Neuron representation and model ○ Hypothesis for neuron ○ Cost function ○ Gradient descent for single neuron ○ Multiclass classification using neural networks • Learning in neural networks ○ Backpropagation algorithm			
04	Naive Bayes, Decision Tree and KNN • Decision Trees ○ Definition, terminology, and need ○ Advantages and limitations ○ Construction and understanding of decision trees ○ Common problems ○ Decision tree algorithms ○ Random Forest ○ Examples • Conditional probability • Naive Bayes classifier • Instance-based learning ○ K-Nearest Neighbor (KNN) classifier	06	1ADMDL1301.4	L3
05	Clustering and Reinforcement Learning • Clustering ○ What is clustering ○ Need of clustering ○ Types of clustering ○ Hierarchical / Connectivity-based clustering ▪ Agglomerative Hierarchical Clustering (AHC) ▪ Divisive Hierarchical Clustering (DHC) • Reinforcement Learning ○ Overview and scope ○ Components of Reinforcement Learning ○ Q-Learning	06	1ADMDL1301.5	L3
06	Recommendation Systems and Time Series Analysis • Basic text processing with Python • Regular expressions • Introduction to NLP • Text classification • Topic modeling • Recommendation Systems ○ Popularity-based ○ Content-based ○ Classification-based ○ Collaborative filtering • Time Series Analysis ○ Date and time handling ○ Window functions ○ Correlation ○ Time series forecasting	06	1ADMDL1301.6	L4

Text Books/Reference Books:

Sr. No	Book Type (Text/Reference)	Name of the Book	Name of the Author	Publisher	Edition	Year of Publication
1	Textbook	Machine Learning	Tom M. Mitchell	McGraw-Hill	1st	1997
2	Textbook	Pattern Recognition and Machine Learning	Christopher M. Bishop	Springer	1st	2006
3	Reference Book	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow	Aurélien Géron	O'Reilly Media	2nd	2019
4	Reference Book	Machine Learning with Python	Andreas C. Müller, Sarah Guido	O'Reilly Media	1st	2016
5	Reference Book	Introduction to Machine Learning with Python	Andreas C. Müller, Sarah Guido	O'Reilly Media	1st	2016

Online References:

Sr. No.	Website Name	URL	Units Covered
1	NPTL	https://nptel.ac.in/courses/106106198	1,2,3,4,5,6

List of Assignments/Tutorials for ISE:

- Minimum 06 Assignments/Tutorials based on the curriculum.

Examination Scheme and Guidelines:

T-I 20 Marks	Examination of 20 marks based on Units 1, 2, and 3 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
T-I 20 Marks	Examination of 20 marks based on Units 4, 5 and 6 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
ISE 10 Marks	ISE/CA -In Semester Evaluation/Continuous Assessment
ESE 50 Marks	ESE-End Semester Examination (Sample)
	Que.1: MCQ's based on All Units (Carries 06 Marks)
	Que.2: based on Unit 1, 2, 3 (Carries 11 Marks)
	Que.3: based on Unit 1,2,3 (Carries 11 Marks)
	Que.4: based on Unit 4, 5, 6 (Carries 11 Marks)
	Que.5: based on Unit 4, 5, 6 (Carries 11 Marks)
Note: For Question Nos. 2, 3, 4, and 5, the subject expert should provide a minimum of one and a maximum of two internal options during paper setting.	

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Machine Learning LAB

Course Details:

Class		Third Year		Semester		V	
Course Title		Machine Learning LAB		Course Code		1ADPCP307	
Prerequisites:							
Teaching Scheme:		Theory Hours:	-	Practical Hours:	2Hrs/ week	Tutorial Hours:	-
		Credits:	-	Credits:	1	Credits:	-
Evaluation Scheme							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
--	---	--	--	50	50	100	

Course Objectives:

The course aims to:

Sr. No.	Course Objective
1	To enable students to implement supervised learning algorithms such as regression, classification, decision trees, SVM, KNN, and random forest.
2	To develop the ability to apply unsupervised learning techniques including clustering and association rule mining.
3	To apply machine learning methods for real-world tasks such as time series prediction, text classification, and recommendation systems.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
1ADPCP307.01	Familiarize students with installing and configuring deep learning environments.	L2
1ADPCP307.02	Introduce cloud platforms like Google Colab for GPU/TPU-based model training.	L3
1ADPCP307.03	Develop simple perceptron and multilayer neural network models.	L3

1ADPCP307.04	Design and develop basic CNN architectures for image tasks.	L4
1ADPCP307.05	Build and experiment with RNN, LSTM, and GRU models.	L4
1ADPCP307.06	Apply advanced deep learning techniques like transfer learning, style transfer, and generation models.	L6

List of Practical/Experiment:

Minimum 10 Experiments based on the curriculum.

Expt. No.	Type of Experiment (Basic / Design / Advanced / Mini Project)	Experiment Title	Bloom's Taxonomy Level
1	Basic	Installing Anaconda/Miniconda and setting up TensorFlow & Keras	L2
2	Basic	Introduction to Google Colab and using GPUs/TPUs	L3
3	Basic	Developing a simple perceptron (single-layer neural network)	L3
4	Design	Developing a simple multilayer neural network for classification tasks	L4
5	Design	Designing and developing a basic CNN for a given image task	L4
6	Advanced	Implementing transfer learning for CNN-based image classification	L5
7	Design	Designing and developing a simple RNN for sequence tasks	L4
8	Advanced	Implementing LSTM-based RNN for sequence prediction	L5
9	Advanced	Implementing GRU-based RNN for sequence modeling	L5
10	Advanced	Designing a text generation model using LSTM	L5
11	Advanced	Designing a neural style transfer model	L5
12	Advanced	Developing a model for generating images (GAN or equivalent)	L5

Examination Scheme and Guidelines:

CIE 50 Marks	In Semester Evaluation/Continuous Assessment
ESE 50 Marks	End Semester Evaluation

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Java Programming Lab

Course Details

Class		Third Year		Semester		V	
Course Title		Java Programming Lab		Course Code		1ADPCP308	
Prerequisites:							
Teaching Scheme:		Theory Hours:	2Hrs/ week	Practical Hours:	4Hrs/ week	Tutorial Hours:	-
		Credits:	-	Credits:	4	Credits:	-
Evaluation Scheme							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
--	--	--	--	50	50	100	

Course Objectives:

The course aims to:

Sr. No.	Course Objective
1	Understand Java Fundamentals
2	Apply Object-Oriented Programming (OOP) Concepts
3	Develop and Execute Java Applications
4	Apply Multithreading and Concurrency Concepts
5	Implement Exception Handling

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr No.	Course Outcomes	Bloom's Taxonomy Level
1ADPCP308.01	Explain different concepts of Java.	L2
1ADPCP308.02	Design an object-oriented solution for given problem using Java	L3
1ADPCP308.03	Implement program using Java	L3

Course Contents				
Unit No.	Unit Title	Hours	Course Outcome Number	Bloom's Taxonomy Level
1	Introduction Introduction: The Java Buzzwords, The Java Programming Environment JVM, JIT Compiler, Byte Code Concept, HotSpot. A Simple Java Program, Source File Declaration Rules, Comments, Data Types, Variables, Operators, Strings, Input and Output, Control Flow, Big Numbers, Arrays- Jagged Array. Objects and Classes: Object-Oriented Programming Concepts, Declaring Classes, Declaring Member Variables, Defining Methods, Constructor, Passing.	07	1ADPCP308.01	L2
2	Interface, Inheritance and Packages Interfaces: Defining an Interface, Implementing an Interface, Using an Interface as a Type, Evolving Interfaces, Default Methods. Inheritance: Definition, Superclasses, and Subclasses, Overriding and hiding methods, Inheritance Hierarchies, Polymorphism, Super keyword, Final Classes and Methods, Abstract Classes and Methods, casting, Design Hints for Inheritance, Nested classes & Inner Classes, finalization and garbage collection. Packages: Class importing, creating a Package, naming a Package, Using Package Members, Managing Source and Class Files.	07	1ADPCP308.02	L3
3	Exception and I/O Streams Exception: Definition, Dealing with Errors, The Classification of Exceptions, Declaring Checked Exceptions, Throw an Exception, Creating Exception Classes, Catching Exceptions, Catching Multiple Exceptions, Re-throwing and Chaining Exceptions, finally clause, Advantages of Exceptions, Tips for Using Exceptions. I/O Streams: Byte Stream – Input Stream, Output Stream, Data Input Stream, Data Output Stream, File Input Stream, File Output Stream, Character Streams, Buffered Stream, Scanner, Random File Access File	04	1ADPCP308.02	L3

4	Graphical User Interfaces using Swing & Multithreading Introduction to the Swing, Swing features, Swing Top Level Containers Creating a Frame, positioning a Frame, Displaying Information in a Panel, The Model-View-Controller Design Pattern, The JComponent Class. Layout Management: Introduction to Layout Management, APIs for Border Layout, Flow Layout, Grid Layout . Event Handling: Basics of Event Handling, The AWT Event Hierarchy, Semantic and Low- Level Events in the AWT, Low Level Event Types User Interface Components: Text Input, Choice Components, Menus, Dialog Boxes Setting the Look and Feel of UI, Introduction to JApplet Multithreading: Processes and Threads, Runnable Interface and Thread Class, Thread Objects, Defining and Starting a Thread, Pausing Execution with Sleep, Interrupts, Thread States, Thread Properties, Joins, Synchronization	06	1ADPCP308.03	L3
5	Collection and Database Programming Collections: Collection Interfaces, Concrete Collections- List, Queue, Set, Map, the Collections Framework Database Programming: The Design of JDBC, The Structured Query Language, JDBC Installation, Basic JDBC Programming Concepts, Query Execution, Scrollable and Updatable Result Sets, Metadata, Row Sets, Transactions	06	1ADPCP308.03	L3
6	Networking and Web Networking: Overview of Networking, Networking Basics, Working with URLs, creating a URL, parsing a URL, Reading Directly from a URL, connecting to a URL, reading from and Writing to a URL Connection, Sockets, reading from and Writing to a Socket, Writing the Server Side of a Socket, Datagram, Writing a Datagram Client and Server. Java 8 Feature Introduction: Lambda Expression, Functional Interface, Default & Static Methods, Reference Constructor References, Date & Time API Changes, Stream API, Optional Class, Spliterator.	06	1ADPCP308.01	L2

TEXT BOOKS

1. Core Java- Volume I Fundamentals: Cay Horstmann and Gary Cornell, Pearson, Eight edition.
2. Core Java- Volume II Advanced Features: Cay Horstmann and Gary Cornell, Pearson, Eight edition.
3. Java Servlet Programming, Jason Hunter O'Reilly Publication, 2nd Edition.
4. Core-Servlet and Java Server Pages Volume – 1 Marty Hall, Larry Brown Pearson Education

REFERENCE BOOKS

1. JAVA-The Complete Reference: Herbert Schildt, Oracle Press, Mcgraw Hill, Ninth edition.
2. JAVA™ HOW TO PROGRAM, By Deitel Paul, Deitel Harvey. 10th Edition, Publisher: PHI Learning
3. Core JAVA An Integrated approach: Dr.R.Nageswara Rao, Dreamtech Press.
4. Head First Java Eric Freeman, Elisabeth Robson, Bert Bates, Kathy Sierra, O'Reilly Publication 3rd edition.

List of Practical/Experiment:

Minimum 10 Experiments based on the curriculum.

Expt. No.	Type of Experiment (Basic / Design / Advanced / Mini Project)	Experiment Title	Bloom's Taxonomy Level
1	Basic	Write a program to find out day of the given date using command line argument.	L2
2	Basic	Write a program to implement matrix operations.	L3
3	Basic	Write a program to develop class employee with constructor to initialize instance variables. Provide Set method and Get method for instance variables. Also provide a method to raise salary of each employee by 10%.	L3
4	Basic	Write a program to demonstrate single inheritance by creating a superclass Room and subclass Bedroom.	L4
5	Design	Write a program to develop class student having instance variable rn and method getno and putno. Create class Test derived from Student having instance variable as part1, part2 and method getmarks and putmarks. Define an Interface Sport having constant variable sportwt and method putwt. Derive Class Result from Test which implements this interface having data members as total. Display the result.	L4
6	Basic	Write a program to create an area interface. Develop two different classes that implements these interface and compute area.	L2
7	Basic	Write a program to implement mathematical package for arithmetic, statistical and trigonometric operations	L3
8	Advanced	Write a program to develop java package for the stack and queue classes.	L4
9	Basic	Write a class having two integer data members. Provide facility to add, subtract, multiply and divide these numbers. If addition goes above 1000, it generates Too Long Addition exception. If subtraction is below 0, it generates Negative Answer exception. If multiplication is above 5000, it generates Too Long Multiplication exception.	L3
10	Basic	Write a program to remove whitespaces from a text file. Name of the file is given using command line	L2
11	Basic	Write a program to accept a file name from user and perform read, write/append operations on it	L3
12	Advanced	Take Employee information such as name, employee id, department, designation, age, city, phone from user and store it in the file using DataOutputStream and FileOutputStream and Retrive data using	L3

		DataInputStream and FileInputStream and display the result.	
13	Advanced	Write a program to develop Swing GUI based standard calculator.	L3
14	Advanced	Write a program to demonstrate key and mouse event.	L3
15	Basic	Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.	L2
16	Advanced	Write a program for bouncing ball application using multithreading in swing GUI.	L3
17	Advanced	Write a program to demonstrate collection and generics.	L3

Examination Scheme and Guidelines:

CIE 50 Marks	In Semester Evaluation/Continuous Assessment
ESE 50 Marks	End Semester Evaluation

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Program Elective Courses-I (LAB)
Software Development Framework Lab

Course Details:

Class		Third Year		Semester		V	
Course Title		Software Development Framework LAB		Course Code		1ADPEP309	
Prerequisites:							
Teaching Scheme:		Theory Hours:	-	Practical Hours:	2Hrs/ week	Tutorial Hours:	-
		Credits:	-	Credits:	1	Credits:	-
Evaluation Scheme							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
--	--	--	--	25	-	25	

Course Objectives:

The course aims to:

Sr. No.	Course Objective
1	Introduce students to various software development frameworks and enable them to understand their features, architecture, and use cases.
2	Develop the ability to identify and select appropriate software process models for different problem domains and project requirements.
3	Develop skills in modeling system architecture using UML diagrams and structured design approaches.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
1ADPEL309.01	Explain different software development frameworks and identify their features, advantages, and limitations.	L2
1ADPEL309.02	Install and configure the software development environment including IDEs, SDKs, and framework dependencies.	L3
1ADPEL309.03	Analyze and select a suitable software process model for a given problem scenario.	L4
1ADPEL309.04	Build SDLC documentation for a framework-based project following standard software engineering practices.	L3
1ADPEL309.05	Design and implement a simple application using MVC architecture and framework conventions.	L3
1ADPEL309.06	Make use of the system architecture using UML diagrams such as Use Case, Class, and Sequence diagrams.	L3

Suggested List of Practical/Experiments:

Minimum 10 Experiments based on the curriculum.

Expt. No.	Type of Experiment (Basic / Design / Advanced / Mini Project)	Experiment Title	Bloom's Taxonomy Level
1	Basic	To study different software development frameworks and understand their features.	L2
2	Basic	To install and configure a software development environment.	L3
3	Basic	To identify a suitable software process model for a given problem.	L4
4	Basic	To prepare SDLC documentation for a framework-based project.	L3
5	Design	To design and implement a simple application using MVC architecture.	L3
6	Design	To model system architecture using UML diagrams.	L3
7	Design	To perform requirement analysis and prepare an SRS document.	L4
8	Design	To model system using structured analysis techniques.	L4
9	Advanced	To develop backend services using a framework.	L3
10	Advanced	To write and execute unit test cases.	L3
11	Advanced	To build and deploy an application.	L3
12	Advanced	To design and develop a complete application using a software development framework.	L6

Examination Scheme and Guidelines:

CIE 25 Marks	In Semester Evaluation/Continuous Assessment
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Program Elective Courses-I (LAB)
Cryptography & Network Security Lab

Course Details:

Class		Third Year		Semester		V	
Course Title		Cryptography & Network Security Lab		Course Code		1ADPEP310	
Prerequisites:							
Teaching Scheme:		Theory Hours:	-	Practical Hours:	2 Hrs./ week	Tutorial Hours:	-
		Credits:	-	Credits:	1	Credits:	-
Evaluation Scheme							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
-	-	-	-	25	-	25	

Course Objectives:

The course aims to:

Sr. No.	Course Objectives
01	Understand the different types of security attacks
02	Implement basic substitution and transposition ciphers.
03	Encrypt and decrypt emails using PGP or S/MIME standards.
04	Implement a secure VPN connection for remote access.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
1ADPEP310.1	Apply classical and modern cryptographic techniques to ensure data confidentiality and integrity	L3
1ADPEP310.2	Implement and verify digital signatures, message authentication codes, and cryptographic hash functions for secure communication	L3
1ADPEP310.3	Configure and analyze transport and network-level security using SSL/TLS, IPsec, firewalls, and VPNs.	L4
1ADPEP310.4	Design and implement secure email systems using PGP or S/MIME to protect data in transit	L3
1ADPEP310.5	Detect, monitor, and analyze security threats using IDS and SIEM tools for proactive cyber defense.	L5

Suggested List of Practical/Experiments:

Minimum 10 Experiments based on the curriculum.

Experiment Number	Type of Experiment	Experiment Title	Bloom's Taxonomy Levels
1.	Basic	Exploring Security Attacks and Threat Models	L2
2.	Basic	Implementation of Classical Encryption Techniques (Substitution & Transposition Ciphers)	L2
3.	Basic	Symmetric Key Cryptography using DES and AES	L3
4.	Basic	Public Key Cryptography: RSA and Diffie-Hellman Key Exchange	L3
5.	Basic	Cryptographic Hash Functions and Integrity Verification	L3
6.	Basic	Message Authentication Codes (MACs) Implementation	L4
7.	Basic	Digital Signature Schemes: ElGamal and DSS	L4
8.	Design	Secure Email Communication using PGP or S/MIME	L3,L5
9.	Design	IPsec Configuration for Secure Communication	L3,L4
10.	Design	Firewall and VPN Setup for Network Security	L3,L6
11.	Design	Intrusion Detection System (IDS) and SIEM Integration	L3,L4

Examination Scheme and Guidelines:

CIE (Practical) (25 Marks)	Continuous Assessment, as per institute policy
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Program Elective Courses-I (LAB)**Natural Language Processing Lab****Course Details:**

Class		Third Year		Semester		V	
Course Title		Natural Language Processing Lab		Course Code		1ADPEP311	
Prerequisites:							
Teaching Scheme:		Theory Hours:	-	Practical Hours:	2Hrs/ week	Tutorial Hours:	-
		Credits:	-	Credits:	1	Credits:	-
Evaluation Scheme							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
--	--	--	--	25		25	

Course Objectives:

The course aims to:

Sr. No.	Course Objective
1	Enable students to set up Natural Language Processing environments and effectively utilize tools such as N-gram-based language modeling techniques, vector semantics, and word embedding models.
2	Develop students' ability to apply sequential labeling techniques for Part-of-Speech (POS) tagging and Named Entity Recognition (NER).
3	Expose students to advance attention-based and Transformer models such as BERT for NLP tasks, including word senses, WordNet, and Word Sense Disambiguation (WSD) methods.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
1ADPEP311.1	Apply foundational NLP techniques to process and analyze textual data.	L3
1ADPEP311.2	Understand the principles of N-gram language models.	L2
1ADPEP311.3	Describe key concepts in lexical and vector semantics for evaluating semantic similarity.	L4
1ADPEP311.4	Evaluate the accuracy and performance of part-of-speech and named entity recognition systems.	L5

1ADPEP311.5	Evaluate Word Sense Induction methods for discovering new senses from large text corpora.	L5
1ADPEP311.6	Analyze the architecture and effectiveness of attention-based models and pretrained transformers.	L4

Suggested List of Practical/Experiment for CIE/ESE:

Minimum 10 Experiments based on the curriculum.

Expt. No.	Type of Experiment (Basic / Design / Advanced / Mini Project)	Experiment Title	Bloom's Taxonomy Level
1	Basic	Demonstration of stemming and lemmatization	L2 – Understand
2	Basic	Demonstrate the tokenization and stop words removal.	L2 – Understand
3	Basic	Write a python program to build N-grams from the text.	L3 – Apply
4	Design	Implement N-gram model to predict the next word in the sentence.	L4 – Analyze
5	Design	Demonstration of stemming and lemmatization	L3 – Apply
6	Advanced	Demonstration of parts-of-speech tagging	L3 – Apply
7	Advanced	Demonstration of document classification using TF-IDF	L4 – Analyze
8	Design	Demonstration of named entity recognition	L4 – Analyze
9	Advanced	Demonstration of sentiment analysis	L4 – Analyze
10	Advanced	Implement Naïve Bays classifier for text classification	L4 – Analyze
11	Advanced	Implement Word Sense Disambiguation algorithm	L5 – Evaluate
12	Advanced	Learn Word2Vec word embedding from the given corpus and perform various operations.	L4 – Analyze
13	Advanced	Implement the machine translation application of NLP where it needs to train a machine translation model for a language with limited parallel corpora. Investigate and incorporate techniques to improve performance in low-resource scenarios.	L6 – Create
14	Advanced	Demonstrate Sentiment Analysis using BERT.	L5 – Evaluate

Examination Scheme and Guidelines:

CIE (Practical)	Continuous Assessment, as per institute policy
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Program Elective Courses-I (LAB)

Cloud Computing Lab

Course Details:

Class		Third Year		Semester		V	
Course Title		Cloud Computing Lab		Course Code		1ADPEP312	
Prerequisites:							
Teaching Scheme:		Theory Hours:	-	Practical Hours:	2	Tutorial Hours:	-
		Credits:	-	Credits:	1	Credits:	-
Evaluation Scheme							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
-	-	-	-	25	-	25	

Course Objectives:

The course aims to:

Sr. No.	Course Objectives
01	Understand the Installation of Cloud.
02	Understand the Key concepts of virtualization
03	Finding the procedure for Launch Virtual Machine.
04	Create and Examine the application of Docker

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
1ADPEP312.1	Develop & deploy an application on Cloud	L6
1ADPEP312.2	Design and Simulate Cloud Scenario.	L6
1ADPEP312.3	Analyse the Virtual Machine	L4
1ADPEP312.4	Experiment with installing and configuring Hadoop	L3
1ADPEP312.5	Create and Use of Docker	L6

Experiment List

Expt No.	Type of Experiment (Basic / Design / Advanced / Mini Project)	Experiment Title	Bloom's Taxonomy Level
1	Basic	Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows 7 or 8.	L4
2	Basic	Install a C compiler in the virtual machine created using virtual box and execute Simple Programs.	L4
3	Basic	Install Google App Engine. Create hello world app and other simple web applications using python/java.	L6
4	Basic	Apply GAE launcher to launch the web applications.	L6
5	Design	Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.	L6
6	Advanced	Find a procedure to transfer the files from one virtual machine to another virtual machine.	L4
7	Advanced	Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)	L4
8	Advanced	Install Hadoop single node cluster and run simple applications like wordcount.	L3
9	Design	Creating and Executing Your First Container Using Docker	L6
10	Advanced	Run a Container from Docker Hub.	L6

Examination Scheme and Guidelines:

CIE 25 Marks	In Semester Evaluation/Continuous Assessment
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Mini Project-II

Course Details:

Class		Third Year		Semester		V	
Course Title		Mini Project-II		Course Code		1ADPCP313	
Prerequisites:							
Teaching Scheme:		Theory Hours:	00	Practical Hours:	02	Tutorial Hours:	00
		Credits:	00	Credits:	01	Credits:	00
Evaluation Scheme							
Theory				Practical		Total	
CIE-I	CIE-II	ISE	ESE	CIE	ESE		
				25	50	75	

Course Objectives:

The course aims to:

Sr. No.	Course Objectives
1ADPCL313.01	To provide hands-on experience in solving real-world problems using AI & Data Science techniques
1ADPCL313.02	To enhance problem formulation, design thinking, and implementation skills
1ADPCL313.03	To promote experiential learning through project-based activities
1ADPCL313.04	To develop teamwork, communication, and documentation skills
1ADPCL313.05	To prepare students for industry-oriented and research-based projects

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
1ADPCL313.01	Identify and formulate real-world problems relevant to AI & DS	Understanding (L2)
1ADPCL313.02	Apply appropriate AI & DS tools and techniques to solve the identified problem	Remembering (L1)
1ADPCL313.03	Design and implement a working prototype or model	Understanding (L2)

1ADPCL313.04	Analyze results and interpret performance metrics	Understanding (L2)
1ADPCL313.05	Demonstrate professional documentation and presentation skills	Understanding (L2)

Course Contents	
Mini Project Guidelines (NEP-2020)	
Nature of Project • Individual or group project (Max 2–3 students per group) • Problem should be relevant to AI, Data Science, or interdisciplinary domains • Emphasis on application, innovation, and skill development	
Suggested Project Domains • Machine Learning / Deep Learning • Expert Systems • Data Analytics & Visualization • Natural Language Processing • Computer Vision • Recommender Systems • AI for Healthcare / Agriculture / Smart Cities • IoT + AI application	
Project Phases • Problem Identification & Literature Survey • Requirement Analysis & System Design • Model/Algorithm Selection • Implementation & Experimentation • Result Analysis & Validation • Documentation & Presentation	
Deliverables • Problem definition document • Literature review summary • Source code / model • Project report (IEEE / institute format) • Presentation and demonstration	

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Deep Learning

Course Details:

Class		Third Year		Semester		VI	
Course Title		Deep Learning		Course Code		1ADPCL314	
Prerequisites:							
Teaching Scheme:		Theory Hours:	3 Hrs./ week	Practical Hours:	-	Tutorial Hours:	-
		Credits:	3	Credits:	-	Credits:	-
Evaluation Scheme							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
20	20	10	50	-	-	100	

Course Objectives:

The course aims to:

Sr. No.	Course Objectives
01	Understand the basic concepts of deep learning networks
02	Introduce different models of deep learning to work with various types of inputs.
03	Learn effects of different parameters and hyper-parameters on deep learning model output.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
1ADPCL314.1	Describe basic concepts of artificial intelligence and deep learning.	L2
1ADPCL314.2	Apply different hyperparameter tuning techniques	L3
1ADPCL314.3	Design and train CNN model for image classification	L3
1ADPCL314.4	Analyze sequence modeling techniques used in deep learning	L4
1ADPCL314.4	Build and monitor advanced deep learning models using the Keras Functional API, callbacks, and TensorBoard	L5
1ADPCL314.5	Implement generative deep learning techniques such as text generation with LSTM	L6

Course Contents				
Unit No.	Unit Title	Hours	Course Outcome Number	Bloom's Taxonomy Level
01	Introduction to Deep Learning Overview of deep learning and its applications: Introduction to Deep Learning, A brief history, Need of Deep Learning, Applications of Deep Learning Neural networks and their Architecture: ANN Intuition, Components of NN Architecture, Types of NN- Supervised - ANN, CNN, RNN, Unsupervised - SOM, AE, BM -Activation functions and their properties: Sigmoid, Hyperbolic Tangent (tanh) Function, Rectified Linear Unit (ReLU), Leaky ReLU, Softmax Practice exercises and discussions: Building ANN for Business Problem	05	1ADPCL314.1	L2
02	Feedforward Neural Networks and Optimization : Multilayer perceptron (MLP):Architecture of MLP with Feedforward, Error Functions-Mean Squared Error (MSE), Binary Cross-Entropy, Categorical Cross-Entropy (CCE), Backpropagation algorithm: Difficulty of Training Deep Neural Networks Regularization techniques: Early Stopping, Drop Out, Optimization algorithms: Adagrad, Adam, Practice exercises and discussions:: Greedy layer wise training Hyperparameters: Learning rate, No of iterations, hidden layers, hidden units, choice of activation function, momentum, mini batch size, Overfitting and underfitting, regularization	05	1ADPCL314.2	L3
03	Convolutional Neural Networks (CNN) Introduction to CNN, CNN Architecture basic, The convolutional operation, The max pooling operation,	05	1ADPCL314.3	L3

	Training a convnet from scratch on a small dataset, Using pre-trained convnet, Visualizing what convnet learn, Convolution operation, pooling, flattening, ReLU Layer, Pooling, Flattening, Softmax and Cross Entropy, Transfer learning with CNNs, Practice exercises and discussions: image classification using CNNs			
04	Recurrent Neural Networks (RNNs) and NLP Basics of sequence modeling, RNN architectures (LSTM, GRU), Applications of RNNs in NLP, Word embeddings and attention mechanisms, Practice exercises and discussions: sentiment analysis using RNNs	05	1ADPCL314.4	L4
05	Advanced Deep Learning Best Practices Going beyond the sequential model: The Keras functional API, Inspecting and monitoring deep learning models using Keras callbacks and Tensor Board, Getting the most out of your models	05	1ADPCL314.5	L5
06	Generative Deep Learning Text generation with LSTM, Deep Dream, Neural Style Transfer, Generating images with variational auto encoders, Introduction to generative adversarial network.	05	1ADPCL314.6	L6

Text Books/Reference Books:

Sr. No	Book Type (Text/Reference)	Name of the Book	Name of the Author	Publisher	Edition	Year of Publication
1.	Textbook	Deep Learning with Python	Francois Chollet	Manning	1st Edition	2017
2.	Textbook	Neural Networks and Deep Learning	Charu C. Aggarwal	Springer	1st Edition	2018
3.	Reference Book	Deep Learning	Ian Good fellow, Yoshua Bengio, Aaron Courville	MIT Press Book	Second Edition	2016
4.	Reference Book	Deep Learning: A Practitioner's Approach	Josh Patterson, Adam Gibson	O'Reilly	1st Edition	2017
5.	Reference Book	Understanding Deep Learning	Simon J.D. Prince	MIT Press	1st Edition	2023

Online References:

Sr. No.	Website Name	URL	Units Covered
1	NPTL	https://nptel.ac.in/courses/106106184	1,2,3,4,5

List of Assignments/Tutorials for ISE:

- Minimum 06 Assignments/Tutorials based on the curriculum.

Examination Scheme and Guidelines:

T-I 20 Marks	Examination of 20 marks based on Units 1, 2, and 3 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
T-I 20 Marks	Examination of 20 marks based on Units 4, 5 and 6 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
ISE 10 Marks	ISE/CA -In Semester Evaluation/Continuous Assessment
ESE 50 Marks	ESE-End Semester Examination (Sample)
	Que.1: MCQ's based on All Units (Carries 06 Marks)
	Que.2: based on Unit 1, 2, 3 (Carries 11 Marks)
	Que.3: based on Unit 1,2,3 (Carries 11 Marks)
	Que.4: based on Unit 4, 5, 6 (Carries 11 Marks)
	Que.5: based on Unit 4, 5, 6 (Carries 11 Marks)
Note: For Question Nos. 2, 3, 4, and 5, the subject expert should provide a minimum of one and a maximum of two internal options during paper setting.	

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Design & Analysis of Algorithm

Course Details:

Class		Third Year		Semester		VI	
Course Title		Design & Analysis of Algorithm		Course Code		1ADPCL315	
Prerequisites:							
Teaching Scheme:		Theory Hours:	3 Hrs./ week	Practical Hours:	-	Tutorial Hours:	1
		Credits:	3	Credits:	-	Credits:	1
Evaluation Scheme							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
20	20	10	50	-	-	100	

Course Objectives:

The course aims to:

Sr. No.	Course Objectives
01	Understand basic algorithm concepts and analysis.
02	Apply divide and conquer and greedy techniques.
03	Use dynamic programming, backtracking, and graph algorithms to solve problems.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
1ADPCL315.1	Understand the concept of Searching and sorting	L2
1ADPCL315.2	Understand the asymptotic performance of algorithms	L2
1ADPCL315.3	Apply algorithmic strategies to solve given problem	L3
1ADPCL315.4	Apply various Techniques to find optimal solution	L3
1ADPCL315.5	Categorize the problem to determine polynomial and non-polynomial based on its nature	L4
1ADPCL315.6	Apply concepts of parallel algorithms	L2

Course Contents				
Unit No.	Unit Title	Hours	Course Outcome Number	Bloom's Taxonomy Levels
01	Divide and conquer What is algorithm, Algorithm Specification, Recurrence relations, Divide and Conquer: The general method, Binary search, Finding the maximum and minimum, Merge sort, Quick sort, DC Selection Algorithm.	07	1ADPCL315.1	L2
02	The Greedy Method The general method, Knapsack problem, Job sequencing with deadlines, minimum-cost spanning trees – Prim's and Kruskal's Algorithms, Optimal storage on tapes.	07	1ADPCL315.2	L2
03	Dynamic Programming The general method, Multistage graphs, all pair shortest paths, 0/1 knapsack, Reliability design, Traveling Sales person problem	07	1ADPCL315.3	L3
04	Basic Traversal and Search Techniques and Backtracking Techniques for Binary Trees, Techniques for Graphs – Breadth First Search & Traversal, Depth First Search & Traversal, Connected components and Spanning Trees. Backtracking - The general method, n-queen problem, sum of subsets, Knapsack Problem, Hamiltonian Cycle, and Graph Coloring	08	1ADPCL315.4	L3
05	NP Hard and NP Complete Problems Basic Concepts, Introduction to NP Hard Graph Problems.	05	1ADPCL315.5	L4
06	Parallel Computational Model Computational Model and Fundamental Techniques and Algorithms – PRAM, MESH and HYPERCUBE.	06	1ADPCL315.6	L3

Text Books/Reference Books:

Sr. No	Book Type (Text/Reference)	Name of the Book	Name of the Author	Publisher	Edition	Year of Publication
1.	Textbook	Fundamentals of Computer Algorithms Ellis Horowitz,	Satraj Sahani,	Saguthevar Rajasejaram Universities Press	2 nd Edition	2008
2.	Reference Book	Fundamentals of Algorithmics Gilles Brassard	Paul Bratley Pearson Education.	Pearson Education		1996
3.	Reference Book	Introduction to Design and Analysis of Algorithms	Anany Levitin	Pearson Education.	3 rd Edition	2012
4.	Reference Book	The Design and Analysis of Algorithms Aho,	Hopcraft, Ullman	Pearson Education	1 st Edition	2006

Online References:

Sr. No.	Website Name	URL	Units Covered
1	NPTL	https://nptel.ac.in/courses/106106131	1,2,3,4,5,6

List of Assignments/Tutorials for ISE:

- Minimum 06 Assignments/Tutorials based on the curriculum.

Examination Scheme and Guidelines:

T-I 20 Marks	Examination of 20 marks based on Units 1, 2, and 3 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
T-I 20 Marks	Examination of 20 marks based on Units 4, 5 and 6 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
ISE 10 Marks	ISE/CA -In Semester Evaluation/Continuous Assessment
ESE 50 Marks	ESE-End Semester Examination
	Que.1: MCQ's based on All Units (Carries 06 Marks)
	Que.2: based on Unit 1, 2, 3 (Carries 11 Marks)
	Que.3: based on Unit 1,2,3 (Carries 11 Marks)
	Que.4: based on Unit 4, 5, 6 (Carries 11 Marks)
	Que.5: based on Unit 4, 5, 6 (Carries 11 Marks)
Note: For Question Nos. 2, 3, 4, and 5, the subject expert should provide a minimum of one and a maximum of two internal options during paper setting.	

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Program Elective Courses-II
Software Testing & Automation

Course Details:

Class		Third. Year		Semester		VI	
Course Title		Software Testing & Automation		Course Code		1ADPEL316	
Prerequisites:							
Teaching Scheme:		Theory Hours:	3 Hrs./ week	Practical Hours:	-	Tutorial Hours:	-
		Credits:	3	Credits:	-	Credits:	-
Evaluation Scheme							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
20	20	10	50	-	-	100	

Course Objectives:

The course aims to:

Sr No.	Course Objectives
01	To understand the basics of software testing.
02	To learn how to do the testing and planning effectively.
03	To build test cases and execute them.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
1ADPEL316.1	Explain and differentiate software testing fundamentals including STLC, V-Model, testing principles, defect concepts, and levels of testing.	L2
1ADPEL316.2	Explain the goals of test planning and identify the components of an effective test plan.	L2
1ADPEL316.3	Design effective test cases using black-box and white-box techniques such as equivalence class, boundary value, path, and data flow testing.	L3
1ADPEL316.4	Develop test cases, track defects, and manage bug reporting using appropriate metrics and life cycle models.	L3

1ADPEL316.5	Analyze software systems using advanced testing techniques including performance, security, usability, agile, and web/mobile testing.	L4
1ADPEL316.6	Analyze software systems using advanced testing techniques including performance, security, usability, agile, and web/mobile testing.	L3

Course Contents				
Unit No.	Unit Title	Hours	Course Outcome Number	Bloom's Taxonomy Level
01	FOUNDATIONS OF SOFTWARE TESTING Why do we test software?, Black-Box Testing and White-Box Testing, Software Testing Life Cycle (STLC), V-Model of Software Testing, Program Correctness and Verification, Reliability versus Safety, Failures, Errors, and Faults (Defects), Software Testing Principles, Program Inspections, Stages of Testing: Unit Testing, Integration Testing, System Testing	08	1ADPEL316.1	Understand(L2)
02	TEST PLANNING Goal of Test Planning, High-Level Expectations, Intergroup Responsibilities, Test Phases, Test Strategy, Resource Requirements, Tester Assignments, Test Schedule, Test Cases Bug Reporting	06	1ADPEL316.2	Understand(L2)
03	TEST DESIGN Test Objective Identification, Test Design Factors, Requirement Identification, Testable Requirements, Modeling a Test Design Process, Modeling Test Results, Boundary Value Testing, Equivalence Class Testing, Path Testing, Data Flow Testing	07	1ADPEL316.3	Apply (L3)
04	TEST EXECUTION AND MANAGEMENT PERFORMANCE Test Design Preparedness Metrics, Test Case Design Effectiveness, Model-Driven Test Design, Test Procedures, Test Case Organization and Tracking, Bug Reporting Bug Life Cycle	06	1ADPEL316.4	Apply (L3)
05	ADVANCED TESTING CONCEPTS Performance Testing: Load Testing, Stress Testing, Volume Testing, Fail-Over Testing, Recovery Test, Configuration Testing, Compatibility Testing, Usability Testing, Testing the Documentation, Security Testing, Testing in the Agile Environment, Testing Web and Mobile Applications.	06	1ADPEL316.5	Analyze (L4)
06	TEST AUTOMATION AND TOOLS Automated Software Testing, Automating Testing of Web Applications Selenium Overview: Introducing WebDriver and Web Elements, Locating Web Elements	07	1ADPEL316.6	Apply (L3)

	Actions on Web Elements, Different Web Drivers, Understanding WebDriver Events, Testing Frameworks, Understanding testng.xml Adding Classes, Packages, and Methods to Test Test Reports.			
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Text Books/Reference Books:

Sr. No	Book Type (Text/Reference)	Name of the Book	Name of the Author	Publisher	Edition	Year of Publication
1.	Textbook	Software Testing	Yogesh Singh	Cambridge University Press	1 st Edition	2012
2.	Reference Book	The Art of Software Testing	Glenford J. Myers, Corey Sandler, Tom Badgett	John Wiley & Sons, Inc.	3 rd Edition	2012
3.	Reference Book	Software Testing	Ron Patton	Sams Publishing	2 nd Edition	2006
4.	Reference Book	Software Testing: A Craftsman's Approach	Paul C. Jorgensen	Taylor & Francis Group	4 th Edition	2014

Online References: Coursera/NPTL/General websites etc)

Sr. No.	Website Name	URL	Units Covered
1	NPTEL	https://youtu.be/KMj49syT8JM?si=XdkqCQ-lR7I2vdrS	1,2,3,4,5

List of Assignments/Tutorials for ISE:

Minimum 06 Assignments/Tutorials based on the curriculum.

Examination Scheme and Guidelines :

T-I 20 Marks	Examination of 20 marks based on Units 1, 2, and 3 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
T-I 20 Marks	Examination of 20 marks based on Units 4, 5 and 6 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
ISE 10 Marks	ISE/CA -In Semester Evaluation/Continuous Assessment
ESE 50 Marks	ESE-End Semester Examination Que.1: MCQ's based on All Units (Carries 06 Marks)

	Que.2: based on Unit 1, 2, 3 (Carries 11 Marks)
	Que.3: based on Unit 1,2,3 (Carries 11 Marks)
	Que.4: based on Unit 4, 5, 6 (Carries 11 Marks)
	Que.5: based on Unit 4, 5, 6 (Carries 11 Marks)
Note: For Question Nos. 2, 3, 4, and 5, the subject expert should provide a minimum of one and a maximum of two internal options during paper setting.	

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Program Elective Courses-II
Cyber Security

Course Details:

Class		Third Year		Semester		VI	
Course Title		Cyber Security		Course Code		1ADPEL317	
Prerequisites:							
Teaching Scheme:		Theory Hours:	3 Hrs./ week	Practical Hours:	-	Tutorial Hours:	-
		Credits:	3	Credits:	-	Credits:	-
Evaluation Scheme							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
20	20	10	50	-	-	100	

Course Objectives:

The course aims to:

Sr No.	Course Objectives
01	To prepare students with the technical knowledge and skills needed to protect and defend computer systems and networks.
02	To develop students can identify the current Computer security and breaches
03	To examine secure software development practice
04	To understand key terms and provisions in I.T. ACT

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
1ADPEL317.1	Understand Cyber Security Concepts	L2
1ADPEL317.2	Identify and explain common network attacks such as eavesdropping, man-in-the-middle (MITM), and denial-of-service (DoS), including their impact on networked systems..	L2
1ADPEL317.3	Identify different types of cyber frauds, including identity theft, online scams, phishing, and financial Fraud.	L2
1ADPEL317.4	Identify and evaluate common hacking techniques used during actual attacks, such as exploitation, privilege escalation, and maintaining access.	L4
1ADPEL317.5	Develop and evaluate a cyber security plan, including cyber security policies and cyber crisis management plans.	L6
1ADPEL317.6	Examine global cyber security regulations and their role in securing digital infrastructure	L4

Course Contents				
Unit No.	Unit Title	Hours	Course Outcome Number	Bloom's Taxonomy Level
01	CYBER SECURITY FUNDAMENTALS: Overview of cyber security and why it is important; Internet governance: challenges and constraints; cyber threats: cyber warfare, cybercrime, cyber terrorism, cyber espionage; Need for a comprehensive cyber security policy; Need for an international convention on cyber space; Identify trends in cyber security events and protection techniques.	06	1ADPEL317.1	L2
02	Computer and Network Security: Networking Common Network Attacks: Types of network attacks: eavesdropping, man-in-the-middle, DoSReal-world examples and case studies Network Security Technologies: Firewalls, intrusion detection/prevention systems (IDS/IPS)Virtual Private Networks (VPNs) for secure communication Wireless Network Security Risks associated with wireless networks Securing Wi-Fi networks against unauthorized access Securing Network Devices Best practices for securing routers, switches, and other devices Implementing access controls and monitoring	06	1ADPEL317.2	L2
03	Cyber Frauds, DoS, Viruses: Cyber Stalking, Fraud, and Abuse: Introduction, How Internet Fraud Works, Identity Theft, Cyber Stalking, Protecting Yourself Against Cyber Crime. Denial of Service	07	1ADPEL317.3	L2

	Attacks: Introduction, DoS, Illustrating an Attack, Malware: Introduction, Viruses, Trojan Horses, and The Buffer-Overflow Attack. The Sasses Virus/Buffer Overflow, Spyware, Other Forms of Malware, Detecting and Eliminating Viruses and Spyware			
04	Techniques Used by Hackers: Introduction, Basic Terminology, The Reconnaissance Phase, Actual Attacks, Malware Creation, Penetration Testing	07	1ADPEL317.4	L4
05	Cyber security Management Compliance and Governance: Cyber security Plan- cyber security policy, cyber crises management plan., Business continuity, Risk assessment, Types of security controls and their goals, Cyber security audit and compliance, National cyber security policy and strategy	06	1ADPEL317.5	L6
06	I.T. ACT: Introduction, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, I.T. Act	06	1ADPEL317.6	L4

Text Books/Reference Books:

Sr. No	Book Type (Text/Reference)	Name of the Book	Name of the Author	Publisher	Edition
1.	Textbook	Computer Security Fundamentals	Chuck Easttom,	Pearson Education	3 rd Edition
2.	Reference Book	Computer Security and Incident Response	Keith J. Jones, Richard Bejtlich, Curtis W. Rose	McGrawHill Osborne Media	3 rd Edition
3	Reference Book	Ethical Hacking	Thomas Mathew,	OSB Publisher	3 rd Edition 2003.

Online References:

Sr. No.	Website Name	URL	Units Covered
1	Cyber Laws of India	https://infosecawareness.in/cyber-laws-of-india	Unit 6

List of Assignments/Tutorials for ISE:

- Minimum 06 Assignments/Tutorials based on the curriculum.

Examination Scheme and Guidelines:

T-I 20 Marks	Examination of 20 marks based on Units 1, 2, and 3 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
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T-I 20 Marks	Examination of 20 marks based on Units 4, 5 and 6 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
ISE 10 Marks	ISE/CA -In Semester Evaluation/Continuous Assessment
ESE 50 Marks	ESE-End Semester Examination
	Que.1: MCQ's based on All Units (Carries 06 Marks)
	Que.2: based on Unit 1, 2, 3 (Carries 11 Marks)
	Que.3: based on Unit 1,2,3 (Carries 11 Marks)
	Que.4: based on Unit 4, 5, 6 (Carries 11 Marks)
	Que.5: based on Unit 4, 5, 6 (Carries 11 Marks)
Note: For Question Nos. 2, 3, 4, and 5, the subject expert should provide a minimum of one and a maximum of two internal options during paper setting.	

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Program Elective Courses-II
Large Language Model

Course Details:

Class		Third Year		Semester		VI	
Course Title		Large Language Model		Course Code		01ADPEL318	
Prerequisites:							
Teaching Scheme:		Theory Hours:	3 Hrs./ week	Practical Hours:	-	Tutorial Hours:	-
		Credits:	3	Credits:	-	Credits:	-
Evaluation Scheme							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
20	20	10	50	-	-	100	

Course Objectives:

The course aims to:

Sr. No.	Course Objectives
01	To understand the fundamentals of Natural Language Processing and language modeling techniques.
02	To explain Transformer architecture and the evolution of Large Language Models.
03	To familiarize students with tokenization, embeddings, pre-training, and foundation models.
04	To introduce prompt engineering, fine-tuning techniques, and Retrieval-Augmented Generation (RAG).
05	To explore LLM applications, deployment strategies, ethical issues, and future trends in Generative AI.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
01ADPEL318.01	Explain NLP concepts, language models, and Transformer architectures.	L1
01ADPEL318.02	Apply tokenization, embeddings, and pre-training techniques used in LLMs.	L2
01ADPEL318.03	Analyze prompt engineering and fine-tuning methods for language models.	L3
01ADPEL318.04	Develop applications using modern LLM frameworks and APIs.	L4
01ADPEL318.05	Evaluate ethical, security, and societal implications of LLMs.	L5
01ADPEL318.06	Evaluate ethical, security, and societal implications of LLMs.	L6

Course Content				
Unit No.	Unit Title	Hours	Course Outcome Number	Bloom's Taxonomy Level
01	Introduction to NLP and Language Models Overview of NLP, Text preprocessing techniques, Word representations: One-Hot Encoding, Word2Vec, GloVe, FastText, Statistical Language Models, N-gram Models, Limitations of traditional language models.	06	01ADPEL318.01	L2
02	Transformer Architecture and Foundation Models Evolution from RNNs and LSTMs to Transformers, Attention Mechanism and Self-Attention, Multi-Head Attention, Positional Encoding, Encoder-Decoder Architecture, BERT, GPT, T5, LLaMA, Foundation Models and Generative AI	06	01ADPEL318.02	L2
03	Large Language Models and Pre-training Introduction to LLMs, Scaling Laws, Tokenization Techniques (BPE, WordPiece, SentencePiece), Masked Language Modeling, Causal Language Modeling, Training Pipelines and Distributed Training, Open-source and Proprietary LLMs	06	01ADPEL318.03	L3
04	Prompt Engineering and Fine-Tuning• Zero-shot, One-shot and Few-shot Learning, Chain-of-Thought Prompting, Prompt Templates and Optimization, Retrieval-Augmented Generation (RAG), Fine-Tuning Techniques, LoRA and PEFT, Instruction Tuning.	06	01ADPEL318.04	L4
05	LLM Applications and Deployment Conversational AI and Chatbots, Question	06	01ADPEL318.05	L5

	Answering Systems, Text Summarization, Machine Translation, Code Generation, LangChain and LlamaIndex, Hugging Face Transformers, LLM Deployment and Monitoring.			
06	Ethics, Security and Future Trends Hallucinations in LLMs, Bias and Fairness, Explainability and Interpretability, Privacy and Data Security, Prompt Injection Attacks, Adversarial Attacks, Responsible AI Practices, Future Trends in Generative AI and LLMs	06	01ADPEL318.06	L6

Text Books/ Reference Books:

Sr. No.	Book Type	Name of the Book	Author	Publisher	Edition
1	Text Book	Hands-On Large Language Models	Jay Alammar, Maarten Grootendorst	O'Reilly	2024
2	Reference	Natural Language Processing with Transformers	Lewis Tunstall et al.	O'Reilly	2022
3	Reference	Speech and Language Processing	Jurafsky & Martin	Pearson	Latest
4	Reference	Generative Deep Learning	David Foster	O'Reilly	2023

Online References:

Sr. No.	Course Name	URL	Units Covered
1	DeepLearning.AI – Generative AI with LLMs	https://www.deeplearning.ai	1 to 6
2	Hugging Face NLP Course	https://huggingface.co/learn	1 to 6
3	NPTEL – Natural Language Processing	https://nptel.ac.in	1 to 3
4	LangChain Documentation	https://python.langchain.com	4 to 6

List of Assignments/Tutorials for ISE:

- Minimum 06 Assignments/ Tutorials based on the curriculum.

Examination Scheme and Guidelines:

T-I 20 Marks	Examination of 20 marks based on Units1, 2, and 3 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQs compulsory.
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T-I 20 Marks	Examination of 20 marks based on Units 4, 5 and 6 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQs compulsory.
ISE 10 Marks	ISE/CA-In Semester Evaluation/ Continuous Assessment
ESE 50 Marks	ESE-End Semester Examination
	Que.1:MCQ's based on All Units (Carries 06 Marks)
	Que.2:based on Unit1,2,3(Carries 11 Marks)
	Que.3:based on Unit 1,2,3(Carries 11 Marks)
	Que.4:based on Unit 4,5,6(Carries 11 Marks)
	Que.5:based on Unit 4,5,6(Carries 11 Marks)
Note: For Question Nos. 2, 3, 4, and 5, the subject expert should provide a minimum of one and a maximum of two internal options during paper setting.	

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Program Elective Courses-II
Virtualization

Course Details:

Class		Third Year		Semester		VI	
Course Title		Virtualization		Course Code		1ADPEL319	
Prerequisites:							
Teaching Scheme:		Theory Hours:	3 Hrs./ week	Practical Hours:	-	Tutorial Hours:	-
		Credits:	3	Credits:	-	Credits:	-
Evaluation Scheme							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
20	20	10	50	-	-	100	

Course Objectives:

The course aims to:

Sr. No.	Course Objectives
01	Introduce the fundamentals and concepts of virtualization and its role in modern computing environments.
02	Explain different virtualization techniques and architectures used in data centers and cloud platforms.
03	Provide knowledge of hypervisors, virtual machines, and resource management mechanisms.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
1ADPEL319.1	Explain the concepts, need, and applications of virtualization in modern computing systems.	L2
1ADPEL319.2	Analyze different virtualization techniques and hypervisor architectures for various computing environments.	L4
1ADPEL319.3	Apply server and storage virtualization concepts to manage and optimize computing resources.	L3
1ADPEL319.4	Implement network and desktop virtualization solutions to support scalable and flexible IT environments.	L3
1ADPEL319.5	Analyze container-based and cloud virtualization technologies and their role in modern application deployment.	L4
1ADPEL319.6	Evaluate virtualization environments for performance, security, and reliability and propose suitable management strategies.	L5

Course Contents				
Unit No.	Unit Title	Hours	Course Outcome Number	Bloom's Taxonomy Level
01	INTRODUCTION TO VIRTUALIZATION Definition of Virtualization, History and evolution, Need for virtualization, Benefits and limitations, Virtualization vs traditional computing, Types of virtualization, Virtualization architecture, Use cases and applications.	07	1ADPEL319.1	Understand (L2)
02	VIRTUALIZATION TECHNIQUES AND HYPERVERSORS Virtualization techniques: Full virtualization, Para-virtualization, Hardware-assisted virtualization, Hypervisors: Type-1 and Type-2, Virtual machine monitor (VMM), Virtual machine life cycle, Comparison of hypervisors.	06	1ADPEL319.2	Analyze (L4)
03	SERVER AND STORAGE VIRTUALIZATION Server virtualization concepts, Virtual machine provisioning, Resource allocation and scheduling, Storage virtualization, RAID concepts, Network Attached Storage (NAS), Storage Area Network (SAN), Virtual storage management.	06	1ADPEL319.3	Apply (L3)
04	NETWORK VIRTUALIZATION AND VIRTUAL INFRASTRUCTURE Network virtualization concepts, Virtual switches, VLANs, Software Defined Networking (SDN), Virtual Desktop Infrastructure (VDI), Desktop virtualization models, Use cases and challenges.	06	1ADPEL319.4	Apply (L3)

05	CONTAINERIZATION AND CLOUD VIRTUALIZATION Introduction to containerization, Virtual machines vs containers, Docker architecture and components, Container orchestration concepts, Kubernetes overview, Role of virtualization in cloud computing, Virtualization in IaaS, PaaS, SaaS.	07	1ADPEL319.5	Analyze (L4)
06	VIRTUALIZATION MANAGEMENT, SECURITY, AND PERFORMANCE Virtualization management tools, Resource monitoring, Performance optimization, Virtual machine migration, Security issues in virtualization, Isolation and access control, Fault tolerance, Disaster recovery, Future trends in virtualization.	06	1ADPEL319.6	Evaluate (L5)

Text Books/Reference Books:

Sr. No	Book Type (Text/Reference)	Name of the Book	Name of the Author	Publisher	Edition	Year of Publication
1.	Textbook	Virtualization Essentials	Matthew Portnoy	Wiley Publishing	1st Edition	2012
2.	Reference Book	Network Virtualization	Kumar Ritesh	Pearson Education	1st Edition	2016
3.	Reference Book	Virtualization Security: Protecting Virtualized Environments	Chris Wolf, Erick M. Halter	Syngress (Elsevier)	1st Edition	2009

Online References:

Sr. No.	Website Name	URL	Units Covered
1	NPTEL	https://nptel.ac.in/courses/106102155	1,2,3,4,5

List of Assignments/Tutorials for ISE:

- Minimum 06 Assignments/Tutorials based on the curriculum.

Examination Scheme and Guidelines:

T-I 20 Marks	Examination of 20 marks based on Units 1, 2, and 3 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
T-I 20 Marks	Examination of 20 marks based on Units 4, 5 and 6 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.

ISE 10 Marks	ISE/CA -In Semester Evaluation/Continuous Assessment
ESE 50 Marks	ESE-End Semester Examination
	Que.1: MCQ's based on All Units (Carries 06 Marks)
	Que.2: based on Unit 1, 2, 3 (Carries 11 Marks)
	Que.3: based on Unit 1,2,3 (Carries 11 Marks)
	Que.4: based on Unit 4, 5, 6 (Carries 11 Marks)
	Que.5: based on Unit 4, 5, 6 (Carries 11 Marks)
Note: For Question Nos. 2, 3, 4, and 5, the subject expert should provide a minimum of one and a maximum of two internal options during paper setting.	

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Program Elective Courses-III
UI and UX Design

Course Details:

Class		Third Year		Semester		VI	
Course Title		UI and UX Design		Course Code		1ADPEL320	
Prerequisites:							
Teaching Scheme:		Theory Hours:	3 Hrs./ week	Practical Hours:	-	Tutorial Hours:	-
		Credits:	3	Credits:	-	Credits:	-
Evaluation Scheme							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
20	20	10	50	-	-	100	

Course Objectives:

The course aims to:

Sr. No.	Course Objectives
01	Understand the fundamentals of UI/UX design and the design thinking process.
02	Apply research, wireframing, prototyping, and usability testing techniques to design effective interfaces.
03	Create accessible, ethical, and user-centered designs following usability and WCAG guidelines.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
1ADPEL320.1	Build UI for user Application.	L3
1ADPEL320.2	Evaluate UX Design of any product or application.	L5
1ADPEL320.3	Demonstrate UX Skills in product development.	L2
1ADPEL320.4	Apply Sketching principles.	L3
1ADPEL320.5	Create Wireframe and Prototype.	L6
1ADPEL320.6	Apply accessibility and ethical principles.	L3

Course Contents				
Unit No.	Unit Title	Hours	Course Outcome Number	Bloom's Taxonomy Level
01	Foundations Of Design UI vs. UX Design - Core Stages of Design Thinking - Divergent and Convergent Thinking - Brainstorming and Game storming - Observational Empathy	06	1ADPEL320.1	L2
02	Foundations Of UI Design Visual and UI Principles - UI Elements and Patterns - Interaction Behaviors and Principles – Branding - Style Guides	06	1ADPEL320.2	L3
03	Foundations Of UX Design Introduction to User Experience - Why You Should Care about User Experience - Understanding User Experience - Defining the UX Design Process and its Methodology - Research in User Experience Design - Tools and Method used for Research - User Needs and its Goals - Know about Business Goals	07	1ADPEL320.3	L4
04	Wireframing, Prototyping and Testing Sketching Principles - Sketching Red Routes - Responsive Design – Wireframing - Creating Wireflows - Building a Prototype - Building High-Fidelity Mockups - Designing Efficiently with Tools - Interaction Patterns - Conducting Usability Tests - Other Evaluative User Research Methods - Synthesizing Test Findings - Prototype Iteration 132	07	1ADPEL320.4	L5
05	Research, Designing, Ideating, & Information Architecture Identifying and Writing Problem Statements - Identifying Appropriate Research Methods - Creating Personas - Solution Ideation - Creating User Stories -	07	1ADPEL320.5	L5

	Creating Scenarios - Flow Diagrams - Flow Mapping - Information Architecture			
06	Accessibility, Ethics & UX Evaluation Introduction to Accessibility in UI/UX, Designing for Inclusivity, WCAG Guidelines, Ethical Design Principles in UX, Dark Patterns vs Ethical UX, UX Metrics and Measurement.	06	1ADPEL320.6	L5

Text Books/Reference Books:

Sr. No	Book Type	Name of the Book	Name of the Author	Publisher	Edition	Year of Publication
1.	Textbook	UX for Beginners	Joel Marsh,	O'Reilly,	1 st Edition	2022
2.	Textbook	Laws of UX using Psychology to Design Better Product & Services	Jon Yablonski,	O'Reilly,	1 st Edition	2021
3.	Reference Book	Jenifer Tidwell, Charles Brewer, Aynne Valencia, "Designing Interface"	O'Reilly	Anany Levitin Pearson Education.	3rd Edition,	2020
4.	Reference Book	Adam Wathan "Refactoring UI",	Steve Schoger,,	Ullman Pearson Education	1 st Edition	2018
5.	Reference Book	"Don't Make Me Think, Revisited: A Commonsense Approach to Web & Mobile",	Steve Krug,	New Riders	3rd Edition,	2015

Online References:

Sr. No.	Website Name	URL	Units Covered
1	NPTEL	https://nptel.ac.in/courses/124107008	1,2,3,4,5,6
2	NPTEL	https://onlinecourses.nptel.ac.in/noc24_ar23/preview	1,2,3,4,5,6

List of Assignments/Tutorials for ISE:

- Minimum 06 Assignments/Tutorials based on the curriculum.

Examination Scheme and Guidelines:

T-I 20 Marks	Examination of 20 marks based on Units 1, 2, and 3 should be conducted, and marks should be communicated to the Exam Cell. • One question of 05 Marks based on MCQ's compulsory.
T-I 20 Marks	Examination of 20 marks based on Units 4, 5 and 6 should be conducted, and marks should be communicated to the Exam Cell. • One question of 05 Marks based on MCQ's compulsory.

ISE 10 Marks	ISE/CA -In Semester Evaluation/Continuous Assessment
ESE 50 Marks	ESE-End Semester Examination
	Que.1: MCQ's based on All Units (Carries 06 Marks)
	Que.2: based on Unit 1, 2, 3 (Carries 11 Marks)
	Que.3: based on Unit 1,2,3 (Carries 11 Marks)
	Que.4: based on Unit 4, 5, 6 (Carries 11 Marks)
	Que.5: based on Unit 4, 5, 6 (Carries 11 Marks)
Note: For Question Nos. 2, 3, 4, and 5, the subject expert should provide a minimum of one and a maximum of two internal options during paper setting.	

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Program Elective Courses-III
Cryptocurrency and Blockchain Technology

Course Details:

Class		Third Year		Semester		VI	
Course Title		Cryptocurrency and Blockchain Technology		Course Code		1ADPEL321	
Prerequisites:							
Teaching Scheme:		Theory Hours:	3 Hrs./ week	Practical Hours:	-	Tutorial Hours:	-
		Credits:	3	Credits:	-	Credits:	-
Evaluation Scheme							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
20	20	10	50	-	-	100	

Course Objectives:

The course aims to:

Sr. No.	Course Objectives
01	To understand the basics of Blockchain
02	To learn Different protocols and consensus algorithms in Blockchain
03	To learn the Blockchain implementation frameworks
04	To understand the Blockchain Applications
05	To experiment the Hyperledger Fabric, Ethereum networks

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
1ADPEL321.1	Understand emerging abstract models for Blockchain Technology	L2
1ADPEL321.2	Identify major research challenges and technical gaps existing between theory and practice in the crypto currency domain.	L3
1ADPEL321.3	Understand of the function of Blockchain	L2
1ADPEL321.4	Understand the concept of bitcoin consensus.	L2
1ADPEL321.5	Apply hyperledger Fabric and Ethereum platform to implement the Block chain Application.	L3
1ADPEL321.6	Understand the Blockchain Applications.	L2

Course Contents				
Unit No.	Unit Title	Hours	Course Outcome Number	Bloom's Taxonomy Level
01	INTRODUCTION TO BLOCKCHAIN Blockchain- Public Ledgers, Blockchain as Public Ledgers - Block in a Blockchain, Transactions- The Chain and the Longest Chain - Permissioned Model of Blockchain, Cryptographic -Hash Function, Properties of a hash function-Hash pointer and Merkle tree	07	1ADPEL321.1	L2
02	BITCOIN AND CRYPTOCURRENCY A basic crypto currency, Creation of coins, Payments and double spending, FORTH – the precursor for Bitcoin scripting, Bitcoin Scripts , Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay	06	1ADPEL321.2	L3
03	Essentials of Cryptocurrency Distributed Identity: Public and Private keys, Digital Identification and Wallets; Decentralized Network –Distributed Ledger: Permissioning Framework, Block chain Data Structure- Double Spending, Network Consensus-Sybil Attack, Block Rewards and Minors, Difficulty under Competitions, forks and Consensus chain	07	1ADPEL321.3	L2
04	BITCOIN CONSENSUS Bitcoin Consensus, Proof of Work (PoW)- Hashcash PoW , Bitcoin PoW, Attacks on PoW	06	1ADPEL321.4	L2

	,monopoly problem- Proof of Stake- Proof of Burn - Proof of Elapsed Time - Bitcoin Miner, Mining Difficulty, Mining Pool-Permissioned model and use cases.			
05	HYPERLEDGER FABRIC & ETHEREUM Architecture of Hyperledger fabric v1.1- chain code- Ethereum: Ethereum network, EVM, Transaction fee, Mist Browser, Ether, Gas, Solidity.	06	1ADPEL321.5	L3
06	BLOCKCHAIN APPLICATIONS Smart contracts, Truffle Design and issue- DApps- NFT. Blockchain Applications in Supply Chain Management, Logistics, Smart Cities, Finance and Banking, Insurance, etc- Case Study.	06	1ADPEL321.6	L2

Text Books/Reference Books:

Sr. No	Book Type (Text/Reference)	Name of the Book	Name of the Author	Publisher	Edition	Year of Publication
1.	Textbook	Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks	Bashir and Imran	MIT	Second Edition	2017
2.	Textbook	“Mastering Bitcoin: Unlocking Digital Cryptocurrencies”	Andreas Antonopoulos	O’Reilly	First Edition	2014
3.	References Books	“Blockchain Basics	Daniel Drescher	Apress	First Edition	2017
4.	References Books	Bitcoin and cryptocurrency technologies: a comprehensive introduction	Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder	Princeton University Press	First Edition	2016
5.	References Books	Blockchain: Blueprint for a New Economy	Melanie Swan	O’Reilly	First Edition	2015

Online References: Coursera /NPTEL/General websites etc)

Sr. No.	Website Name	URL	Units Covered
1	NPTEL	https://nptel.ac.in/courses/106104220	1,2,3,4,5,6

List of Assignments/Tutorials for ISE:

- Minimum 06 Assignments/Tutorials based on the curriculum.

Examination Scheme and Guidelines:

T-I 20 Marks	Examination of 20 marks based on Units 1, 2, and 3 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
T-II 20 Marks	Examination of 20 marks based on Units 4, 5 and 6 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
ISE 10 Marks	ISE/CA -In Semester Evaluation/Continuous Assessment
ESE 50 Marks	ESE-End Semester Examination
	Que.1: MCQ's based on All Units (Carries 06 Marks)
	Que.2: based on Unit 1, 2, 3 (Carries 11 Marks)
	Que.3: based on Unit 1,2,3 (Carries 11 Marks)
	Que.4: based on Unit 4, 5, 6 (Carries 11 Marks)
	Que.5: based on Unit 4, 5, 6 (Carries 11 Marks)
Note: For Question Nos. 2, 3, 4, and 5, the subject expert should provide a minimum of one and a maximum of two internal options during paper setting.	

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Program Elective Courses-III
Generative AI

Course Details:

Class		Third Year		Semester		VI	
Course Title		Generative AI		Course Code		1ADPEL322	
Prerequisites:							
Teaching Scheme:		Theory Hours:	3 Hrs./ week	Practical Hours:	-	Tutorial Hours:	-
		Credits:	3	Credits:	-	Credits:	-
Evaluation Scheme							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
20	20	10	50	-	-	100	

Course Objectives:

The course aims to:

Sr. No.	Course Objectives
01	Understand the basic concepts of Generative AI
02	Learn the various Generative AI models.
03	Explore the knowledge about working of Generative AI.
04	Explore real-world applications of Generative AI.
05	Explore real-world LLM powered applications.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
1ADPEL322.1	Understand the fundamental concepts, theories, and techniques related to generative artificial intelligence.	L2

1ADPEL322.2	Understand the Evaluation of Generative Models.	L2
1ADPEL322.3	Understand Working of GAN.	L2
1ADPEL322.4	Understand real-world applications of generative AI in industries such as entertainment, advertising, healthcare, and robotics.	L2
1ADPEL322.5	Understand various generative models,	L2
1ADPEL322.6	Understand Reinforcement Learning and LLM-Powered Applications.	L2

Course Contents				
Unit No.	Unit Title	Hours	Course Outcome Number	Bloom's Taxonomy Level
01	Introduction to Generative AI Introduction to GAI, Discriminative vs. Generative AI, Broad Application Fields and Potential, GAI in Top Strategic Tech Trends, Example: Face Generation, Example: Do-as-I-do-motion Transfer.	07	1ADPEL322.1	L2
02	Evolution of GAI Location of GAI, The Evolution of Deep Generative Models, Example: GAI-generated Art AND the Interlock with Crypto & NFTs.	06	1ADPEL322.2	L2
03	The power of GAN GANs are Powerful, Working of GAN, Excursion: Neural Networks, Existent GANs and Generative AI Ideation.	06	1ADPEL322.3	L2
04	Application of GAI 3D-Object Generation, Interactive Image Generation, Conditional GAN (cGAN) Demo, Working of GauGAN, How to augment Data and Why, Data Augmentation with a GAN, What Data Augmentation Techniques exist & what is their Effectiveness.	06	1ADPEL322.4	L2
05	Generative AI Models Concerns around Generative AI Models, Noteworthy GAN Architectures, GAI can learn to simulate full Games, Text Generation with (NLP) Language Models.	06	1ADPEL322.5	L2
06	Reinforcement Learning and LLM-Powered Applications Reinforcement learning from human feedback (RLHF), Reward model, Proximal policy optimization, Reward hacking, Program-aided language models (PAL), ReAct: Combining reasoning and action, KL Divergence.	08	1ADPEL322.6	L2

Text Books/Reference Books:

Sr. No	Book Type (Text/Reference)	Name of the Book	Name of the Author	Publisher	Edition	Year of Publication
1.	Textbook	Deep Learning	Ian Good fellow, Yoshua Bengio, and Aaron Courville,	MIT	First Edition	2016
2.	Textbook	Deep Learning with PyTorch	Eli Stevens, Luca Antiga, and Thomas Viehmann, Manning;	Manning	First Edition	2020
3.	Reference Book	Generative Deep Learning: Teaching Machines to Paint, Write, Compose, and Play	David Foster	O'Reilly	First Edition	2019

Online References:

Sr. No.	Website Name	URL	Units Covered
1	NPTL	https://onlinecourses.swayam2.ac.in/imb24_mg116/preview	1,2,3,4,5,6

List of Assignments/Tutorials for ISE:

- Minimum 06 Assignments/Tutorials based on the curriculum.

Examination Scheme and Guidelines:

T-I 20 Marks	Examination of 20 marks based on Units 1, 2, and 3 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
T-II 20 Marks	Examination of 20 marks based on Units 4, 5 and 6 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
ISE 10 Marks	ISE/CA -In Semester Evaluation/Continuous Assessment
ESE 50 Marks	ESE-End Semester Examination
	Que.1: MCQ's based on All Units (Carries 06 Marks)
	Que.2: based on Unit 1, 2, 3 (Carries 11 Marks)
	Que.3: based on Unit 1,2,3 (Carries 11 Marks)
	Que.4: based on Unit 4, 5, 6 (Carries 11 Marks)
	Que.5: based on Unit 4, 5, 6 (Carries 11 Marks)
Note: For Question Nos. 2, 3, 4, and 5, the subject expert should provide a minimum of one and a maximum of two internal options during paper setting.	

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Program Elective Courses-III
Cloud Service Management

Course Details:

Class		Third Year		Semester		VI	
Course Title		Cloud Service Management		Course Code		1ADPEL323	
Prerequisites:							
Teaching Scheme:		Theory Hours:	3 Hrs./ week	Practical Hours:	-	Tutorial Hours:	-
		Credits:	3	Credits:	-	Credits:	-
Evaluation Scheme							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
20	20	10	50	-	-	100	

Course Objectives:

The course aims to:

Sr No.	Course Objectives
01	Build foundational knowledge of cloud computing essentials and management principles.
02	Understand cloud governance frameworks, compliance standards and service agreements.
03	Learn deployment, provisioning, and configuration techniques in cloud platforms.
04	Enable operations, monitoring tools and strategies for performance and reliability.
05	Understand security principles and risk controls in a cloud environment.
06	Integrate concepts into planning and real-world application.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
1ADPEL323.1	Describe core cloud computing models, service types, and deployment models.	L2
1ADPEL323.2	Analyze service-level agreements (SLAs), compliance, and governance in cloud environments.	L4
1ADPEL323.3	Apply provisioning and configuration management techniques for cloud resources	L3
1ADPEL323.4	Apply cloud monitoring, performance optimization, and cost management strategies	L3
1ADPEL323.5	Evaluate security, privacy, and risk management controls for cloud services.	L5
1ADPEL323.6	Design a cloud service management plan based on real-world requirements and best practices	L6

Course Contents				
Unit No.	Unit Title	Hours	Course Outcome Number	Bloom's Taxonomy Level
01	Introduction to Cloud Service Management: Overview of Cloud Computing, Service Models: IaaS, PaaS, SaaS, Deployment Models: Public, Private, Hybrid, Community, Principles of Cloud Service Management, Key Terminology	07	1ADPEL323.1	L2
02	Cloud Governance, Compliance & SLAs: Governance in Cloud Environment, Policies and Standards, Service Level Agreements (SLAs): Elements & Metrics, Compliance Requirements (ISO, GDPR, Local Regulations), Cloud Audit and Reporting	07	1ADPEL323.2	L4
03	Cloud Provisioning & Configuration Management: Cloud Provisioning Models, Infrastructure as Code (IaC), Configuration Management Tools (Ansible, Terraform), Automation and Orchestration, Resource Tagging & Lifecycle Management	07	1ADPEL323.3	L3
04	Cloud Operations, Monitoring & Performance: Cloud Operations Practices, Monitoring Metrics & Tools (CloudWatch, Stackdriver, Azure Monitor), Log Management, Cost Monitoring and Optimization, Benchmarking & Performance Tuning,	08	1ADPEL323.4	L3
05	Cloud Security & Risk Management : Cloud Security Fundamentals, Identity & Access Management (IAM), Encryption and Data Protection, Threats & Vulnerabilities in Cloud, Risk Assessment and Mitigation	07	1ADPEL323.5	L5
06	Cloud Service Management Plan & Case Studies: Designing a Cloud Service Management Plan, Business Continuity & Disaster Recovery in Cloud, Case Studies: AWS, Azure, GCP, Best Practices & Industry Trends, Student Presentations / Mini Project	07	1ADPEL323.6	L6

Text Books/Reference Books:

Sr. No	Book Type (Text/Reference)	Name of the Book	Name of the Author	Publisher	Edition
1.	Textbook	Cloud Computing Concepts and Technologies	Dr. Sunilkumar Manvi, Dr. Gopal K. Shyam	CRC Press / Taylor & Francis Group	1st Edition (2025)
2.	Textbook	Resource Management in Cloud Computing: Concepts and Implementation	Sakshi Patni, Deepika Saxena, Ashutosh Kumar Singh	Springer Nature (Cham)	Edition: 1st Edition (2025)
3	Reference Book	Cloud Computing, A Practical Approach	Anthony T. Velte, Toby J. Velte & Robert Elsenpeter	Tata McGraw-Hill	2nd Edition 2017

Online References:

Sr. No.	Website Name	URL	Units Covered
1	NPTEL – Cloud Computing (IIT Kharagpur)	https://onlinecourses.nptel.ac.in/noc25_cs107/preview?utm_source=chatgpt.com	1,2,3

List of Assignments/Tutorials for ISE:

- Minimum 06 Assignments/Tutorials based on the curriculum.

Examination Scheme and Guidelines :(Sample)

T-I 20 Marks	Examination of 20 marks based on Units 1, 2, and 3 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
T-II 20 Marks	Examination of 20 marks based on Units 4, 5 and 6 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
ISE 10 Marks	ISE/CA -In Semester Evaluation/Continuous Assessment
ESE 50 Marks	ESE-End Semester Examination
	Que.1: MCQ's based on All Units (Carries 06 Marks)
	Que.2: based on Unit 1, 2, 3 (Carries 11 Marks)
	Que.3: based on Unit 1,2,3 (Carries 11 Marks)
	Que.4: based on Unit 4, 5, 6 (Carries 11 Marks)
	Que.5: based on Unit 4, 5, 6 (Carries 11 Marks)
Note: For Question Nos. 2, 3, 4, and 5, the subject expert should provide a minimum of one and a maximum of two internal options during paper setting.	

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TY- B.Tech -SEM-VI

Multidisciplinary Minor – 04

Machine Learning II

Course Details:

Class		Third Year		Semester		VI	
Course Title		Machine Learning II		Course Code		1ADMDL1302	
Prerequisites:							
Teaching Scheme:		Theory Hours:	2 Hrs./ week	Practical Hours:	-	Tutorial Hours:	-
		Credits:	2	Credits:	-	Credits:	-
Evaluation Scheme							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
20	20	10	50	-	-	100	

Course Objectives:

The course aims to:

Sr No.	Course Objectives
01	To establish a strong foundation in advanced machine learning concepts and their relation to AI and data science.
02	To develop proficiency in feature engineering, including preprocessing, dimensionality reduction, extraction, selection, and statistical techniques.
03	To gain knowledge of clustering methods and their applications in market segmentation, social networks, image analysis, and anomaly detection.
04	To develop skills in designing and applying Support Vector Machines for linear and non-linear classification, as well as support vector regression.
05	To understand the role and types of activation functions in neural network architectures.
06	To apply machine learning to real-world signal processing problems using LSTMs, CNNs, transfer learning, attention models, and attribute-based learning.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
1ADMDL1302.1	Understand core concepts of ML and differentiate it from AI and traditional programming.	L2
1ADMDL1302.2	Apply feature engineering techniques to prepare data for ML models.	L3
1ADMDL1302.3	Apply clustering methods for practical data analysis tasks.	L3
1ADMDL1302.4	Analyze and implement Naïve Bayes and SVM classifiers.	L3
1ADMDL1302.5	Implement and analyze neural networks including MLP, RBF, RNNs, and CNNs.	L4
1ADMDL1302.6	Evaluate and apply ML techniques for audio and image processing tasks.	L5

Course Contents				
Unit No.	Unit Title	Hours	Course Outcome Number	Bloom's Taxonomy Level
01	Advanced Introduction to Machine Learning - Introduction to Machine Learning - Comparison of ML with traditional programming - ML vs AI vs Data Science - Models of Machine Learning: - Geometric, Probabilistic, Logical - Grouping and Grading models - Parametric and Non-parametric models - Important elements of ML: - Data formats - Learnability - Statistical learning approaches	05	1ADMDL1302.1	L2

02	Feature Engineering • Concept of features • Data preprocessing: ◦ Normalization, Scaling, Standardization ◦ Handling missing values • Dimensionality reduction: PCA • Feature extraction: ◦ Kernel PCA ◦ Local Binary Pattern • Feature selection techniques: ◦ Sequential Forward Selection ◦ Sequential Backward Selection • Statistical feature engineering: ◦ Count-based, length-based ◦ Mean, median, mode-based features • Multidimensional Scaling • Matrix Factorization techniques	05	1ADMDL1302.2	L3
03	Clustering • Centroid-based / Partitioning clustering: ◦ K-Means algorithm ◦ Advantages and disadvantages ◦ Elbow method ◦ Silhouette method • Density-based clustering: ◦ DBSCAN algorithm ◦ Working, advantages and disadvantages • Distribution-based clustering: ◦ Gaussian Mixture Model (GMM) • Applications of clustering: ◦ Market segmentation ◦ Statistical data analysis ◦ Social network analysis ◦ Image segmentation ◦ Anomaly detection	05	1ADMDL1302.3	L3
04	Naive Bayes and Support Vector Machine • Bayes Theorem • Naïve Bayes classifiers: ◦ Multinomial Naïve Bayes ◦ Gaussian Naïve Bayes • Support Vector Machine (SVM): ◦ Linear SVM ◦ Linear classification ◦ Kernel-based classification ◦ Non-linear examples ◦ Controlled SVM ◦ Support Vector Regression (SVR)	05	1ADMDL1302.4	L3
05	Neural Networks • Artificial Neural Networks: ◦ Single Layer Neural Network	05	1ADMDL1302.5	L4

	○ Multilayer Perceptron (MLP) ○ Functional Link ANN ○ Radial Basis Function Network • Activation functions • Introduction to: ○ Recurrent Neural Networks (RNNs) ○ Convolutional Neural Networks (CNNs)			
06	Machine Learning Applications for Signal Processing • Machine Learning for Audio Classification ○ Time Series Analysis ○ LSTMs and CNNs • Machine Learning for Image Processing ○ Transfer Learning ○ Attention models ○ Attribute-based learning	05	1ADMDL1302.6	L5

Text Books/Reference Books:

Sr. No	Book Type	Name of the Book	Name of the Author	Publisher	Edition	Year of Publication
1	Textbook	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow	Aurélien Géron	O'Reilly Media	2nd / Latest	2022
2	Textbook	Python Machine Learning	Sebastian Raschka & Vahid Mirjalili	Packt Publishing	Latest	2023
3	Reference Book	Learning with Kernels: Support Vector Machines, Regularization, Optimization, and Beyond	Bernhard Schölkopf & Alexander J. Smola	MIT Press	1st	2002
4	Reference Book	Introduction to Statistical Learning: with Applications in R	Gareth James, Daniela Witten, Trevor Hastie & Robert Tibshirani	Springer	1st / 2nd	2013 / 2021
5	Reference Book	Feature Engineering and Selection: A Practical Approach for Predictive Models	Max Kuhn & Kjell Johnson	CRC Press	1st	2019

Online References:

Sr. No.	Website Name	URL	Units Covered
1	NPTL	https://nptel.ac.in/courses/106106198	1,2,3,4,5,6

List of Assignments/Tutorials for ISE:

- Minimum 06 Assignments/Tutorials based on the curriculum.

Examination Scheme and Guidelines:

T-I 20 Marks	Examination of 20 marks based on Units 1, 2, and 3 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
T-I 20 Marks	Examination of 20 marks based on Units 4, 5 and 6 should be conducted, and marks should be communicated to the Exam Cell. One question of 05 Marks based on MCQ's compulsory.
ISE 10 Marks	ISE/CA -In Semester Evaluation/Continuous Assessment
ESE 50 Marks	ESE-End Semester Examination (Sample)
	Que.1: MCQ's based on All Units (Carries 06 Marks)
	Que.2: based on Unit 1, 2, 3 (Carries 11 Marks)
	Que.3: based on Unit 1,2,3 (Carries 11 Marks)
	Que.4: based on Unit 4, 5, 6 (Carries 11 Marks)
	Que.5: based on Unit 4, 5, 6 (Carries 11 Marks)
Note: For Question Nos. 2, 3, 4, and 5, the subject expert should provide a minimum of one and a maximum of two internal options during paper setting.	

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ML DevOps Laboratory

Course Details:

Class		Third Year		Semester		VI	
Course Title		ML DevOps Laboratory		Course Code		1ADPCP324	
Prerequisites:							
Teaching Scheme:		Theory Hours:	1 Hrs./ week	Practical Hours:	2 Hrs./ week	Tutorial Hours:	-
		Credits:		Credits:	2	Credits:	-
Evaluation Scheme							
Theory				Practical		Total	
T1	T2	ISE	ESE	CIE	ESE		
				25	50	75	

Course Objectives:

The course aims to:

Sr. No.	Course Objectives
1	To provide hands-on experience in building, versioning, deploying, and automating end-to-end machine learning pipelines using MLOps tools and practices.
2	To enable students to apply industry-standard DevOps techniques for managing data, models, deployment, and monitoring of machine learning applications.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
1ADPCP324.01	To provide hands-on experience in building, versioning, deploying, and automating end-to-end machine learning pipelines using MLOps tools and practices.	L1
1ADPCP324.02	To enable students to apply industry-standard DevOps techniques for managing data, models, deployment, and monitoring of machine learning applications.	L2
1ADPCP324.03	Implement version control and experiment tracking for machine learning projects using Git, DVC, and MLflow.	L3
1ADPCP324.04	Develop and automate end-to-end machine learning pipelines from data preprocessing to model training and deployment.	L4
1ADPCP324.05	Deploy machine learning models as scalable services using REST APIs and containerization tools such as Docker.	L5
1ADPCP324.06	Monitor deployed machine learning models for performance, drift, and reliability using MLOps best practices	L6

Course Contents				
Unit No.	Unit Title	Hours	Course Outcome Number	Bloom's Taxonomy Level
01	Introduction to ML DevOps Overview of Machine Learning Lifecycle, Introduction to DevOps and MLOps, Challenges in ML Systems vs Traditional Software, MLOps Architecture and Workflow, Tools and Platforms used in MLOps.	03	1ADPCP324.01	L1
02	Version Control and Data Management Git Fundamentals for ML Projects, Repository Structure and Best Practices, Data Versioning Concepts, Dataset Management using DVC, Reproducible ML Pipelines	03	1ADPCP324.02	L2
03	Data Processing and Experiment Tracking Exploratory Data Analysis (EDA) in ML Pipelines, Feature Engineering and Preprocessing Automation, Model Training Workflow, Experiment Tracking using MLflow, Model Metrics, Parameters, and Artifacts	03	1ADPCP324.03	L3
04	Model Packaging and Deployment Model Serialization Techniques (Pickle, Joblib), Model Versioning and Registry Concepts, Building REST APIs using Flask/FastAPI, Local and Cloud-based Model Deployment, API Testing and Validation.	03	1ADPCP324.04	L4
05	Containerization and CI/CD for ML Introduction to Docker and Containers, Creating Dockerfiles for ML Applications, Containerizing ML Models and Services, CI/CD Concepts for ML Pipelines, Automation using GitHub Actions / Jenkins	03	1ADPCP324.05	L5

06	Monitoring, Maintenance, and End-to-End MLOps Model Monitoring and Logging, Data Drift and Concept Drift, Model Performance Evaluation in Production, Continuous Retraining and Model Updates, End-to-End MLOps Case Study and Best Practices	03	1ADPCP324.06	L6
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Text Books/Reference Books:

Sr. No.	Book Type	Name of the Book	Name of the Author	Publisher	Edition	Year of Publication
1	Text	Introducing MLOps	Mark Treveil, Nicolas Omont, et al.	O'Reilly Media	1st	2020
2	Text	Machine Learning Engineering	Andriy Burkov	True Positive Inc.	1st	2020
3	Reference	Practical MLOps	Noah Gift, Alfredo Deza	O'Reilly Media	1st	2021
4	Reference	Building Machine Learning Pipelines	Hannes Hapke, Catherine Nelson	O'Reilly Media	1st	2020
5	Reference	Designing Machine Learning Systems	Chip Huyen	O'Reilly Media	1st	2022
6	Reference	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow	Aurélien Géron	O'Reilly Media	3rd	2022

Online References:

Sr. No.	Website Name	URL	Units Covered
1	MLflow Official Documentation	https://mlflow.org/docs/latest/index.html	Unit III, Unit IV
2	DVC Documentation	https://dvc.org/doc	Unit II, Unit III
3	Docker Documentation	https://docs.docker.com	Unit V
4	GitHub Actions Documentation	https://docs.github.com/en/actions	Unit V
5	FastAPI Documentation	https://fastapi.tiangolo.com	Unit IV
6	Google MLOps Guide	https://cloud.google.com/architecture/mlops-continuous-delivery-and-automation-pipelines-in-machine-learning	Unit I, Unit VI

Suggested list of Practical /Experiment for CIE/ESE:

Minimum 10 Experiments based on the curriculum.

Expt. No.	Type of Experiment (Basic / Design / Advanced / Mini / Minor Projects / Seminar / Case Studies)	Experiment Title	Bloom's Taxonomy Level
1	Basic	Introduction to ML DevOps and Environment Setup	L1

2	Basic	Version Control for ML Projects using Git and GitHub	L2
3	Basic	Data Versioning and Pipeline Management using DVC	L3
4	Design	Exploratory Data Analysis and Automated Preprocessing Pipeline	L3
5	Design	Model Training and Experiment Tracking using MLflow	L3
6	Design	Model Packaging, Serialization, and Versioning	L3
7	Advanced	Model Deployment as REST API using Flask/FastAPI	L4
8	Advanced	Containerization of ML Applications using Docker	L4
9	Advanced	CI/CD Automation for ML Pipelines using GitHub Actions / Jenkins	L5
10	Advanced	Model Monitoring and Performance Evaluation	L5
11	Mini Project	End-to-End Automated ML DevOps Pipeline	L5
12	Mini Project	Case Study:	L6

Examination Scheme and Guidelines:

CIE 25 Marks	In Semester Evaluation/Continuous Assessment
Practical 50 Marks	Continuous Assessment, as per institute policy

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Deep Learning LAB

Course Details:

Class		Third Year		Semester		VI	
Course Title		Deep Learning LAB		Course Code		1ADPCP325	
Prerequisites:							
Teaching Scheme:		Theory Hours:	-	Practical Hours:	2Hrs/ week	Tutorial Hours:	-
		Credits:	-	Credits:	1	Credits:	-
Evaluation Scheme							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
--	--	--	--	25	50	75	

Course Objectives:

The course aims to:

Sr. No.	Course Objective
1	To enable students to set up deep learning environments and utilize tools such as TensorFlow, Keras, and Google Colab effectively.
2	To develop students' ability to build, train, and evaluate fundamental neural network architectures for various tasks.
3	To expose students to advanced deep learning applications including transfer learning, text generation, style transfer, and image generation.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
1ADPCP325.01	Familiarize students with installing and configuring deep learning environments.	L2
1ADPCP325.02	Introduce cloud platforms like Google Colab for GPU/TPU-based model training.	L3
1ADPCP325.03	Develop simple perceptron and multilayer neural network models.	L3

1ADPCP325.04	Design and develop basic CNN architectures for image tasks.	L4
1ADPCP325.05	Build and experiment with RNN, LSTM, and GRU models.	L4
1ADPCP325.06	Apply advanced deep learning techniques like transfer learning, style transfer, and generation models.	L6

Suggested list of Practical /Experiment for CIE/ESE:

Expt No.	Type of Experiment (Basic / Design / Advanced / Mini Project)	Experiment Title	Bloom's Taxonomy Level
1	Basic	Installing Anaconda/Miniconda and setting up TensorFlow & Keras	L2
2	Basic	Introduction to Google Colab and using GPUs/TPUs	L3
3	Basic	Developing a simple perceptron (single-layer neural network)	L3
4	Design	Developing a simple multilayer neural network for classification tasks	L4
5	Design	Designing and developing a basic CNN for a given image task	L4
6	Advanced	Implementing transfer learning for CNN-based image classification	L5
7	Design	Designing and developing a simple RNN for sequence tasks	L4
8	Advanced	Implementing LSTM-based RNN for sequence prediction	L4
9	Advanced	Implementing GRU-based RNN for sequence modeling	L4
10	Advanced	Designing a text generation model using LSTM	L5
11	Advanced	Designing a neural style transfer model	L5
12	Advanced	Developing a model for generating images (GAN or equivalent)	L5

Examination Scheme and Guidelines:

CIE 25 Marks	In Semester Evaluation/Continuous Assessment
Practical 50 Marks	Continuous Assessment, as per institute policy

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Program Elective Courses-III (LAB)
UI and UX Design LAB

Course Details:

Class		Third Year		Semester		VI	
Course Title		UI and UX Design LAB		Course Code		1ADPEP326	
Prerequisites:							
Teaching Scheme:		Theory Hours:	-	Practical Hours:	2Hrs/ week	Tutorial Hours:	-
		Credits:	-	Credits:	1	Credits:	-
Evaluation Scheme							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
--	--	--	--	25	--	25	

Course Objectives:

The course aims to:

Sr. No.	Course Objective
1	Understand the fundamentals of UI/UX design and the design thinking process.
2	Apply research, wireframing, prototyping, and usability testing techniques to design effective interfaces.
3	Create accessible, ethical, and user-centered designs following usability and WCAG guidelines.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
1ADPEP326.01	Understand UI/UX fundamentals and design thinking.	L2
1ADPEP326.02	Apply visual principles and UI patterns.	L3
1ADPEP326.03	Analyze user needs and business goals.	L4
1ADPEP326.04	Create wireframes and prototypes.	L5
1ADPEP326.05	Conduct usability testing and evaluate designs.	L5
1ADPEP326.06	Implement accessibility and ethical principles.	L5

Suggested list of Practical /Experiment for CIE/ESE (any 10):

Expt. No.	Type of Experiment (Basic / Design / Advanced / Mini Project)	Experiment Title	Bloom's Taxonomy Level
1	Apply	Designing a Responsive layout for an societal application	L3
2	Understand	Exploring various UI Interaction Patterns	L2
3	Apply	Developing an interface with proper UI Style Guides	L3
4	Analyze	Developing Wireflow diagram for application using open source software	L4
5	Understand	Exploring various open source collaborative interface Platform	L2
6	Apply	Hands on Design Thinking Process for a new product	L3
7	Create	Brainstorming feature for proposed product	L6
8	Evaluate	Defining the Look and Feel of the new Project	L5
9	Create	Create a Sample Pattern Library for that product (Mood board, Fonts, Colors based on UI principles)	L6
10	Analyze	Identify a customer problem to solve	L4
11	Evaluate	Conduct end-to-end user research - User research, creating personas, Ideation process (User stories, Scenarios), Flow diagrams, Flow Mapping	L5
12	Evaluate/ Create	Sketch, design with popular tool and build a prototype and perform usability testing and identify improvements	L5–L6

Examination Scheme and Guidelines:

CIE 25 Marks	In Semester Evaluation/Continuous Assessment
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Program Elective Courses-III (LAB)
Cryptocurrency and Blockchain Technology Lab

Course Details:

Class		Third Year		Semester		VI	
Course Title		Cryptocurrency and Blockchain Technology Lab		Course Code		1ADPEP327	
Prerequisites:							
Teaching Scheme:		Theory Hours:	-	Practical Hours:	2	Tutorial Hours:	-
		Credits:		Credits:	1	Credits:	-
Evaluation Scheme							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
-	-	-	-	25	-	25	

Course Objectives:

The course aims to:

Sr No.	Course Objectives
01	Understanding Block chain Fundamentals and creating basic blocks.
02	Able to Develop Block chain Applications in a structured manner
03	Ability to create own crypto currency and get familiarity with future currencies.
04	Able to Evaluate and Analyze Block chain Systems

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
1ADPEP327.1	Understand the knowledge of Blockchain Concepts and creating basic blocks.	L2
1ADPEP327.2	Design and Implement Blockchain Applications.	L3
1ADPEP327.3	Evaluation and Analysis of Blockchain Systems.	L5
1ADPEP327.4	Understand the knowledge of crypto currency and creating a basic form of it.	L2

Suggested list of Practical /Experiment for CIE/ESE:

Expt No.	Type of Experiment (Basic / Design / Advanced / Mini Project)	Experiment Title	Revised Bloom's Taxonomy Level
1	Basic	Creating Merkle tree	L6
2	Basic	Creation of Block	L6
3	Design	Block chain Implementation Programming code	L3
4	Basic	Creating ERC20 token	L6
5	Basic	Java code to implement blockchain in Merkle Trees	L3
6	Advanced	Java Code to implement Mining using block chain	L3
7	Advanced	Java Code to implement peer-to-peer using block chain	L3
8	Advanced	Creating a Crypto-currency Wallet	L6

Examination Scheme and Guidelines:

CIE 25 Marks	In Semester Evaluation/Continuous Assessment
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Program Elective Courses-III (LAB)**Generative AI Lab****Course Details:**

Class		Third Year		Semester		VI	
Course Title		Generative AI Lab		Course Code		1ADPEP328	
Prerequisites:							
Teaching Scheme:		Theory Hours:	-	Practical Hours:	2Hrs/ week	Tutorial Hours:	-
		Credits:	-	Credits:	1	Credits:	-
Evaluation Scheme							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
--	--	--	--	25		25	

Course Objectives:

The course aims to:

Sr. No.	Course Objective
1	To enable students to set up deep learning environments and utilize tools such as TensorFlow, Keras, and Google Colab effectively.
2	To develop students' ability to build, train, and evaluate fundamental neural network architectures for various tasks.
3	To expose students to advanced deep learning applications including transfer learning, text generation, style transfer, and image generation.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr No.	Course Outcomes	Revised Bloom's Taxonomy
1ADPEP328.01	Develop generative models using popular deep learning frameworks such as TensorFlow or PyTorch.	L3
1ADPEP328.02	Develop various real-world applications of generative AI, such as image synthesis, text generation, music composition, data augmentation, and style transfer.	L3
1ADPEP328.03	apply generative AI techniques to solve a specific problem or create novel generative models.	L3

Suggested list of Practical /Experiment for CIE/ESE:

Expt No.	Type of Experiment (Basic / Design / Advanced / Mini Project)	Experiment Title	Revised Bloom's Taxonomy Level
1	Basic	Implement a GAN-based approach to enhance the resolution of low-resolution images.	L3
2	Basic	Image-to-Image Translation: Using conditional GANs.	L3
3	Basic	Implement models like "Attribute-conditioned Text Style Transfer" to transfer the style of one text to another while preserving the content.	L3
4	Design	3D Object Generation like 3D-GANs or VAEs to generate 3D objects from a latent space.	L3
5	Design	Implement approaches like Video GANs or Temporal Convolutional Networks (TCNs) to generate realistic video sequences.	L3
6	Advanced	Data Augmentation using Generative Models: Students can implement generative models like GANs or VAEs to generate synthetic data samples that can be added to the training dataset.	L3
7	Design	Creative Art Generation: Students can experiment with architectures like DeepArt, NeuralPainting, or DeepDream to generate novel and visually appealing artwork.	L3
8	Advanced	Speech Synthesis with Generative Models: Students can implement models like WaveNet or Tacotron to generate realistic and natural-sounding speech.	L3
9	Advanced	Time Series Generation: Students can implement approaches like Variational Recurrent Neural Networks (VRNNs) or Long Short-Term Memory (LSTM) models to generate synthetic time series data.	L3
10	Advanced	Multi-Modal Generation: Students can explore architectures like StackGAN or AttnGAN for text-to-image generation or image captioning tasks.	L3

Examination Scheme and Guidelines:

CIE (Practical) (25 Marks)	Continuous Assessment, as per institute policy
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Program Elective Courses-III (LAB)

Cloud Service Management Lab

Course Details:

Class		Third Year		Semester		VI	
Course Title		Cloud Service Management Lab		Course Code		1ADPEP329	
Prerequisites:							
Teaching Scheme:		Theory Hours:	-	Practical Hours:	2 Hrs./ week	Tutorial Hours:	-
		Credits:	-	Credits:	1	Credits:	-
Evaluation Scheme							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
-	-	-	-	25	-	25	

Course Objectives:

The course aims to:

Sr. No.	Course Objectives
01	To understand cloud computing fundamentals
02	To develop practical skills in cloud provisioning and automation
03	To apply cloud monitoring, performance optimization, and cost management techniques
04	To design and implement secure, compliant, and well-governed cloud service management solutions

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
1ADPEP329.1	Describe cloud computing models, service types, deployment models, and key concepts of cloud service management.	L3

1ADPEP329.2	Analyze cloud governance, compliance requirements, and service-level agreements (SLAs) for effective cloud operations.	L4
1ADPEP329.3	Apply cloud provisioning, automation, and configuration management techniques using IaC and orchestration tools.	L3
1ADPEP329.4	Implement cloud monitoring, performance optimization, and cost management strategies using industry-standard tools.	L3
1ADPEP329.5	Design secure, compliant, and efficient cloud service management plans, incorporating risk mitigation and disaster recovery strategies.	L6

Suggested List of Practical/Experiments for

Minimum 10 Experiments based on the curriculum.

Expt. No.	Type of Experiment (Basic/Design/ Advanced/ Mini/ Minor Projects/ Seminar/ Case Studies)	Experiment Title	Bloom's Taxonomy Level
1.	Basic	Exploring Cloud Computing Models and Service Types	L2
2.	Basic	Cloud Governance and Compliance Overview	L2
3.	Basic	Provisioning Cloud Resources Using Console/CLI	L3
4.	Basic	Introduction to Infrastructure as Code (IaC) with Terraform	L3
5.	Basic	Configuration Management using Ansible	L3
6.	Design	Automating Cloud Workflows and Orchestration	L4
7.	Design	Cloud Monitoring and Performance Analysis	L4
8.	Design	Cost Monitoring and Optimization	L3/L5
9.	Design	Cloud Security Implementation and IAM	L3 / L4
10.	Design	Designing a Cloud Service Management Plan	L3 / L6

Examination Scheme and Guidelines:

CIE (Practical) (25 Marks)	Continuous Assessment, as per institute policy
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Dr. J. J. Magdum Trust's

Dr J J Magdum College Of Engineering, Jaysingpur

ARTIFICIAL INTELLIGENCE & DATA SCIENCE

TY- B.Tech -SEM-VI

Mobile App Development

Course Details:

Class		Third Year		Semester		VI	
Course Title		Mobile App Development LAB		Course Code		1ADVSP330	
Prerequisites:							
Teaching Scheme:		Theory Hours:	1 Hrs./ week	Practical Hours:	2 Hrs./ week	Tutorial Hours:	-
		Credits:	-	Credits:	2	Credits:	-
Evaluation Scheme							
Theory				Practical		Total	
T1	T2	ISE	ESE	CIE	ESE		
-	-	-	-	25	-	25	

Course Objectives:

The course aims to:

Sr. No.	Course Objectives
01	To familiarize students with installation and configuration of Android SDK, Emulator, and Android Studio.
02	To develop understanding of Android project structure and APK deployment on emulator and real mobile devices.
03	To implement activity navigation using Intents and communication between Android components.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy level
1ADVSP330.1	Explain the fundamentals of the Android platform, including its evolution, version history, OS architecture, and core application components.	L2
1ADVSP330.2	Analyze Android application components such as Activities, Fragments, processes, and threads, along with the activity lifecycle and execution model.	L4
1ADVSP330.3	Demonstrate the use of the Android development environment by creating projects, managing project structure, configuring the Manifest file, permissions, and debugging using Logcat and DDMS.	L3
1ADVSP330.4	Design and implement user interfaces using XML layouts and Intent-based communication, including explicit/implicit intents and broadcast receivers.	L3
1ADVSP330.5	Develop interactive Android applications using various input controls, event handling mechanisms, focus handling, and dialog components.	L6
1ADVSP330.6	Implement and manage Android menus, notifications, and action bar features to enhance user interaction and application usability.	L3

Course Contents

Unit No.	Unit Title	Hours	Course Outcome Number	Bloom's Taxonomy Level
01	Introduction to Android Platform: - Overview of Android - History of Android - Android Versions - Android OS Architecture (Stack): - Linux Kernel - Native Libraries & Dalvik Virtual Machine (DVM) - Application Framework - Applications - Android Application Components Overview	2	1ADVSP330.1	Understand (L2)
02	Android Application Components: - Activity and Activity Lifecycle - Fragments - Android Process and Threads	2	1ADVSP330.2	Analyze (L4)

	• Application Execution Model • Multithreading Basics in Android			
03	Android Development Environment: • Introduction to Android SDK • Android Emulator • Creating an Android Project • Project Directory Structure • Dalvik Debug Monitor Server (DDMS) • Logging in Android (Logcat) • Android Manifest File • Android Permissions	2	1ADVSP330.3	Apply (L3)
04	Intents and Layout Management • Introduction to XML • Android View Hierarchy • Layouts: ◦ Linear Layout ◦ Relative Layout ◦ Table Layout ◦ Frame Layout ◦ Sliding Layouts • Using Padding and Margins in Layouts • Introduction to Intents • Android Intent Messaging • Types of Intents • Sending Intents (Telephony, SMS) • Broadcast Receivers	2	1ADVSP330.4	Apply (L3)
05	User Interface Controls and Dialogs • Input Controls: • Buttons • Text Fields • Checkboxes • Radio Buttons • Toggle Buttons • Spinners • Input Events • Event Listeners and Event Handlers • Touch Mode and Handling Focus • Dialogs: • Alert Dialogs • Pop-up Dialogs • Toast Messages	2	1ADVSP330.5	Create (L6)
06	Menus, Notifications and Action Bar • Menus in Android • Options Menu • Context Menu • Popup Menu • Handling Menu Click Events • Notifications: • Creating Notifications	2	1ADVSP330.6	Apply (L3)

	• Notification Actions • Notification Priority • Managing Notifications • Removing Notifications • Introduction to Action Bar			
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Text Books/Reference Books:

Sr. No	Book Type (Text/Reference)	Name of the Book	Name of the Author	Publisher	Edition	Year of Publication
1.	Textbook	Beginning Android Application Development	Wei-Meng Lee	Wiley India Pvt. Ltd.	5th Edition	2015
2.	Reference Book	Android Programming: Pushing the Limits	Mark L. Murphy	Commons Ware	1st Edition	2014
3.	Reference Book	Android Wireless Application Development	Lauren Darcey & Shane Conder	Pearson Education	4th Edition	2018

Online References:

Sr. No.	Website Name	URL	Units Covered
1	NPTL	https://youtu.be/9z7AEAyhAG8?si=5NAiW6_gg5jgZl-f	1,2,3,4,5,6

Suggested List of Practical/Experiment for CIE/ESE:

- Minimum 10 Experiments based on the curriculum.

Expt. No.	Type of Experiment (Basic /Design/ Advanced/ Mini/ Minor Projects/ Seminar/ Case Studies)	Experiment Title	Bloom's Taxonomy Level
1.	Basic	Installation of Android SDK, emulator.	L3
2.	Basic	Creating simple project and study of android project structure and installing apk on mobile device/tablet, configuring mobile device/tablet in Android Studio with developer options and running app directly on mobile device/tablet.	L3
3.	Basic	Write a program to use of different layouts.	L3
4.	Basic	Write a program to study Intents for switching between activities.	L3
5.	Design	Write a program to study and demonstrate Broadcast Receiver.	L6

6.	Design	Program to demonstrate Buttons, Text Fields, Checkboxes, Radio Buttons, and Toggle Buttons with their events handler.	L4
7.	Design	Program to demonstrate Spinners, Touch Mode, Alerts, Popups, and Toasts with their events handler.	L3
8.	Design	Program to demonstrate Touch Mode, Alerts, Popups and Toasts with their events handler.	L3
9.	Advanced	Program to demonstrate notification with their action.	L4
10	Advanced	Develop a native calculator application.	L5–L6
11.	Advanced	Write a mobile application that creates alarm clock.	L5–L6
12.	Advanced	Develop a Mobile application for simple needs (Mini Project)	L5–L6

Examination Scheme and Guidelines:

CIE 25 Marks	In Semester Evaluation/Continuous Assessment
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Dr. J. J. Magdum Trust's
Dr J J Magdum College Of Engineering, Jaysingpur
ARTIFICIAL INTELLIGENCE & DATA SCIENCE
TY- B.Tech -SEM-VI

Project Phase-I

Course Details:

Class		Third Year		Semester		VI	
Course Title		Project-I		Course Code		1ADPRP331	
Prerequisites:							
Teaching Scheme:		Theory Hours:	00	Practical Hours:	04	Tutorial Hours:	00
		Credits:	00	Credits:	02	Credits:	00
Evaluation Scheme							
Theory				Practical		Total	
T-I	T-II	ISE	ESE	CIE	ESE		
				50	50	100	

Course Objectives:

The course aims to:

Sr No.	Course Objectives
01	To enable students to identify and define real-world problems in AI & Data Science
02	To develop analytical and research skills through literature survey
03	To design system architecture and select appropriate methodologies
04	To promote innovation, multidisciplinary thinking, and teamwork
05	To prepare students for Project Phase-II and industry-oriented projects

Course Outcomes:

Upon successful completion of this course, the student will be able to:

Sr. No.	Course Outcomes	Bloom's Taxonomy Level
1ADPRP331.01	Identify and define a suitable AI & DS problem statement	Understanding (L2)
1ADPRP331.02	Conduct an effective literature survey and gap analysis	Remembering (L1)
1ADPRP331.03	Design system architecture and methodology	Understanding (L2)
1ADPRP331.04	Select appropriate datasets, tools, and performance metrics	Understanding (L2)
1ADPRP331.05	Demonstrate technical documentation and presentation skills	Understanding (L2)

Course Content / Project Activities
Project Guidelines - Project can be individual or group-based (max 3 students) - Topic must be relevant to AI, Data Science, or interdisciplinary domains - Use of open datasets encouraged - Ethical and sustainability considerations must be addressed Suggested Project Domains - Machine Learning / Deep Learning - Natural Language Processing - Computer Vision - Expert Systems - Data Analytics & Big Data - AI for Healthcare, Agriculture, Finance, Smart Cities, IoT + AI
Phase 1: Problem Identification - Identification of real-world problem - Domain analysis - Project objectives and scope Phase 2: Literature Survey - Review of research papers, patents, and case studies - Identification of research gaps - Comparative analysis of existing methods Phase 3: Requirement Analysis - Functional and non-functional requirements - Dataset identification and preprocessing plan - Constraints and assumptions Phase 4: System Design - Proposed system architecture - Algorithm / model selection

- Flow diagrams and block diagrams

Phase 5: Planning & Feasibility

- Tools and technologies
- Performance metrics
- Risk analysis and timeline

Deliverables

- Approved problem statement
- Literature survey report
- System design document
- Project proposal (Phase-I report)
- Presentation and viva

Assessment & Evaluation Scheme

Continuous Internal Evaluation (100 Marks)

Component	Marks
Problem Identification & Objectives	20
Literature Survey & Gap Analysis	25
System Design & Methodology	25
Report Quality	15
Presentation & Viva	15