

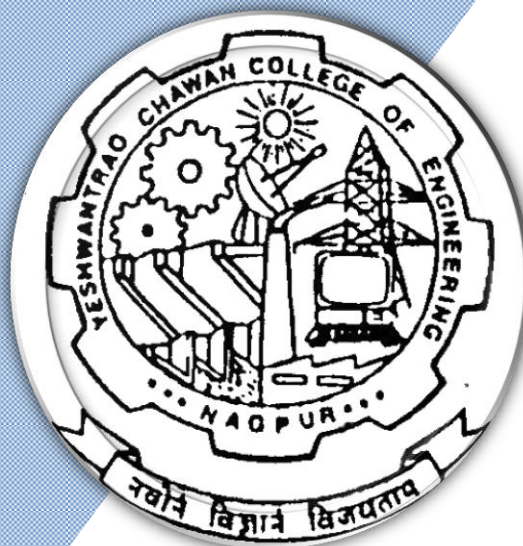
Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

(Accredited 'A++' Grade by NAAC with a score of 3.6)

Hingna Road, Wanadongri, Nagpur - 441 110



Bachelor of Technology

SoE & Syllabus 2023

1st to 6th Semester

(Department of Computer Science & Engineering)

B. Tech in Artificial Intelligence and Machine Learning (AIML)



SN	Sem	Type	BoS/Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration n Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
FIRST SEMESTER (GROUP-A)															
1	1	BS	GE	23GE1101	Calculus and Vector	T	3	0	0	3	3	30	20	50	3
2	1	BS	GE	23GE1106	Engineering Chemistry	T	3	0	0	3	3	30	20	50	3
3	1	BS	GE	23GE1107	Lab : Engineering Chemistry	P	0	0	2	2	1		60	40	
4	1	HS/AEC1	GE	23GE1113	Technical Communication	T	2	0	0	2	2	30	20	50	3
5	1	HS/AEC2	GE	23GE1114	Lab : Technical Communication	P	0	0	2	2	1		60	40	
6	1	HS/IKS	GE	23GE1115	Indian Knowledge System	T	2	0	0	2	2	30	20	50	3
7	1	BES	CSE	23AML1103	Web Technology	T	2	0	0	2	2	30	20	50	3
8	1	BES	CSE	23AML1104	Lab : Web Technology	P	0	0	2	2	1		60	40	
9	1	BES	CSE	23AML1101	Introduction to Computer Programming	T	2	0	0	2	2	30	20	50	3
10	1	BES	CSE	23AML1102	Lab : Introduction to Computer Programming	P	0	0	2	2	1		60	40	
11	1	VSEC1	GE	23GE1117	Get Set Go	...	...	...	...	...	2		60	40	
12	1	LLC1	GE		Liberal Learning Course (LLC1)	...	...	...	...	...	2		60	40	
TOTAL FIRST SEM							14	0	8	22	22				

MANDATORY LEARNING COURSES															
1	1	HS		GE2301	Disaster Management and Preparedness	A	2	0	0	2	0				

SECOND SEMESTER (GROUP-A)															
1	2	BS	GE	23GE1203	Differential Equation and Complex Analysis	T	3	0	0	3	3	30	20	50	3
2	2	BS	GE	23GE1210	Applied Physics	T	3	0	0	3	3	30	20	50	3
3	2	BS	GE	23GE1211	Lab : Applied Physics	P	0	0	2	2	1		60	40	
4	2	BES	AML	23AML1205	Data Structure	T	3	0	0	3	3	30	20	50	3
5	2	BES	AML	23AML1206	Lab : Data Structure	P	0	0	2	2	1		60	40	
6	2	BES	EL	23EL1201	Basic Electrical and Electronics Engineering	T	3	0	0	3	3	30	20	50	3
7	2	PC	AML	23AML1207	Object Oriented Programming	T	3	0	0	3	3	30	20	50	3
8	2	PC	AML	23AML1208	Lab : Object Oriented Programming	P	0	0	2	2	1		60	40	
9	2	VSEC2	GE	23GE1218	Functional English	...	...	...	...	...	2		60	40	
10	2	LLC2	GE		Liberal Learning Course (LLC2)	...	...	...	...	...	2		60	40	
TOTAL SECOND SEM							15	0	6	21	22				

MANDATORY LEARNING COURSES															
1	2	HS	GE2131	Universal Human Values (UHV)		A	2	0	0	2	0				

MSEs* = Two MSEs of 15 Marks each will conducted and marks of these 2 MSEs will be considered for Continuous Assessment
TA ** = for Theory : TA1-5 marks on Proctored Online Exam, TA2-12 marks on activitied decided by course teacher, TA3 - 3 marks on class attendance
TA** = for Practical : MSPA will be 15 marks each

				July, 2023		1.00	Applicable for AY 2023-24 Onwards
Chairperson		Dean (Acad. Matters)		Date of Release		Version	



B.TECH SCHEME OF EXAMINATION 2023
(Scheme of Examination w.e.f. 2023-24 onward)
(Department of Computer Science & Engineering)
B. Tech. in Artificial Intelligence and Machine Learning

SoE No.
23AML-101

SN	Sem	Type	BoS/Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	

Liberal Learning Course					Subject
SN	Sem	Type	BoS/Deptt	Sub. Code	Subject
1	2	CC2	GE	LLC1201	Music (Vocal)
2	2	CC2	GE	LLC1202	Music (Instrumental)
3	2	CC2	GE	LLC1203	Indian Classical Dance
4	2	CC2	GE	LLC1204	Folk Dances
5	2	CC2	GE	LLC1205	Painting
6	2	CC2	GE	LLC1206	Theatre and acting
7	2	CC2	GE	LLC1207	Photography
8	2	CC2	GE	LLC1208	Yoga
9	2	CC2	GE	LLC1209	Chess
10	2	CC2	GE	LLC1210	Athletics
11	2	CC2	GE	LLC1211	Basket Ball
12	2	CC2	GE	LLC1212	Judo
13	2	CC2	GE	LLC1213	Elements of Japanese Language
14	2	CC2	GE	LLC1214	Elements of German Language
15	2	CC2	GE	LLC1215	Elements of French Language
16	2	CC2	GE	LLC1216	Elements of Spanish Language
17	2	CC2	GE	LLC1217	Basics of Vedic Maths
18	2	CC2	GE	LLC1218	Skilling in Microsoft Visio and Inkscape
19	2	CC2	GE	LLC1219	Art of Public Speaking

Liberal Learning Course					Subject
SN	Sem	Type	BoS /Deptt	Sub. Code	Subject
1	1	CC1	GE	LLC1101	Music (Vocal)
2	1	CC1	GE	LLC1102	Music (Instrumental)
3	1	CC1	GE	LLC1103	Indian Classical Dance
4	1	CC1	GE	LLC1104	Folk Dances
5	1	CC1	GE	LLC1105	Painting
6	1	CC1	GE	LLC1106	Theatre and acting
7	1	CC1	GE	LLC1107	Photography
8	1	CC1	GE	LLC1108	Yoga
9	1	CC1	GE	LLC1109	Chess
10	1	CC1	GE	LLC1110	Athletics
11	1	CC1	GE	LLC1111	Basket Ball
12	1	CC1	GE	LLC1112	Judo
13	1	CC1	GE	LLC1113	Elements of Japanese Language
14	1	CC1	GE	LLC1114	Elements of German Language
15	1	CC1	GE	LLC1115	Elements of French Language
16	1	CC1	GE	LLC1116	Elements of Spanish Language
17	1	CC1	GE	LLC1117	Basics of Vedic Maths
18	1	CC1	GE	LLC1118	Skilling in Microsoft Visio and Inkscape
19	1	CC1	GE	LLC1119	Art of Public Speaking

MSEs* = Two MSEs of 15 Marks each will conducted and marks of these 2 MSEs will be considered for Continuous Assessment
TA ** = for Theory : TA1-5 marks on Proctored Online Exam, TA2-12 marks on activitied decided by course teacher, TA3 - 3 marks on class attendance
TA = for Practical : MSPA will be 15 marks each**

		July, 2023	1.00	Applicable for AY 2023-24 Onwards
Chairperson	Dean (Acad. Matters)	Date of Release	Version	



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SoE No.
23AML-101

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
THIRD SEMESTER															
1	3	BS	GE	23GE1303	Linear Algebra	T	3	0	0	3	3	30	20	50	3
2	3	HSSM-1	GE	23GE1301	Fundamentals of Management & Economics	T	2	0	0	2	2	30	20	50	3
3	3	VEC-1	CV	23CV1311	Environmental Sustainability, Pollution and Management	T	2	0	0	2	2	30	20	50	3
4	3	PC	AML	23AML1301	Computer Architecture & Organisation	T	3	0	0	3	3	30	20	50	3
5	3	PC	AML	23AML1302	Database Management Systems	T	3	0	0	3	3	30	30	40	3
6	3	PC	AML	23AML1303	Lab : Database Management Systems	P	0	0	2	2	1		60	40	
7	3	PC	AML	23AML1304	Lab : Programming with Python	P	0	0	2	2	1		60	40	
8	3	CEP	AML	23AML1305	Community Engagement Project	P	0	0	2	4	2		60	40	
9	3	OE-1	OE		Open Elective -I	T	2	0	0	2	2	30	20	50	3
10	3	MDM	AML		MD Minor Course-I	T	2	0	0	2	2	30	20	50	3
TOTAL							17	0	6	25	21				

List of Mandatory Learning Course (MLC)

1	3	HS	T&P	MLC2123	YCAP3 : YCCE Communication Aptitude Preparation	A	3	0	0	3	0				
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Open Elective - I

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject
1	3	OE1	GE	23OE1301	OE-I : Combinatorics
2	3	OE1	GE	23OE1302	OE-I : Fuzzy Set Theory, Arithmetic And Logic
3	3	OE1	GE	23OE1303	OE-I : Green Chemistry & Sustainability
4	3	OE1	GE	23OE1304	OE-I : Hydrogen Fuel
5	3	OE1	GE	23OE1305	OE-I : Electronic Materials And Applications
6	3	OE1	GE	23OE1306	OE-I : Laser Technology And Applications
7	3	OE1	MGT	23OE1307	OE-I : Finance And Cost Management
8	3	OE1	MGT	23OE1308	OE-I : Operation Research Techniques
9	3	OE1	MGT	23OE1309	OE-I : Project Evaluation & Management
10	3	OE1	MGT	23OE1310	OE-I : Total Quality Management
11	3	OE1	MGT	23OE1311	OE-I : Value Engineering
12	3	OE1	MGT	23OE1312	OE-I : Maintenance Management
13	3	OE1	MGT	23OE1313	OE-I : Industrial Safety
14	3	OE1	MGT	23OE1314	OE-I : Industry 4.0
15	3	OE1	MGT	23OE1315	OE-I : Operation Management
16	3	OE1	MGT	23OE1316	OE-I : Material Management
17	3	OE1	MGT	23OE1317	OE-I : Hospitality Management
18	3	OE1	MGT	23OE1318	OE-I : Human Resource Management & Organizational Behaviour
19	3	OE1	MGT	23OE1319	OE-I : Agri-Business Management
20	3	OE1	MGT	23OE1320	OE-I : Rural Marketing
21	3	OE1	MGT	23OE1321	OE-I : Marketing Management
22	3	OE1	MGT	23OE1322	OE-I : Health Care Management
23	3	OE1	MGT	23OE1323	OE-I : Designated approved online NPTEL/KKSU Course
24	3	OE1	MGT	23OE1324	OE-I : Indian Archeology
25	3	OE1	MGT	23OE1325	OE-I : Social & Positive Psychology
26	3	OE1	MGT	23OE1326	OE-I : Seismology & Earthquake

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(Department of Computer Science & Engineering)

B. Tech. in Artificial Intelligence and Machine Learning

SoE No.
23AML-101

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
FOURTH SEMESTER															
1	4	HSSM-2	GE	23GE1401	Entrepreneurship Development	T	2	0	0	2	2	30	20	50	3
2	4	AEC-2	GE	23GE1405 23GE1406	Marathi Language Hindi Language	T	2	0	0	2	2	30	20	50	3
3	4	PC	AML	23AML1401	Operating Systems	T	3	0	0	3	3	30	20	50	3
4	4	PC	AML	23AML1402	Lab : Operating Systems	P	0	0	2	2	1		60	40	
5	4	PC	AML	23AML1403	Discrete Mathematics and Probability theory	T	3	0	0	3	3	30	20	50	3
6	4	PC	AML	23AML1404	Statistics for data science	T	3	0	0	3	3	30	20	50	3
7	4	PC	AML	23AML1405	Lab : Statistics for data science	P	0	0	2	2	1		60	40	
8	4	VEC-2	AML	23AML1406	Digital & Technological Solution- Open source tools	T	2	0	0	2	2	30	20	50	3
9	4	VSEC-3	AML	23AML1407	Lab : Vocational & Skill Enhancement - Web Application development	P	0	0	2	4	2		60	40	
10	4	OE-2	OE		Open Elective -II	T	2	0	0	2	2	30	20	50	3
11	4	MDM	AML		MD Minor Course-II	T	2	0	0	2	2	30	20	50	3
TOTAL							19	0	6	27	23				

List of Mandatory Learning Course (MLC)

1	4	HS	T&P	MLC2124	YC4P4 : YCCE Communication Aptitude Preparation	A	3	0	0	3	0				
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Open Elective - II

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject
1	4	OE2	GE	23OE2401	OE-II : Combinatorics
2	4	OE2	GE	23OE2402	OE-II : Fuzzy Set Theory, Arithmetic And Logic
3	4	OE2	GE	23OE2403	OE-II : Green Chem. & Sustainability
4	4	OE2	GE	23OE2404	OE-II : Hydrogen Fuel
5	4	OE2	GE	23OE2405	OE-II : Electronic Materials And Applications
6	4	OE2	GE	23OE2406	OE-II : Laser Technology And Applications
7	4	OE2	MGT	23OE2407	OE-II : Finance And Cost Management
8	4	OE2	MGT	23OE2408	OE-II : Operation Research Techniques
9	4	OE2	MGT	23OE2409	OE-II : Project Evaluation & Management
10	4	OE2	MGT	23OE2410	OE-II : Total Quality Management
11	4	OE2	MGT	23OE2411	OE-II : Value Engineering
12	4	OE2	MGT	23OE2412	OE-II : Maintenance Management
13	4	OE2	MGT	23OE2413	OE-II : Industrial Safety
14	4	OE2	MGT	23OE2414	OE-II : Industry 4.0
15	4	OE2	MGT	23OE2415	OE-II : Operation Management
16	4	OE2	MGT	23OE2416	OE-II : Material Management
17	4	OE2	MGT	23OE2417	OE-II : Hospitality Management
18	4	OE2	MGT	23OE2418	OE-II : Human Resource Management & Organizational Behaviour
19	4	OE2	MGT	23OE2419	OE-II : Agri-Business Management
20	4	OE2	MGT	23OE2420	OE-II : Rural Marketing
21	4	OE2	MGT	23OE2421	OE-II : Marketing Management
22	4	OE2	MGT	23OE2422	OE-II : Health Care Management
23	4	OE2	MGT	23OE2423	OE-II : Designated approved online NPTEL/KKSU Course
24	4	OE2	MGT	23OE2424	OE-II : Indian Archeology
25	4	OE2	MGT	23OE2425	OE-II : Social & Positive Psychology
26	4	OE2	MGT	23OE2426	OE-II : Seismology & Earthquake

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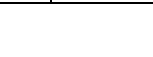
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SoE No.
23AML-101

SN	Sem	Type	BoS/Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration in Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
FIFTH SEMESTER															
1	5	PC	AML	23AML1501	Formal Language & Automata Theory	T	3	0	0	3	3	30	20	50	3
2	5	PC	AML	23AML1502	Lab : Formal Language & Automata Theory	P	0	0	2	2	1		60	40	
3	5	PC	AML	23AML1503	Design & Analysis of Algorithms	T	3	0	0	3	3	30	30	40	3
4	5	PC	AML	23AML1504	Lab : Design & Analysis of Algorithms	P	0	0	2	2	1		60	40	
5	5	PC	AML	23AML1505	Fundamentals of Artificial Intelligence	T	3	0	0	3	3	30	40	3	
6	5	PC	AML	23AML1506	Lab : Fundamentals of Artificial Intelligence	P	0	0	2	2	1	1	60	40	
7	5	PE	AML		Professional Elective-I	T	3	0	0	3	3	30	30	40	3
8	5	PE	AML		Lab : Professional Elective-I	P	0	0	2	2	1	1	60	40	
9	5	OE-3	OE		Open Elective-III	T	3	0	0	3	3	30	20	50	3
10	5	MDM	AML		MD Minor Course-III	T	3	0	0	3	3	30	20	50	3
11	5	STR	AML	23AML1507	Internship, Seminar and Report	P	0	0	2	2	1		60	40	
TOTAL							18	0	10	28	23				

List of Mandatory Learning Course (MLC)															
1	5	HS	T&P	MLC2125	YCAP5 : YCCE Communication Aptitude Preparation	A	3	0	0	3	0				

Professional Elective - I					
1	5	PE-I	AML	23AML1521	PE-I : Neural Network algorithms and applications
2	5	PE-I	AML	23AML1522	PE-I : Lab : Neural Network algorithms and applications
3	5	PE-I	AML	23AML1523	PE-I : Digital Image Processing
4	5	PE-I	AML	23AML1524	PE-I : Lab : Digital Image Processing
5	5	PE-I	AML	23AML1525	PE-I : Business Intelligence and Analytics
6	5	PE-I	AML	23AML1526	PE-I : Lab : Business Intelligence and Analytics
7	5	PE-I	AML	23AML1527	PE-I : Internet of Things
8	5	PE-I	AML	23AML1528	PE-I : Lab : Internet of Things
Coursera Electives					
1	5	PE-I	PC	23AML1529	PE-I : IBM Generative AI Engineering Professional Certificate
2	5	PE-I	PC	23AML1530	PE I : Lab.: IBM Generative AI Engineering Professional Certificate

Open Elective - III								
SN	Sem	Type	BoS/Deptt	Sub. Code	Subject	FACULTY		
1	5	OE3	CSE	23OE3501	OE-III : Social Reformers in Modern Maharashtra	ARTS		
2	5	OE3	CSE	23OE3502	OE-III : Independent India 1948-2010	ARTS		
3	5	OE3	CT	23OE3503	OE-III : Introduction To Cognitive Psychology	ARTS		
4	5	OE3	CT	23OE3504	OE-III : Introduction To Engineering Psychology	ARTS		
5	5	OE3	CT	23OE3505	OE-III : Introduction To Behavioural Psychology	ARTS		
6	5	OE3	CT	23OE3506	OE-III : Introduction To Emotional Psychology	ARTS		
7	5	OE3	EL	23OE3507	OE-III : Elements of Public Administration	ARTS		
8	5	OE3	ETC	23OE3508	OE-III : Ancient Indian History	ARTS		
9	5	OE3	IT	23OE3509	OE-III : Consciousness Studies	ARTS		
10	5	OE3	IT	23OE3510	OE-III : Psychology for Professionals	ARTS		
11	5	OE3	IT	23OE3511	OE-III : Introduction to Sociology and Human Behavior	ARTS		
12	5	OE3	GE	23OE3512	OE-III : Economics of Money and Banking	ARTS		
13	5	OE3	GE	23OE3513	OE-III : Economics of Capital Market	ARTS		
14	5	OE3	GE	23OE3514	OE-III : Digital Humanities	ARTS		
15	5	OE3	GE	23OE3515	OE-III : Introduction to Political Science	ARTS		
16	5	OE3	CT	23OE3516	OE-III : Bhagwat Geeta - An Engineer's Interpretation	ARTS - IKS		
17	5	OE3	CT	23OE3517	OE-III : Artha shastra by Kautiliya	ARTS - IKS		
18	5	OE3	CSD	23OE3518	OE-III : Glimpses of Ancient science and Technology	ARTS - IKS		
19	5	OE3	CV	23OE3519	OE-III : Indian taxation system	COMMERCE		
20	5	OE3	CV	23OE3520	OE-III : Elements of share trading	COMMERCE		
21	5	OE3	EE	23OE3521	OE-III : Introduction to Fintech	COMMERCE		
22	5	OE3	EE	23OE3522	OE-III : Financial Analytics	COMMERCE		
23	5	OE3	ETC	23OE3523	OE-III : Fundamentals of Investments	COMMERCE		
24	5	OE3	EE	23OE3524	OE-III : Lifestyle Diseases	HEALTHCARE & MEDICINE		
25	5	OE3	EE	23OE3525	OE-III : Holistic Nutrition	HOME SCIENCE		
26	5	OE3	EL	23OE3526	OE-III : Community Organization & Development	HOME SCIENCE		
27	5	OE3	CSE	23OE3527	OE-III : Human Rights & International Laws	LAW		
28	5	OE3	CSE	23OE3528	OE-III : Cyber Crime Administration	LAW		
29	5	OE3	MATHS	23OE3529	OE-III : Finite Differences & Numerical Methods	SCIENCE		
30	5	OE3	MATHS	23OE3530	OE-III : Business Statistics	SCIENCE		
31	5	OE3	PHY	23OE3531	OE-III : Crystalline Solids: Properties and Applications.	SCIENCE		
32	5	OE3	PHY	23OE3532	OE-III : Nanotechnology: Fundamental to Applications	SCIENCE		
33	5	OE3	CHE	23OE3533	OE-III : Chemistry in daily life	SCIENCE		
34	5	OE3	CHE	23OE3534	OE-III : Battery Systems and Management	SCIENCE		
35	5	OE3	NPTL	23OE3535	OE-III : Designated approved online NPTEL Course	NPTL		
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Chairperson					Dean (Acad. Matters)	Date of Release	Version	



SN	Sem	Type	BoS/Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration n Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
SIXTH SEMESTER															
1	6	PC	AML	23AML1601	Machine Learning Essentials	T	3	0	0	3	3	30	30	40	3
2	6	PC	AML	23AML1602	Lab : Machine Learning Essentials	P	0	0	2	2	1		60	40	
3	6	PC	AML	23AML1603	Computer Networks	T	3	0	0	3	3	30	30	40	3
4	6	PC	AML	23AML1604	Advanced Artificial Intelligence	T	3	0	0	3	3	30	30	40	3
5	6	PC	AML	23AML1605	Lab : Advanced Artificial Intelligence	P	0	0	2	2	1	30	30	40	3
6	6	PC	AML	23AML1606	Design Thinking and Research Methodology	T	2	0	0	2	2	30	20	50	3
7	6	PE	AML		Professional Elective-II	T	3	0	0	3	3	30	30	40	3
8	6	PE	AML		Professional Elective-III	T	3	0	0	3	3	30	30	40	3
9	6	MDM	AML		MD Minor Course-IV	T	3	0	0	3	3	30	20	50	3
10	6	VSEC-4	AML	23AML1607	Lab : Vocational & Skill Enhancement - Linux administration and shell programming	P	0	0	2	4	2		60	40	
11	6	STR	AML	23AML1608	Project Phase-I	P	0	0	4	4	2		60	40	
TOTAL							20	0	10	32	26				

List of Mandatory Learning Course (MLC)															
1	6	HS	T&P	MLC126	YCAP6 : YCCE Communication Aptitude Preparation	A	3	0	0	3	0				

Professional Elective - II					
1	6	PE-II	AML	23AML1621	PE-II : Game Theory
2	6	PE-II	AML	23AML1622	PE-II : Blockchain Technology
3	6	PE-II	AML	23AML1623	PE-II : Industry 4.0
4	6	PE-II	AML	23AML1624	PE-II : Augmented Reality
5	6	PE-II	AML	23AML1625	PE-II : Customer Relationship Management

Professional Elective - III					
1	6	PE-III	AML	23AML1641	PE-III : Robotics and its Applications
2	6	PE-III	AML	23AML1642	PE-III : Distributed systems
3	6	PE-III	AML	23AML1643	PE-III : Software defined networking
4	6	PE-III	AML	23AML1644	PE-III : Cloud computing
5	6	PE-II	AML	23AML1645	PE-III : Product Development

Coursera Electives					
1	6	PE-II	AML	23AML1646	PE-II: IBM Deep Learning with PyTorch, Keras and Tensorflow Professional Certificate
		PE-II	AML	23AML1647	PE-II: Lab. IBM Deep Learning with PyTorch, Keras and Tensorflow Professional Certificate

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Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B.TECH SCHEME OF EXAMINATION 2023
(Scheme of Examination w.e.f. 2023-24 onward)
(Department of Computer Science & Engineering)
B. Tech. in Artificial Intelligence and Machine Learning

SoE No.
23AML-101

SN	Sem	Type	BoS/Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration n Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
SEVENTH SEMESTER															
1	7	PC	AML	23AML1701	Computer Vision	T	3	0	0	3	3	30	30	40	3
2	7	PC	AML	23AML1702	Deep Learning	T	3	0	0	3	3	30	30	40	3
3	7	PC	AML	23AML1703	Lab : Deep Learning	P	0	0	2	2	1		60	40	
4	7	PC	AML	23AML1704	Software Engineering	T	3	0	0	3	3	30	30	40	3
5	7	PC	AML	23AML1705	Language Processors	T	3	0	0	3	3	30	30	40	3
6	7	PC	AML	23AML1706	Lab : Language Processors	P	0	0	2	2	1		60	40	
7	7	PE	AML		Professional Elective-IV	T	3	0	0	3	3	30	30	40	3
8	7	PE	AML		Lab : Professional Elective-IV	P	0	0	2	2	1		60	40	
9	7	MDM	AML		MD Minor Course-V	T	2	0	0	2	2	30	20	50	3
10	7	STR	AML	23AML1707	Project Phase-II	P	0	0	8	8	4		60	40	
11	7	STR	AML	23AML1708	Campus Recrutment Training (CRT)	P	0	0	0	0	2			100	
12	7	STR	AML	23AML1709	Comprehensive Evaluation of Core Knowledge	P	0	0	2	2	1		60	40	
TOTAL							17	0	16	33	27				

Professional Elective - IV					
1	7	PE-IV	AML	23AML1721	PE-IV : Big data analytics
2	7	PE-IV	AML	23AML1722	PE-IV : Lab : Big data analytics
3	7	PE-IV	AML	23AML1723	PE-IV : MLops
4	7	PE-IV	AML	23AML1724	PE-IV : Lab : MLops
5	7	PE-IV	AML	23AML1725	PE-IV : Edge computing
6	7	PE-IV	AML	23AML1726	PE-IV : Lab : Edge computing
7	7	PE-IV	AML	23AML1727	PE-IV : Java Fullstack Development
8	7	PE-IV	AML	23AML1728	PE-IV : Lab : Java Fullstack Development

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(Scheme of Examination w.e.f. 2023-24 onward)
(Department of Computer Science & Engineering)
B. Tech. in Artificial Intelligence and Machine Learning

SoE No.
23AML-101

SN	Sem	Type	BoS/Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
EIGHTH SEMESTER															
1	8	PE	AML		Professional Elective-V	T	3	0	0	0	3	30	20	50	3
2	8	MDM	AML		MD Minor Course-VI	T	2	0	0	2	2	30	20	50	3
3	8	STR	AML	23AML1802	Internship / On Job training	P	0	0	14	14	7			100	
							5	0	14	16	12				
GRAND TOTAL							125	0	76	204	176				

Professional Elective -V					
1	8	PE-V	AML	23AML1821	PE-V : Natural Language Understanding and Generation
2	8	PE-V	AML	23AML1822	PE-V : Prompt Engineering
3	8	PE-V	AML	23AML1823	PE-V : Virtual Reality
4	8	PE-V	AML	23AML1824	PE-V : AI for medical domain
5	8	PE-V	AML	23AML1825	PE-V : Cyber Security

Multidisciplinary Minor Courses		
Track 1		
Courses	Sem	Artificial Intelligence and Machine learning
MDM-I	3	(MDM1AML101) Fundamentals of Data Structures
MDM-II	4	(MDM2AML102) Introduction to Analysis of Algorithms
MDM-III	5	(MDM3AML103) Data analysis and Statistics
MDM-IV	6	(MDM4AML104) Fundamentals of Artificial Intelligence
MDM-V	7	(MDM5AML105) Machine Learning and its Applications
MDM-VI	8	(MDM6AML106) Practical Machine Learning for Data analysis

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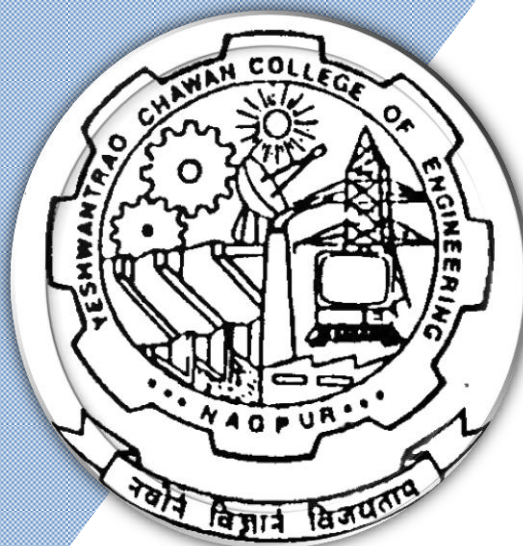
Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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(Accredited 'A++' Grade by NAAC with a score of 3.6)

Hingna Road, Wanadongri, Nagpur - 441 110



Bachelor of Technology SoE & Syllabus 2023 1st Semester

(Department of Computer Science & Engineering)

B. Tech in Artificial Intelligence and Machine Learning (AIML)



SN	Sem	Type	BoS/Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration n Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
FIRST SEMESTER (GROUP-A)															
1	1	BS	GE	23GE1101	Calculus and Vector	T	3	0	0	3	3	30	20	50	3
2	1	BS	GE	23GE1106	Engineering Chemistry	T	3	0	0	3	3	30	20	50	3
3	1	BS	GE	23GE1107	Lab : Engineering Chemistry	P	0	0	2	2	1		60	40	
4	1	HS/AEC1	GE	23GE1113	Technical Communication	T	2	0	0	2	2	30	20	50	3
5	1	HS/AEC2	GE	23GE1114	Lab : Technical Communication	P	0	0	2	2	1		60	40	
6	1	HS/IKS	GE	23GE1115	Indian Knowledge System	T	2	0	0	2	2	30	20	50	3
7	1	BES	CSE	23AML1103	Web Technology	T	2	0	0	2	2	30	20	50	3
8	1	BES	CSE	23AML1104	Lab : Web Technology	P	0	0	2	2	1		60	40	
9	1	BES	CSE	23AML1101	Introduction to Computer Programming	T	2	0	0	2	2	30	20	50	3
10	1	BES	CSE	23AML1102	Lab : Introduction to Computer Programming	P	0	0	2	2	1		60	40	
11	1	VSEC1	GE	23GE1117	Get Set Go	...	...	...	...	...	2		60	40	
12	1	LLC1	GE		Liberal Learning Course (LLC1)	...	...	...	...	...	2		60	40	
TOTAL FIRST SEM							14	0	8	22	22				

MANDATORY LEARNING COURSES															
1	1	HS		GE2301	Disaster Management and Preparedness	A	2	0	0	2	0				

SECOND SEMESTER (GROUP-A)															
1	2	BS	GE	23GE1203	Differential Equation and Complex Analysis	T	3	0	0	3	3	30	20	50	3
2	2	BS	GE	23GE1210	Applied Physics	T	3	0	0	3	3	30	20	50	3
3	2	BS	GE	23GE1211	Lab : Applied Physics	P	0	0	2	2	1		60	40	
4	2	BES	AML	23AML1205	Data Structure	T	3	0	0	3	3	30	20	50	3
5	2	BES	AML	23AML1206	Lab : Data Structure	P	0	0	2	2	1		60	40	
6	2	BES	EL	23EL1201	Basic Electrical and Electronics Engineering	T	3	0	0	3	3	30	20	50	3
7	2	PC	AML	23AML1207	Object Oriented Programming	T	3	0	0	3	3	30	20	50	3
8	2	PC	AML	23AML1208	Lab : Object Oriented Programming	P	0	0	2	2	1		60	40	
9	2	VSEC2	GE	23GE1218	Functional English	...	...	...	...	...	2		60	40	
10	2	LLC2	GE		Liberal Learning Course (LLC2)	...	...	...	...	...	2		60	40	
TOTAL SECOND SEM							15	0	6	21	22				

MANDATORY LEARNING COURSES															
1	2	HS	GE2131	Universal Human Values (UHV)		A	2	0	0	2	0				

MSEs* = Two MSEs of 15 Marks each will conducted and marks of these 2 MSEs will be considered for Continuous Assessment
TA ** = for Theory : TA1-5 marks on Proctored Online Exam, TA2-12 marks on activitied decided by course teacher, TA3 - 3 marks on class attendance
TA** = for Practical : MSPA will be 15 marks each

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(Department of Computer Science & Engineering)
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23AML-101

SN	Sem	Type	BoS/Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	

Liberal Learning Course					Subject
SN	Sem	Type	BoS/Deptt	Sub. Code	
1	2	CC2	GE	LLC1201	Music (Vocal)
2	2	CC2	GE	LLC1202	Music (Instrumental)
3	2	CC2	GE	LLC1203	Indian Classical Dance
4	2	CC2	GE	LLC1204	Folk Dances
5	2	CC2	GE	LLC1205	Painting
6	2	CC2	GE	LLC1206	Theatre and acting
7	2	CC2	GE	LLC1207	Photography
8	2	CC2	GE	LLC1208	Yoga
9	2	CC2	GE	LLC1209	Chess
10	2	CC2	GE	LLC1210	Athletics
11	2	CC2	GE	LLC1211	Basket Ball
12	2	CC2	GE	LLC1212	Judo
13	2	CC2	GE	LLC1213	Elements of Japanese Language
14	2	CC2	GE	LLC1214	Elements of German Language
15	2	CC2	GE	LLC1215	Elements of French Language
16	2	CC2	GE	LLC1216	Elements of Spanish Language
17	2	CC2	GE	LLC1217	Basics of Vedic Maths
18	2	CC2	GE	LLC1218	Skilling in Microsoft Visio and Inkscape
19	2	CC2	GE	LLC1219	Art of Public Speaking

Liberal Learning Course					Subject
SN	Sem	Type	BoS /Deptt	Sub. Code	
1	1	CC1	GE	LLC1101	Music (Vocal)
2	1	CC1	GE	LLC1102	Music (Instrumental)
3	1	CC1	GE	LLC1103	Indian Classical Dance
4	1	CC1	GE	LLC1104	Folk Dances
5	1	CC1	GE	LLC1105	Painting
6	1	CC1	GE	LLC1106	Theatre and acting
7	1	CC1	GE	LLC1107	Photography
8	1	CC1	GE	LLC1108	Yoga
9	1	CC1	GE	LLC1109	Chess
10	1	CC1	GE	LLC1110	Athletics
11	1	CC1	GE	LLC1111	Basket Ball
12	1	CC1	GE	LLC1112	Judo
13	1	CC1	GE	LLC1113	Elements of Japanese Language
14	1	CC1	GE	LLC1114	Elements of German Language
15	1	CC1	GE	LLC1115	Elements of French Language
16	1	CC1	GE	LLC1116	Elements of Spanish Language
17	1	CC1	GE	LLC1117	Basics of Vedic Maths
18	1	CC1	GE	LLC1118	Skilling in Microsoft Visio and Inkscape
19	1	CC1	GE	LLC1119	Art of Public Speaking

MSEs* = Two MSEs of 15 Marks each will conducted and marks of these 2 MSEs will be considered for Continuous Assessment
TA ** = for Theory : TA1-5 marks on Proctored Online Exam, TA2-12 marks on activitied decided by course teacher, TA3 - 3 marks on class attendance
TA = for Practical : MSPA will be 15 marks each**

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(Scheme of Examination w.e.f. 2023-24 onward)
(Department of Mathematics & Humanities)

SoE No.
23FY-101

B.Tech First Year

I SEMESTER

23GE1101: Calculus and Vector

Course Outcomes :

The students will be able to

1. Apply the knowledge of differentiation to solve the Engineering problems.
2. Determine the derivatives of functions of several variables and develop the relations among the derivatives of variables.
3. Apply the knowledge of Beta and Gamma functions to find area, volume and mass.
4. Discuss Calculus of Scalar and vector point function and use appropriate theorems to evaluate integrals of functions of single and multiple variables.

Unit I: Differential Calculus

(7 Hrs.)

Successive differentiation, n^{th} derivative of rational function, Trigonometrical transformations, n^{th} derivative of the product of two functions (Leibnitz's theorem), Taylor's theorem, Use of Maclaurin's theorem for one variable, standard expansions, Examples on Taylor's Theorem. **(Contemporary Issues related to Topic)**

Unit II: Partial Differentiation

(8 Hrs.)

Derivative of Functions of several variables, First and higher order derivatives, Homogeneous functions, Euler's theorem on homogeneous function, Chain rule and total differential coefficient of composite functions, Jacobians, Properties of Jacobians, Relation between functions **(Contemporary Issues related to Topic)**

Unit III: Integral Calculus

(7 Hrs.)

Gamma function, Transformation of Gamma functions, Beta function, Transformation of Beta functions, Properties of Beta function (without proof), Relation between Beta and Gamma functions, Differentiation under Integral sign (Leibniz rule). **(Contemporary Issues related to Topic)**

Unit IV: Multiple integrals

(8 Hrs.)

Double integral, change of order of integral, change of variables, triple integrals and its applications on Area, Mass, Centre of Gravity, Volume **(Contemporary Issues related to Topic)**

Unit V: Vector Calculus

(7 Hrs.)

Vector fields, Vector differentiation, Gradient, Divergence and Curl, Directional derivatives with physical interpretation, Solenoidal and irrotational motions. **(Contemporary Issues related to Topic)**

Unit VI: Vector Integration & Applications

(8 Hrs.)

Vector integration: Line, surface and volume integrals, Statement of Stoke's theorem, Gauss divergence theorem and Green's theorem (without proof), Simple applications of these theorems. **(Contemporary Issues related to Topic)**

Total Lecture 45 Hours

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(Scheme of Examination w.e.f. 2023-24 onward)
(Department of Mathematics & Humanities)

SoE No.
23FY-101

B.Tech First Year

Textbooks:

1. Erwin Kreyzig, Advance Engineering Mathematics, 10th Edition, John Wiley and Sons, INC.
2. H.K. Dass, Engineering Mathematics, 11th revised edition, S. Chand, Delhi.
3. H.K. Dass, Advanced Engineering Mathematics, 8th revised edition, S. Chand, Delhi.
4. Dr. B.S. Grewal, Higher Engineering Mathematics, 42th edition, Khanna Publishers.
5. P.N.Wartikar and J.N.Wartikar, Applied Mathematics, 4th Edition, Vidyarthi GrihaPrakashan.

Reference Books:

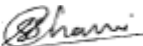
1. G B Thomas and R L Finney, Calculus and Analytical Geometry, 9th edition, Addison-Wesley, 1999.
2. Michael Spivak and Tom Apostol, Calculus, Vol I & Vol II 2nd edition, Wiley.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, 10th edition, Laxmi Prakashan.

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1. <http://103.152.199.179/YCCE/Supported%20file/Supported%20file/e-copies%20of%20books/Applied%20Sciences%20&%20Humanities/Mathematics%20and%20Humanities/>

MOOCs Links and additional reading, learning, video material

1. <https://nptel.ac.in/courses/111/106/111106146/>
2. <https://nitkkr.ac.in/docs/5-Multiple%20Integrals%20and%20their%20Applications.pdf>

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B. Tech SoE and Syllabus 2023
(Scheme of Examination w.e.f. 2023-24 onward)
(Department of Applied Chemistry)

B.Tech First Year

SoE No.
23FY-101

I/II SEMESTER

23GE1106/23GE1206: Engineering Chemistry

Course Outcomes :

Upon successful completion of the course the students will be able to:

1. **Build** the knowledge of qualitative and quantitative aspects of water for industrial and domestic applications. (L3)
2. **Apply** fundamental principles of electrochemistry to understand corrosion, energy storage devices and their industrial applications. (L3)
3. **Develop** insight into spectroscopic techniques for material characterization. (L3)
4. **Utilize** knowledge of advanced engineering materials for technological applications. (L3).

Unit I: Water Chemistry

(8 Hrs.)

Introduction, Potable water quality parameters. Hardness, Types of hardness. Sterilization. Desalination of water by R.O. Softening of water by Zeolite process and Ion Exchange Process (principle, advantages, and limitations). Numerical based on Hardness and Zeolite process. Boiler trouble (Scale and sludge). Contemporary issues related to the topic.

Unit II: Electrochemistry

(8 Hrs.)

Introduction, Redox reactions, EMF of a cell, standard electrode potential, Nernst equation, numerical and applications to chemical cells. Conductance in electrolytic solutions, specific and molar conductivity, variations of conductivity with concentration, Electrolysis, laws of electrolysis and numerical.

Industrial applications: Electroplating, Electrolytic refining.

Corrosion: Definition, Causes, theories of corrosion- dry, wet and differential aeration.

Contemporary issues related to the topic.

Unit III: Energy storage devices

(7 Hrs.)

Battery: Introduction, Characteristics, and General applications

Lithium-ion battery, Glass battery, H_2 - O_2 Fuel cell. Differences between Battery and Fuel cell. Recycling and safe disposal of batteries.

Supercapacitors: Definition, Types, Characteristics, and Application.

H_2 as a green fuel: Introduction, Production, Storage, and Utilization. Contemporary issues related to the topic.

Unit IV: Spectroscopic Techniques and Applications

(7 Hrs.)

Introduction, fundamentals, types, principles, and selection rules of spectroscopy.

Basic principle and applications of UV- Visible, IR, NMR Spectroscopy and numerical.

Contemporary issues related to the topic.

Unit V: Drugs & Polymer chemistry

(8 Hrs.)

Drugs: Introduction, types of drugs, synthesis of commonly used drug molecules such as aspirin and paracetamol.

Polymer: Introduction, Classification of polymers, Use and disposal of polymers.

Properties of polymers - Solubility, Molecular Weight, Crystallinity and Glass transition temperature.

Synthesis of conducting polymers: Polyaniline, Polypyrrole. Contemporary issues related to the topic.

Unit VI: Advanced Materials

(7 Hrs.)

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(Department of Applied Chemistry)

SoE No.
23FY-101

B.Tech in CT/IT/CSE/AIDS/AIML/CSD/CSE-IoT

Nanomaterials: Definition, Carbon Nanotubes and types. Applications of Nanomaterials in Electronics, Environment and Medicine.

Chemical sensors: Types and application.

Liquid Crystal Polymers: Introduction, General properties and applications.

Polymers in electronic industries: Introduction, Piezo, Pyroelectric, Ferroelectric polymers.

Smart materials: Introduction, Properties and applications of Chromoactive, Photoactive and Magneto rheological materials. Contemporary issues related to the topic

Total Lecture 45 Hours

Text books

- 1 S S. Dara, A Textbook of Engineering Chemistry, S. Chand & Co New Delhi. Eleventh Edition.
- 2 P.C. Jain and Monica Jain, Engineering Chemistry, Dhanpat Rai & sons New Delhi, Sixteenth Edition.
- 3 P. W. Atkins, Physical Chemistry, Oxford Publications, Eighth edition.
- 4 Y.R. Sharma, Elementary organic spectroscopy, S. Chand and company private limited.

Reference Books

1. B.K.Sharma Krishna, Engineering Chemistry, Prakashan media private LTD. 1st Edition, 2014.
2. CNR Rao, Chemistry of Advanced Materials, Willey Publications, 1993.
3. Fred. Billmeyer Jr., A textbook of polymer science, Wiley India, 2nd Edition.
4. Robert B Leighou, Chemistry of Engineering Materials, Hill Book Company, Inc New York
5. C.N. Banwell, Fundamentals of Molecular Spectroscopy, Mc Graw hill education, 4th Edition
6. William C. O'Mara, Robert B. Herring, Handbook of Semiconductor Silicon Technology, Noyes Publications Park Ridge, NJ, USA. 1st Edition.

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

- 1 <http://103.152.199.179/YCCE/Supported%20file/Supported%20file/SERIES%20WISE%20BOOKS/CHEMISTRY/>

MOOCs Links and additional reading, learning, video material

- 1 <https://www.youtube.com/watch?v=XTt3gXB0a84>
- 2 <https://www.youtube.com/watch?v=iihYXx79QiE>
- 3 <https://www.youtube.com/watch?v=JfJ7MIP9Dco>
- 4 <https://www.youtube.com/watch?v=L2VSOccUrSk>
- 5 <https://www.youtube.com/watch?v=p5pk4Um6lsk>
- 6 <https://www.youtube.com/watch?v=zVDMgoffmC0>

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(Department of Applied Chemistry)
B.Tech First Year

SoE No.
23FY-101

I/II SEMESTER

23GE1107/23GE1207: Engineering Chemistry Lab

Course Objectives (PR)

- 1) Develop analytical ability.
- 2) Integrate chemistry fundamentals with practical applications.

Course Outcomes

Upon successful completion of the course the students will be able to

1. **Apply** the knowledge of quantitative and qualitative chemical analysis to perform record and analyze the results. (L3)
2. **Experiment** with instrumental and analytical techniques in Chemistry to solve engineering problems related to sustainability. (L3)
3. **Write** effective reports and communicate through oral presentations. (L3)
4. **Review** and apply laboratory safety protocols and procedures to acquire the ability for independent and lifelong learning. (L3)

Total 9 experiments are to be performed

(4 each from Lab I and Lab II and one demonstration experiment)

SN	Experiments based on
	List of Experiments-Lab- I
1	Estimation of Nickel.
2	Estimation of Fe^{2+} ions by redox titration
3	Determination of copper by iodometric titration
4	Determination of Cation exchange capacity of an ion exchange resin
5	To determine the strength of a given potassium dichromate solution with N/20 sodium thiosulphate solution
6	Determination of COD of water sample.
	List of Experiments-Lab- II
1	Determination of viscosity of lubricating oil by Redwood Viscometer I or II
2	Determination of molecular weight of a polymer.
3	Proximate analysis of coal
4	Determination of electrochemical equivalence of copper using Faradays Law
5	Determination of strength of the given acid conductometrically.
6	To verify Beer-Lambert law for KMnO_4 calorimetrically and determine the concentration of the given solution of KMnO_4 .
	List of Demonstration Experiments
1	Synthesis of urea formaldehyde.

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Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B. Tech SoE and Syllabus 2023

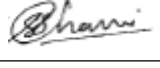
(Scheme of Examination w.e.f. 2023-24 onward)

(Department of Applied Chemistry)

B.Tech in CT/IT/CSE/AIDS/AIML/CSD/IOT

SoE No.
23FY-101

Advanced Topics (CBS)	
1.	To Determine optimum alum dosage for water or wastewater treatment by turbidity measurement using nephelometer and residual chlorine testing using chloroscope.
2.	Comparative study of effects of different drying techniques on the quality of fruits and vegetables.

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B. Tech SoE and Syllabus 2023
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(Department of Mathematics & Humanities)

SoE No.
23FY-101

B.Tech First Year

I SEMESTER

23GE1113 : Technical Communication

Course Outcomes :

Upon successful completion of the course the students will be able to:

1. Apply different modes for effective communication
2. Produce competently the Phonology of English language
3. Apply nuances of LSRW skills
4. Practice Communication through different channels

Unit I: Basics of Communication	(7 Hrs.)
Process of Communication, Levels of Communication, Flow of Communication, Networks of Communication, Barriers to communication- Intrapersonal, Interpersonal, Organizational	
Unit II: English Phonetics	(8 Hrs.)
Speech Mechanism, Organs of speech, Consonant and Vowels sounds symbols, word stress rules	
Unit III: Presentation & Visual Communication , Reading & Listening Skills	(7 Hrs.)
Presentation-Purpose, Analysing Audience & Locale, Organizing Contents, Nuances of presentation- Kinesics, Proxemics, Chronemics, Vocalics, Modes of Presentation, Visual Communication –Introduction & importance, Role & Psychology of color in visual communication, Listening Skills -definition types and traits	
Unit IV: Research Paper & Technical Communication	(8 Hrs.)
Research Paper - Characteristics, components, Title, Abstract, Introductory Paragraph, Body of Presentation Conclusion, Acknowledgements , List of Symbols, References Memo- Objectives, Types, Structure and Layout Email-Etiquette , acronyms	
Total Lecture 30 Hours	

Textbooks:

1.	Meenakshi Raman & Sangeeta Sharma, Technical Communication, Raman & Sharma, Oxford University Press Orford University Press
2.	T. Balasubramaniam, Textbook of English Phonetics for Indian Students, Macmillan India Ltd

			July, 2023	1.00	Applicable for AY 2023-24 Onwards
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SoE No.
23FY-101

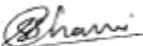
B.Tech First Year

Reference Books:

- | | |
|----|---|
| 1. | Dale Carnegie ,How to Develop Self – Confidence & Influence People by Public Speaking |
| 2. | AshaKaul, Communication Skills |
| 3. | Allen Peas ,Body Language |
| 4. | Gerson's Gerson, Technical Communication |

MOOCs Links and additional reading, learning, video material

- | | |
|----|---|
| 1. | https://dl.uswr.ac.ir/bitstream/Hannan/141245/1/9781138219120.pdf |
| 2. | https://www.pdfdrive.com/word-power-made-easy-the-complete-handbook-for-building-a-superiorvocabulary-e157841139.html |
| 3. | https://www.pdfdrive.com/improve-your-communication-skills-present-with-confidence-write-with-stylelearn-skills-of-persuasion-e156963640.html |
| 4. | https://www.pdfdrive.com/21-days-of-effective-communication-everyday-habits-and-exercises-to-improveyour-communication-skills-and-social-intelligence-e158273760.html |

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SoE No.
23FY-101

B.Tech First Year

I SEMESTER

23GE1114 : Lab. Technical Communication

Course Outcomes :

Upon successful completion of the course the students will be able to:

1. Apply different modes for effective communication
2. competently use the phonology of English language
3. Apply nuances of LSRW skills
4. Communicate through different channels

Lab I	(2 Hrs.)
Handson for Consonants and vowel sounds (Contemporary issues related to topic)	
Lab II	(2 Hrs.)
Identifying the pragmatic meaning of the text (Contemporary issues related to topic)	
Lab III	(2 Hrs.)
Sessions for Interview (Contemporary issues related to topic)	
Lab IV	(2 Hrs.)
Grooming session for effective use of body language (Contemporary issues related to topic)	
Lab V	(2 Hrs.)
Visual Media – preparing poster boards, advertising product (Contemporary issues related to topic)	
Lab VI	(2 Hrs.)
Group Discussion (Contemporary issues related to topic)	
Total Lecture	12 Hours

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(Department of Mathematics & Humanities)

SoE No.
23FY-101

B.Tech First Year

Textbooks:

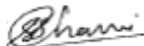
- | | |
|----|---|
| 1. | Technical Communication, 3 rd Edition, Raman & Sharma, Oxford University Press |
| 2. | Textbook of English Phonetics for Indian Students, 3 rd Edition, T. Balasubramaniam, Macmillan India Ltd |

Reference Books:

- | | |
|----|--|
| 1. | How to Develop Self – Confidence & Influence People by Public Speaking, 1st Edition, Dale Carnegie |
| 2. | Communication Skills, 2nd Edition, Asha Kaul |
| 3. | Body Language, 1st Edition, Allen Peas |
| 4. | Technical Communication, January 2003, Gerson's Gerson |

MOOCs Links and additional reading, learning, video material

- | | |
|----|---|
| 1. | https://youtu.be/XoVLa6Dqd5I |
| 2. | https://youtu.be/45uNWLmAZR8 |

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(Department of Mathematics & Humanities)

SoE No.
23FY-101

B.Tech First Year

I SEMESTER

23GE1115 : Indian Knowledge System

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Apply primary requirements pertaining towards awareness of Indian Knowledge System.
2. Analyze various Indian society, culture and literature to enhance their traditions.
3. Evaluate structure of Indian art.
4. Understand Indian heritage and architectural skills.

Unit:1	Introduction to Indian Civilization	7 Hours
Development of Human Civilization with specific reference: Stone age: Tool Technology and Cultural Development, Indus Valley civilization, Vedic Civilization. (Contemporary Issues related to Topic)		
Unit:2	Indian Society, Culture and Literature	7 Hours
Society and its types, Culture and its Characteristics, Foundational Literature. (Contemporary Issues related to Topic)		
Unit:3	Tradition of Indian Art and Painting	8 Hours
Indian Traditional Painting, Art style folk, mural with Gandhara and Mathura school of art. (Contemporary Issues related to Topic)		
Unit:4	Indic Traditions of Architecture, Design and Planning	8 Hours
Monumental studies of architectural skill: Rock Cut Caves, Stupa and Temple Architecture, The Ancient cities of Indus Saraswati region. Town Planning and drainage system. (Contemporary Issues related to Topic)		
Total Lecture Hours		30 Hours

Textbooks

1	Reader's Digest: Vanished Civilizations, THE READER'S DIGEST ASSOCIATION LIMITED, LONDON, NEWYORK.
2	Qaiser Zoha Alam ; Language and Literature Divers Indian Experience
3	Bal Ram Singh (Author), Nath Girish (Author) ; Science and Technology in Ancient Indian Texts
4	NCERT Books

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(Department of Mathematics & Humanities)

SoE No.
23FY-101

B.Tech First Year

Reference Books

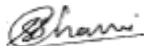
1	B S Harishankar; Art and Archaeology of India: Stone Age to the Present, 2003.
2	Gupte R S and Mahajan B D; Ajanta, Ellora and Aurangabad, 1962.
3	Dharampal, Some Aspects of Earlier Indian Society and Polity and Their Relevance Today, New Quest Publications, Pune, 1987.
4	Michel Lorblanchet, "Rock Art In The Old World" IGNCA series, in India
5	Percy Brown, "Indian Architecture" D. B. Taraporevala sons & co. Pvt. Ltd. Bombay(1959).

PPT's/Research papers

1	https://www.researchgate.net/publication/360889208_STONE_AGE_TOOL_TECHNOLOGY_and_CULTURAL_DEVELOPMENT
2	https://scholar.google.com/citations?view_op=view_citation&hl=en&user=iT1KSV8AAAAJ&sortby=pubdate&citation_for_view=iT1KSV8AAAAJ:UeHWp8X0CEIC

MOOCs Links and additional reading, learning, video material

1	https://prepp.in/news/e-492-indian-architecture-art-and-culture-notes
2	https://www.artzolo.com/blog/most-famous-indian-painting-styles
3	https://www.researchgate.net/publication/360889332_Stone_Age_Tool_Technology_Cultural_Development
4	https://testbook.com/ias-preparation/ancient-history-16-mahajanapadas

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(Department of Computer Science & Engineering)

**SoE No.
23AML-101**

B.Tech. in Artificial Intelligence and Machine Learning

I SEMESTER

23AML1103 : Web Technology

Course Outcomes :

On completion of this course, the student will be able to

1. Develop and design structured web pages using HTML and various list, table, and hyperlink elements.
2. Apply CSS styling techniques to enhance the appearance of web pages using inline, internal, and external stylesheets
3. Design and develop web forms using HTML form elements and validate user input with JavaScript.
4. Implement interactive web elements using JavaScript, including loops, conditional statements, functions, and dialog boxes.

UNIT I: Introduction to internet and HTML5

7

Overview of Internet, Intranet, WWW, Internet Protocols (HTTP, FTP, SMTP), Email, broadband.

HTML5: Web server, Web Client/Browser, Structure of an HTML Program, Basic HTML Tags(Headings, Paragraph, Division, Text formatting, Image, Anchors), HTML Lists (Ordered Lists, Unordered Lists, Description Lists), HTML Attributes, HTML Links (Href Attribute, Target Attribute).

(Contemporary Issues related to Topic)

UNIT II: Table handling in HTML and Creating Forms

6

Table handling in HTML: width and border attribute, CELLPADDING attribute, CELLSPACING attribute, COLSPAN and ROWSPAN attributes, background color attribute, HTML Forms: Elements to Capturing Form Data, Properties of Form Elements, HTML Layout Elements(Semantic Elements), HTML style attribute, HTML class and id attribute.

(Contemporary Issues related to Topic)

UNIT III: Cascading Style Sheets (CSS3)

6

Introduction to CSS, Differences between CSS3 and earlier CSS specifications, CSS Syntax, CSS selectors, Inserting CSS: Inline, Internal, External, CSS properties: Background, Text, Font, Border, Margin, Padding, List, Dimension, and Classification.

(Contemporary Issues related to Topic)

UNIT IV: Java Script

7

Introduction to Java Script, Functions of JavaScript, Variables and Data Types, Operators, Loops and control statement: if ..Statement, if...else Statement, else if Statement, JavaScript Switch Statement, JavaScript Functions, JavaScript Loops: for loop, while loop, do...while loop, Dialog Boxes, JavaScript Events.

(Contemporary Issues related to Topic)

Total Lectures

26

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(Department of Computer Science & Engineering)

SoE No.
23AML-101

B.Tech. in Artificial Intelligence and Machine Learning

Text Books

- | | |
|----|---|
| 1. | Web Technologies Black Book: HTML, JavaScript, PHP, Java, JSP, XML and AJAX, 1st Edition, Dreamtech Press |
|----|---|

Reference Books

- | | |
|----|--|
| 1. | HTML & CSS: The Complete Reference, Fifth Edition, Thomas A. Powell, The McGraw-Hill Companies, Inc. |
| 2. | Web Technologies, Ivan Bayross, BPB Publication |

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

- | | |
|---|---|
| 1 | http://103.152.199.179/YCCE/Supported%20file/Supported%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/HTML...the_complete_reference.pdf |
| 2 | http://103.152.199.179/YCCE/Supported%20file/Supported%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/JavaScript%20Programmer's%20Reference.pdf |

MOOCs Links and additional reading, learning, video material

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|----|---|
| 1. | https://onlinecourses.swayam2.ac.in/nou20_cs05/preview |
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**SoE No.
23AML-101**

B.Tech. in Artificial Intelligence and Machine Learning

I SEMESTER

23AML1104 : Lab. Web Technology

List of Experiment

Sr. No.	Experiments based on
1	Implement basic HTML Tags.
2	Write a HTML code to illustrate the usage of the following - Ordered Lists - Unordered Lists - Description Lists
3	Write a HTML code to display data in tabular form (row* column) using HTML table tags
4	Write a HTML code to create a home page having three links: About us, Services and Contact us create separate web pages for the three links.
5	Develop and demonstrate the usage of inline, internal and external style sheet using CSS.
6	Create web forms by using form tags in HTML.
7	a) Program to demonstrate the use of java Script in while and for loops. b) Program to demonstrate the use of java Script in conditional statements and functions.
8	Develop and demonstrate the usage of jQuery
9	Introduction to XML program to demonstrate the use of External and Internal DTD.
10	Create a single page responsive website using Bootstrap

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**SoE No.
23AML-101**

B.Tech. in Artificial Intelligence and Machine Learning

I SEMESTER

23AML1101 : Introduction to Computer Programming

Course Outcomes :

On completion of this course, the student will be able to

- 1) Understand the fundamental components of a computer system, their operations, and the basics of algorithms and flowcharts.
- 2) Apply programming concepts, syntax, and control structures to develop and analyze effective solutions.
- 3) Develop analytical approaches by utilizing decision-making techniques to design and implement efficient solutions.
- 4) Apply programming concepts to develop efficient solutions for real-world applications.

Unit No.	Contents	Max. Hrs.
1	Computer System Basics: Introduction to components of a computer system (disks, memory, processor), how program is executed, understanding of concepts such as operating system, compilers, source and object programs, etc. Introduction to algorithms and flowcharts. Basic building blocks of C: Character set, variables, identifiers & keywords, Data types, Operators: arithmetic, logical and relational operators. Expressions, sizeof() operator, constants, typedef statement, basic input/output statements and functions (scanf, printf, getch, putch, gets, puts), Introduction to library functions, writing straight line programs.	7
2	Decision control statements: if, if - else and nested if-else statements, else-if ladder statement, switch-case control statement. Loop Structures: While, do while and for loops, break and continue statement, "goto" statement, real life programming examples based on these loop structures, bitwise operators, real life programming examples.	7
3	Modular programming: Concept of functions, user defined functions, function prototypes, formal parameters, actual parameters, return types, call by value , C programs using functions, Recursive functions, Concepts of a pointer, call by reference, types of programming errors, real life programming examples	6
4	Arrays: One dimensional array, insertion, deletion of an element, Two-dimensional arrays: matrix representation, programs for basic matrix operations such as addition, multiplication and transpose, Array as function arguments. Strings: string representation and string handling functions. Structure and Union, concept of pre-processor directives and macros	6
Total Lectures		26

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SoE No.
23AML-101

B.Tech. in Artificial Intelligence and Machine Learning

Text Books

1. Mastering C, K.R.Venugopal & S.R. Prasad, TMH,2007.
2. Programming in ANSI C, E. Balaguruswamy, Mc Graw Hill Education
3. The C Programming Language, J.B.W.Kernighan & D.M.Ritchie, Prentice Hall

Reference Books

- 1.Problem Solving And Program Design In C, Jeri. R. Hanly, Elliot B. KoffmanPearson Education
- 2.Programming with C, Byron Gottfried, Schaum;s Outline Series
- 3.How to solve it by computers, R. G. Dromey, Prentice Hall India

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

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|---|---|
| 1 | http://103.152.199.179/YCCE/Supported%20file/Supported%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/Programming%20with%20C.pdf |
| 2 | http://103.152.199.179/YCCE/Supported%20file/Supported%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/C-in-depth-2nd-ed.pdf |
| 3 | http://103.152.199.179/YCCE/Supported%20file/Supported%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/The%20C%20Programming%20Language%20-%202nd%20Edition%20-%20Ritchie%20Kernighan.pdf |

MOOCs Links and additional reading, learning, video material

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|----|---|
| 1. | https://archive.nptel.ac.in/courses/106/104/106104128/ |
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SoE No.
23AML-101

B.Tech. in Artificial Intelligence and Machine Learning

I SEMESTER

23AML1102 : Lab. Introduction to Computer Programming

Course Outcome

On completion of this course, the student will be able to

- 1) To develop and run C programs on Linux system
- 2) To develop programs using conditional statements and loops.
- 3) To develop user defined functions required to solve a given problem
- 4) To understand and use single and multi-dimensional arrays as a data structure for problem solving.
- 5) To understand the basics of Strings, Structures, Unions, and File handling and its use for problem solving.
- 6) To understand the given problem statement of a real-life problem and write a program to solve it.

List of Practical's

Sr. No.	Problem Statements			
1	Introduction to Linux Operating system & its different commands.			
2	Introduction to editor, Compilation and Execution of a program in Linux			
3	a) Write a C program to display Your Name, Address and City in different lines. b) Write a C program to convert centigrade into Fahrenheit. Formula: $C = (F - 32) / 1.8$.			
4	Write program using conditional operators to evaluate the following function and print the value of y. $y = 2.4x + 3$, for $x \leq 2$ $y = 3x - 5$, for $x > 2$			
5	Write a program to implement the following table, which tries to predict if a customer would buy a product. In particular, you need to ask for inputs Age, Gender and City, and print one of the three outputs Yes, No or Cannot Say.			
	Age	Gender	City	Will Buy?
	25-30	M	Chennai	Yes
	33-45	F	Bangalore	Yes
	57-80	F	Chennai	No
	25-30	F	Hyderabad	No
	13-19	M	Bangalore	Yes
	16-20	M	Chennai	No

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B.Tech. in Artificial Intelligence and Machine Learning

6	Write a menu driven program to perform following operations. 1) To display maximum number among inputted three number. 2) To display the final prize based on assumption that if total purchase price is above 2500 rs then discount is 25% and if total prize is above 5000 then discount is 30% else 40% discount. 3) To Display percentage of 2nd number to 1st number if two numbers is entered by the user. 4) Exit.
7	Write a program print whether entered number is Prime or not
8	Write a program to print the sum of exponential series $e(x) = 1 + x/1! + x^2/2! + x^3/3! + \dots$
9	Write a program to print the given number pyramid
10	Write a program in C that will scan a number N and then output the sum of the powers from 1 to N. thus, if the input is 4, the output should be 288. E.g. $(1)^1 + (2)^2 + (3)^3 + (4)^4 = 1 + 4 + 27 + 256 = 288$ [1,2,3,4] Write a recursive function to print Factorial of a entered number. Use power function to calculate the power of number. Write a recursive function to print Factorial of a entered number.

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(Department of Civil Engineering)

SoE No.
23FY-101

B.Tech in FYC

I SEMESTER

23GE1117-Get Set Go

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Students will understand the importance of building trust in communication and learn how to use the 3Vs of communication (Visual, Vocal, Verbal) to energize their interactions.
2. The course will focus on leadership principles and styles, emphasizing how effective communication can motivate others and gain willing cooperation. Students will participate in activities like skits and team presentations to demonstrate their leadership skills.
3. The course will equip students with team management and organization skills, enabling them to lead and participate in team-building activities effectively.

Unit:1	Build a foundation for success	6 Hours
Explain the Importance of Process of improvement, stating your Name with Impact, Recall and Use Names, Name Remembering Formula o LIRA o PACE – Individual Activity o BRAMMS o Chaining Method, Introduce “My Vision” Communication Fundamentals for Building Trust- Be a good listener, use conversation links, show genuine interest Hi-Five of Success ♣ Build on Memory Skills and Enhance Relationships ♣ PEG words ♣ Explain Permanent PEG Memory System, energize our Communications – Explain 3Vs of communication – Visual-Vocal-Verbal Activity – Practice Conversations, Pause-Part-Punch, Group Activity		
Unit:2	Increase Self Confidence	6 Hours
Use our experiences to communicate more confidently • Communicate with clarity and conciseness • Discover how past experiences influence behaviour ,Motivate Others and Enhance Relationships- • Learning Objectives • Explain Gain Willing Cooperation Principles • Group Presentation • Explain Demonstration of Leadership Principles • Explain “Evidence” critical in establishing credibility Individual Activity – Sharing of defining moment, Skit to demonstrate Leadership Principles, Stranded on Island .		
Unit:3	Fundamentals of Communication	6 Hours
Fundamentals of Communication (Earn the right – Excite -Eagerness) ♣ Elevator Pitch ♣ Develop more Flexibility, ♣ Recap and Summarize Activities - – Individual Presentation, Flexibility Drills, Individual Presentations – My Vision Assignment		
Unit:4	Team Management and Organization skills	5 Hours
Team Management and Organization skills, Leadership Styles, Effective Communication Activity- Team Presentation, Team building activities.		
EVALUATION	1 Hour	EVALUATION
WRITTEN TEST		
Total Lecture Hours		24 Hours

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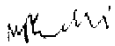
B. Tech SoE and Syllabus 2023
(Scheme of Examination w.e.f. 2023-24 onward)
(Department of Civil Engineering)

SoE No.
23FY-101

B.Tech in FYC

Reference Books

- | | |
|---|---|
| 1 | Soft Skills - Enhancing Employability: Connecting Campus with Corporate. - M S Rao |
| 2 | Soft Skills Training: A Workbook to Develop Skills for Employment - Frederick H Wentz |
| 3 | Soft Skills: Know Yourself and Know the World - Alex |

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(Department of Civil Engineering)
B.Tech in Civil Engineering

SoE No.
23CV-101

I & II SEMESTER

Audit Course

GE2301 : Disaster Management and Preparedness

Course Outcomes :

Upon successful completion of the course, the students will be able to

CO1: Explain the basic concepts, classifications and causes of disasters.

CO2: Identify the impacts of disasters on society, environment and economy.

CO3: Describe disaster risk reduction measures and disaster management practices.

CO4: Explain sustainable recovery methods and accessibility measures during disasters.

Unit:1 Introduction to Disasters 7 Hours

Definition and Classification: Natural and Man-made disasters; Concepts: Hazard, vulnerability, risk, resilience, capacity building; Disaster Cycle: Preparedness, response, recovery, mitigation; Brief about Global and Indian perspectives: Case studies

Unit:2 Common Disasters and Their Safety Measures 6 Hours

Natural Disasters : Earthquakes, Landslides, Tsunamis, Floods, Glacial lake outburst floods (GLOFs) ; Volcanic Eruptions Types, monitoring, volcanic hazards ; Cloud burst, Cyclones & Storm Surges, Classification, impacts, prediction ; Forest Fires: Causes, spread, control measures; Desertification and Droughts: Types, causes, and management; Anthropogenic Disasters: Industrial & Chemical Accidents; Nuclear Hazards , safety measures; Urban Disasters: Building collapses, fires ; Environmental Pollution: Air, water, soil contamination incidents

Unit:3 Disaster Impacts and Disaster Preparedness 7 Hours

Disaster impacts: (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

Emergency preparedness: Evacuation, emergency kits, and communication; Early warning systems and basic use of GIS in disaster management; relief and rehabilitation: Temporary shelters and community support.

Unit:4 Disaster Management & Policies, Institutions, and Governance 6 Hours

Disaster Management Act, 2005 and amendments – Overview, National and State Disaster Management Authorities (NDMA & SDMA), Disaster Risk Reduction (DRR) and the Sendai Framework, Role of Government, NGOs, and Community in disaster management, Responsibilities of citizens and engineers during disasters.

Total Lecture 26 Hours

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SoE No.
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Text books

1	Anil K. Gupta, Pradeep K. Goyal(2026). Disaster Management, Khanna Publishing House
2	R Subramanian(2023). Disaster Management . Vikas Publication
3	Coppola, D.P. (2015). Introduction to International Disaster Management. Elsevier.
4	Shaw, R., & Krishnamurthy, R. (2009). Disaster Management: Global Challenges and Local Solutions. Universities Press.
5	Alexander, D. (2002). Principles of Emergency Planning and Management. Oxford University Press.

Reference Books

1	NDMA (2005 & updates). Disaster Management Guidelines. Government of India
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YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1	https://onlinecourses.swayam2.ac.in/e-learning/preview/cec24_hs83
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MOOCs Links and additional reading, learning, video material

1	https://www.youtube.com/watch?v=-dxhci6s9tY
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			July, 2026	1.00	Applicable for AY 2026-27 Onwards
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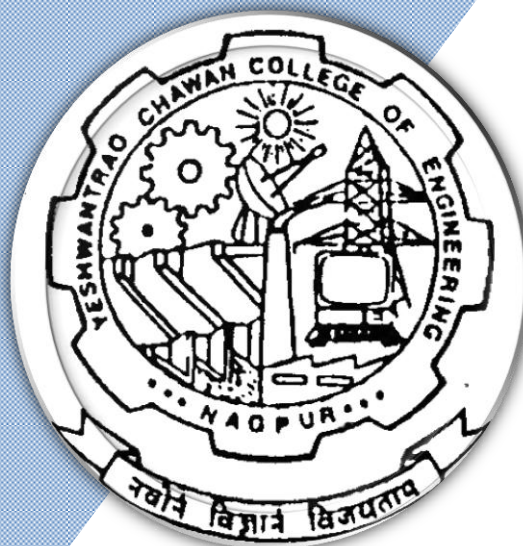
Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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(Accredited 'A++' Grade by NAAC with a score of 3.6)

Hingna Road, Wanadongri, Nagpur - 441 110



Bachelor of Technology SoE & Syllabus 2023 2nd Semester

(Department of Computer Science & Engineering)

B. Tech in Artificial Intelligence and Machine Learning (AIML)



Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
 (An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.TECH SCHEME OF EXAMINATION 2023
 (Scheme of Examination w.e.f. 2023-24 onward)
 (Department of Computer Science & Engineering)
B.Tech. in Artificial Intelligence and Machine Learning

SoE No.
23AML-101

S N	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
FIRST SEMESTER (GROUP-A)															
1	1	BS	GE	23GE1101	Calculus and Vector	T	3	0	0	3	3	30	20	50	3
2	1	BS	GE	23GE1106	Engineering Chemistry	T	3	0	0	3	3	30	20	50	3
3	1	BS	GE	23GE1107	Lab: Engineering Chemistry	P	0	0	2	2	1		60	40	
4	1	HS/AEC1	GE	23GE1113	Technical Communication	T	2	0	0	2	2	30	20	50	2
5	1	HS/AEC2	GE	23GE1114	Lab:Technical Communication	P	0	0	2	2	1		60	40	
6	1	HS/IKS	GE	23GE1115	Indian Knowledge System	T	2	0	0	2	2	30	20	50	2
7	1	BES	CSE	23AML103	Web Technology	T	2	0	0	2	2	30	20	50	2
8	1	BES	CSE	23AML104	Lab : Web Technology	P	0	0	2	2	1		60	40	
9	1	BES	CSE	23AML1101	Introduction to Computer Programming	T	2	0	0	2	2	30	20	50	2
10	1	BES	CSE	23AML1102	Lab: Introduction to Computer Programming	P	0	0	2	2	1		60	40	
11	1	VSEC	GE	23GE1117	Get Set Go	...	...	...	...	...	2		60	40	
11	1	CC1	GE		Liberal Learning Course (LLC1)	...	...	...	...	...	2		60	40	
TOTAL FIRST SEM							14	0	8	22	22				
SECOND SEMESTER (GROUP-A)															
1	2	BS	GE	23GE1203	Differential Equations and Complex Analysis	T	3	0	0	3	3	30	20	50	3
2	2	BS	GE	23GE1210	Applied Physics	T	3	0	0	3	3	30	20	50	3
3	2	BS	GE	23GE1211	Lab: Applied Physics	P	0	0	2	2	1		60	40	
4	2	BES	CSE	23AML1205	Data Structure	T	3	0	0	3	3	30	20	50	3
5	2	BES	CSE	23AML1206	Lab: Data Structure	P	0	0	2	2	1		60	40	
6	2	BES	EL	23EL1201	Basic Electrical and Electronics Engineering	T	3	0	0	3	3	30	20	50	3
7	2	PC	CSE	23AML1207	Object Oriented Programming	T	3	0	0	3	3	30	20	50	3
8	2	PC	CSE	23AML1208	Lab : Object Oriented Programming	P	0	0	2	2	1		60	40	
9	2	VSEC	GE	23GE1218	Functional English	...	...	...	...	...	2		60	40	
11	2	CC2	GE		Liberal Learning Course (LLC2)	...	...	...	...	...	2		60	40	
TOTAL SECOND SEM							15	0	6	21	22				

Liberal Learning Course

S N	Sem	Type	BoS/ Deptt	Sub. Code	Subject
1	1	CC1	GE	23LLC1101	Music (Vocal)
2	1	CC1	GE	23LLC1102	Music (Instrumental)
3	1	CC1	GE	23LLC1103	Indian Classical Dance
4	1	CC1	GE	23LLC1104	Other forms of Dances
5	1	CC1	GE	23LLC1105	Painting
6	1	CC1	GE	23LLC1106	Theatre and acting
7	1	CC1	GE	23LLC1107	Photography
8	1	CC1	GE	23LLC1108	Yoga
9	1	CC1	GE	23LLC1109	Chess
10	1	CC1	GE	23LLC1110	Athletics
11	1	CC1	GE	23LLC1111	Basket Ball
12	1	CC1	GE	23LLC1112	Judo
13	1	CC1	GE	23LLC1113	Elements of Japanese Language
14	1	CC1	GE	23LLC1114	Elements of German Language
15	1	CC1	GE	23LLC1115	Elements of French Language
16	1	CC1	GE	23LLC1116	Elements of Spanish Language
17	1	CC1	GE	23LLC1117	Basics of Vedic Maths
18	1	CC1	GE	23LLC1118	Skilling in Microsoft Visio and Inkscape



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 (Department of Computer Science & Engineering)
B.Tech. in Artificial Intelligence and Machine Learning

SoE No.
23AML-101

S N	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	

Liberal Learning Course

S N	Sem	Type	BoS/ Deptt	Sub. Code	Subject
1	2	CC2	GE	23LLC1201	Music (Vocal)
2	2	CC2	GE	23LLC1202	Music (Instrumental)
3	2	CC2	GE	23LLC1203	Indian Classical Dance
4	2	CC2	GE	23LLC1204	Other forms of Dances
5	2	CC2	GE	23LLC1205	Painting
6	2	CC2	GE	23LLC1206	Theatre and acting
7	2	CC2	GE	23LLC1207	Photography
8	2	CC2	GE	23LLC1208	Yoga
9	2	CC2	GE	23LLC1209	Chess
10	2	CC2	GE	23LLC1210	Athletics
11	2	CC2	GE	23LLC1211	Basket Ball
12	2	CC2	GE	23LLC1212	Judo
13	2	CC2	GE	23LLC1213	Elements of Japanese Language
14	2	CC2	GE	23LLC1214	Elements of German Language
15	2	CC2	GE	23LLC1215	Elements of French Language
16	2	CC2	GE	23LLC1216	Elements of Spanish Language
17	2	CC2	GE	23LLC1217	Basics of Vedic Maths
18	2	CC2	GE	23LLC1218	Skilling in Microsoft Visio and Inkscape

MANDATORY LEARNING COURSES

1	2	HS		GE2131	Universal Human Values (UHV)	A	2	0	0	2	0		
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MSEs* = Two MSEs of 15 Marks each will conducted and marks of these 2 MSEs will be considered for Continuous Assessment

TA ** = for Theory : TA1-5 marks on Proctored Online Exam, TA2-12 marks on activities decided by course teacher, TA3 - 3 marks on class attendance

TA = for Practical : MSPA will be 15 marks each**

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B. Tech SoE and Syllabus 2023
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(Department of Mathematics & Humanities)

SoE No.
23FY-101

B.Tech First Year

II SEMESTER

23GE1203: Differential Equations and Complex Analysis

Course Outcomes

The students will be able to

1. Use appropriate Methods to solve first order and higher order differential equations and apply it to find solutions of engineering problems.
2. Use appropriate methods to solve partial differential equations.
3. Determine the various functions of complex numbers.
4. Evaluate the integration of function of complex variables.

Unit I: Differential Equations I

(7 Hrs.)

Linear differential equations of first order and first degree, Differential equation reducible to linear form, Exact differential equations (excluding the case of integrating factor) and their applications to various fields. **(Contemporary Issues related to Topic)**

Unit II: Differential Equations II

(8 Hrs.)

Higher order linear differential equations with constant coefficients, Complementary functions and Particular Integral for different cases, Method of variation of parameters, Examples on application to various fields. **(Contemporary Issues related to Topic)**

Unit III: Differential Equations III

7 Hrs.)

Cauchy's homogeneous linear differential equations, Legendre's linear differential equations, Applications of differential equations to various fields (only up to second order). **(Contemporary Issues related to Topic)**

Unit IV: Partial Differential Equations

(8 Hrs.)

Partial Differential Equations of first order, first degree i.e. Lagrange's form, linear homogeneous equations of higher order with constant coefficient. Application of variable separable method to solve first and second order partial differential equations. **(Contemporary Issues related to Topic)**

Unit V: Complex Number

(8 Hrs.)

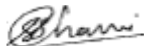
Basic concepts of complex numbers and its various forms. Separation of real and imaginary parts, De Moivre's theorem, Application of De Moivre's theorem, Exponential function of complex numbers, Circular function of complex numbers, Hyperbolic function and their inverse, Logarithm of a complex number. **(Contemporary Issues related to Topic)**

Unit VI: Complex Variables

(7 Hrs.)

Analytic function, Cauchy-Riemann conditions, Harmonic functions, Finding Harmonic conjugates, Taylor's and Laurent's Theorem (statement only), Examples on Taylor's and Laurent's Theorem, Evaluation integral by using Residue theorem. **(Contemporary Issues related to Topic)**

Total Lecture 45 Hours

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(Department of Mathematics & Humanities)

SoE No.
23FY-101

B.Tech First Year

Textbooks:

1. Erwin Kreyzig, Advance Engineering Mathematics, 6th Edition, John Wiley and Sons, INC.
2. H.K. Dass, Engineering Mathematics, 11th revised edition, S. Chand, Delhi.
3. H.K. Dass, Advanced Engineering Mathematics, 8th revised edition, S. Chand, Delhi.
4. Dr. B.S. Grewal, Higher Engineering Mathematics, 42th edition, Khanna Publishers.
5. P.N.Wartikar and J.N.Wartikar, Applied Mathematics, 4th Edition, Vidyarthi GrihaPrakashan.

Reference Books:

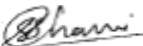
1. G B Thomas and R L Finney, Calculus and Analytical Geometry, 9th edition, Addison-Wesley, 1999.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, 10th edition, Laxmi Prakashan.

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

- 1 <http://103.152.199.179/YCCE/Supported%20file/Supported%20file/e-copies%20of%20books/Applied%20Sciences%20&%20Humanities/Mathematics%20and%20Humanities/>

MOOCs Links and additional reading, learning, video material

1. <https://nptel.ac.in/courses/111103070>
2. https://onlinecourses.nptel.ac.in/noc19_ma28/preview
3. <https://nptel.ac.in/courses/111/106/111106100/>

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(Department of Physics)

SoE No.
23FY-101

B.Tech First Year

II SEMESTER

23GE1210 : Applied Physics

Course Outcomes :

Upon successful completion of the course the students will be able to

1. Correlate fundamentals of quantum mechanics to solve problems dealing with quantum particles.
2. Justify the characteristics of semiconductor materials in terms of crystal structures, charge carriers and energy bands.
3. Analyze the motion of charged particles in electric and magnetic field and its applications to electron optic devices.
4. Examine the intensity variation of light due to Laser and its application.
5. Illustrate working principles of optical fibers for their use in the field of industry.

Unit I: Quantum Physics

(8 Hrs.)

Wave particle duality, Davisson and Germer experiment, Wave packet, Heisenberg's uncertainty principle, thought experiment, Significance, Applications. **(Contemporary Issues related to Topic)**

Unit II: Introduction to Quantum Computing

(7 Hrs.)

Introduction of complex numbers, operators, Eigen values, Eigen functions. Wave function and its probability interpretation, Schrodinger Equation, Particle in infinite and finite potential well, quantum tunneling, Introduction to Bits and Qubits. **(Contemporary Issues related to Topic)**

Unit III: Band Theory of Solids

(8 Hrs.)

Formation of energy bands in solids; Classification of solids, Energy band diagram of Si and Ge, Intrinsic and extrinsic semiconductors, Conductivity, Law of mass action, Hall effect, Direct and Indirect band gap semiconductors. **(Contemporary Issues related to Topic)**

Unit IV: Electron Ballistics and Devices

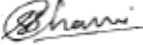
(9 Hrs.)

Motion of a charged particle in uniform electric and magnetic field, Cross field configuration; Electron refraction, Electron lens. Cathode ray oscilloscope and its application. **(Contemporary Issues related to Topic)**

Unit V: Lasers

(7 Hrs.)

Coherence and its types, Interaction of radiation with matter, Population Inversion, Pumping: methods and schemes, Optical resonant cavity, Ruby laser, He-Ne laser, diode laser, Properties and engineering applications of laser. **(Contemporary Issues related to Topic)**

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(Department of Physics)

**SoE No.
23FY-101**

B.Tech First Year

Unit VI: Optical Fibres	(6 Hrs.)
Principle, structure and classification, Acceptance angle, Numerical aperture, Losses in optical fibers, Applications as sensors. (Contemporary Issues related to Topic)	
Total Lecture	45 Hours

Textbooks	
1	M. N. Avadhanulu, P. G. Kshirsagar, A Textbook of Engg. Physics, S. Chand and Company.
2	Hitendra K Malik, A K Singh, Engineering Physics, 2nd Edition, Tata McGraw Hill Education Private Limited,

Reference Books	
1	David Halliday, Robert Resnick and Jerle Walker, John-Wiley India, Fundamentals of Physics, 10 th John Wiley & Sons Inc.
2	Brijlal and Subramanyam, Text Book of Optics, Revised edition, S. Chand and Company.
3	M.N. Avadhanulu, 2 nd Edition, Laser, S.Chand and Company.
4	A. Beiser, Concept of Modern Physics, 6 th Edition, Laser, Tata McGraw-Hill.
5	Thyagarajan K. and Ghatak A.K, LASERS: Theory and Applications, 2 nd Edition, Macmillan Publication
6	S. O. Pillai, Solid State Physics, 9 th Edition, New Edge International Publishers.
7	Palanisamy, Solid State Physics, 8 th Edition, New Edge International Publishers.
8	C. Kittel, Solid State Physics, 8 th Edition, Willey Publication.

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	chrome-http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Applied%20Sciences%20&%20Humanities/Physics/Eisberg%20&%20Resnick%20-%20Quantum%20Physics.pdf
2	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Applied%20Sciences%20&%20Humanities/Physics/2016 Book ThePhysicsOfSemiconductors.pdf

MOOCs Links and additional reading, learning, video material	
1	https://nptel.ac.in/courses/115106066 - Quantum Physics
2	https://archive.nptel.ac.in/courses/115/105/115105121/ -CRO
3	www.digimat.in/nptel/courses/video/115102124/L36.html - Laser

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(Department of Physics)

B.Tech First Year

SoE No.
23FY-101

II SEMESTER

23GE1211 : Lab. Applied Physics

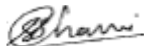
Course Outcomes:

Upon successful completion of the course the students will be able to

1. Correlate fundamentals of quantum mechanics to solve problems dealing with quantum particles.
2. Justify the characteristics of semiconductor materials in terms of crystal structures, charge carriers and energy bands.
3. Analyze the motion of charged particles in electric and magnetic field and its applications to electron optic devices.
4. Examine the intensity variation of light due to Laser and its application.
5. Illustrate working principle of optical fibers for their use in the field of industry.

List of Experiments :

Sr. No.	Experiments based on
1	Determination of Planck's Constant
2	Study of Tunnel Diode.
3	Determination of Hall coefficient and density of charge carriers using Hall effect.
4	Dependence of Hall coefficient on temperature.
5	The study of V-I characteristics of a semiconductor diode (Germanium and silicon) in forward and reverse bias mode.
6	Determination of Band gap in a semiconductor by four probe method.
7	Determination of Band gap in a semiconductor using reverse biased p-n junction diode.
8	Determination of wavelength of laser using diffraction grating.
9	Determination of divergence of laser beam.
10	Determination of Acceptance angle and numerical aperture of a given optical fiber.
11	To measure the phase shift introduced by a phase shift network using Dual beam CRO.
12	Determination of amplitude and frequency of sinusoidal signal using CRO.

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B. Tech SoE and Syllabus 2023

(Scheme of Examination w.e.f. 2023-24 onward)

(Department of Computer Science & Engineering)

**SoE No.
23AML-101**

B.Tech. in Artificial Intelligence and Machine Learning

II SEMESTER

23AML1205 : Data Structure

Course Outcomes :

On completion of this course, the student will be able to

1. To understand fundamental concepts in data structures
2. To apply and analyse algorithms for performing operations on data structures
3. To evaluate the performance of data structures and its applications.
4. Simulate the algorithms for performing operations on data structures.

UNIT I: Introduction to data structures

(4 Hrs)

Need of data structures, Types of data structures, recursion, Arrays, sorting – Bubble sort, Insertion sort, Selection sort, Merge sort, Quick sort and searching techniques- Linear Search and Binary Search, Hashing: Direct-address tables, Hash tables, open addressing, Perfect Hashing

UNIT II: Stacks and queues

(4 Hrs)

The stack as an ADT, Representation, Stack operation, Application. Queue: The Queue as an ADT, Representation, Queue operation, Circular and Priority queue, Applications of stacks and queues

UNIT III: Linked Lists

(5 Hrs)

Linked list as an ADT, Singly-linked lists, doubly linked lists and circular linked lists. Operations on linked list etc., Linked stacks and Queues, Applications of lists in polynomial representation, multi-precision arithmetic.

UNIT IV: Binary Trees

(4 Hrs)

Binary trees, binary trees- basic algorithms and various traversals. Binary Search Trees (BSTs) and insertion, deletion in BSTs. Heaps and heap sort

UNIT V: Balanced trees

(5 Hrs)

Height-balanced (AVL) trees, Splay tree, Red-black trees, Multi-way trees-B and B+ and applications

UNIT VI: Graphs: Representation & traversals

(4 Hrs)

Spanning trees, topological sort, shortest path algorithm, all-pairs shortest paths

Total Lecture 26 Hours

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Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B. Tech SoE and Syllabus 2023

(Scheme of Examination w.e.f. 2023-24 onward)

(Department of Computer Science & Engineering)

SoE No.
23AML-101

B.Tech. in Artificial Intelligence and Machine Learning

Text Books

1.	Data Structures & Program Design in C, Robert Kruse, G. L. Tondo and B. Leung ,Person
2	“Fundamentals of Data Structures in C”, Horowitz, S. Sahni, S. Anderson-freed, University Press,
3	"Data Structures Using C and C++", Y. Langsam, M. J. Augenstein and A. M. Tannenbau Prentice Hall India,

Reference Books

1	Fundamentals of Data Structures in C++ ,2nd, 2009, Ellis Horowitz, Sartaj Sahani, Dinesh Mehta , University Press
2	Data Structures with C , Seymour Lipschutz , Tata McGraw Hill

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1	http://103.152.199.179/YCCE/Supported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/Book%20Fundamentals%20of%20Data%20Structure%20(1982)%20by%20Ellis%20Horowitz%20and%20Sartaj%20Sahni.pdf
2.	http://103.152.199.179/YCCE/Supported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/Data%20Structures%20Succinctly%20Part%201.pdf

MOOCs Links and additional reading, learning, video material

1.	https://nptel.ac.in/courses/106102064
2.	https://archive.nptel.ac.in/courses/106/106/106106127/

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(Department of Computer Science & Engineering)

SoE No.
23AML-101

B.Tech. in Artificial Intelligence and Machine Learning

II SEMESTER

23AML1206 : Lab. Data Structure

List of Experiments

Sr. No.	List of Experiment
1	Program based on searching- linear , binary search
2	Program based on sorting- quick sort / merge sort
3	Program based on stacks creation and operations on it
4	Program based on queue creation and operations on it
5	Program based on single linked list creation and operations on it
6	Program based on double linked list creation and operations on it
7	Program based on Binary tree : creation and traversal
8	Program based on Binary search tree : creation and searching
9	Program based on graphs: creation and traversal
10	Program based on graph: Prims/ Kruskal algorithm for finding minimum cost spanning tree

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B. Tech SoE and Syllabus 2023

(Scheme of Examination w.e.f. 2023-24 onward)

(Department of Electrical Engineering)

B.Tech in Electrical Engineering

**SoE No.
23EL-101**

II SEMESTER

23EL1201 : Basic Electrical and Electronics Engineering

Course Outcomes:

1. Understand the fundamental concepts of Analog Electronic and Electrical Circuits
2. Apply the concepts of Electrical and Electronic Circuits to obtain the desired parameter
3. Analyze analog Electrical Circuits for given application.
4. Analyze analog Electronic Circuits for given application

Unit I: Circuit Elements and Energy Sources

(7 Hrs.)

Circuit Elements, Series and Parallel Combination of Resistances, Inductance and Capacitances, Energy Sources, Source Transformation, Sources with Periodic Waveforms, A.C. in Inductance and Capacitance, Star-Delta Connection. **(Contemporary Issues related to Topic)**

Unit II: Analysis of Network

(7 Hrs.)

Kirchhoff's Laws, Current Division, Voltage Division, Nodal and Mesh Analysis of Electric Circuits, Thevenin's Theorem **(Contemporary Issues related to Topic)**

Unit III: Generator and Motors

(7 Hrs.)

Introduction to Generator, Construction, working principle, Types of Generators, Introduction to DC Motor, Working Principle of DC Motor, Types of Motors. **(Contemporary Issues related to Topic)**

Unit IV: Diode and Transistor

(6 Hrs.)

Introduction to Semiconductor, P-N junction diodes, Biasing & Characteristics of diodes. Diode Circuits - Half wave rectifier, full wave rectifier, bridge rectifier. Introduction to BJT- NPN and PNP, Modes of operation,. **(Contemporary Issues related to Topic)**

Unit V: Operational Amplifier and Its Application

(7 Hrs.)

Introduction to Op-Amp, Inverting and Non-Inverting Amplifier, Linear Applications of OP-AMP like adder, Subtractor, integrator, differentiator and non-linear application using Comparator. **(Contemporary Issues related to Topic)**

Unit VI: Electronics Measurement

(6 Hrs.)

Introduction to Measurement System, Generalized block diagram of Measurement System, Static & dynamic characteristics of measurement system, Types of errors & their sources, Statistical analysis. **(Contemporary Issues related to Topic)**

Total Lecture 40 Hours

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(Department of Electrical Engineering)

B.Tech in Electrical Engineering

SoE No.
23EL-101

Textbooks:

- | | |
|----|--|
| 1. | Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford Higher Education, First Edition 2005 |
| 2. | Electronics Devices and circuits, Millman Jacob, McGraw Hill Education, Fourth Edition (2015) |
| 3. | Circuit Theory (Analysis and Synthesis), by A. Chakrabarti, Dhanpat Rai & Co., Reprint Edition 2014 |

Reference Books:

- | | |
|----|---|
| 1. | OP-AMP and Linear Integrated Circuit, by Ramakant A. Gayakwad, Prentice Hall India Learnin Private Limited, Published in 2002 |
| 2. | Electrical & Electronic measurement & Instrument, A. K. Sawhney, Dhanpat Rai & Co., 18th edition 2008 |

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

- | | |
|---|---|
| 1 | http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0 |
| 2 | https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042 |

MOOCs Links and additional reading, learning, video material

- | | |
|----|---|
| 1. | https://onlinecourses.nptel.ac.in/noc22_ee113/preview |
|----|---|

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B. Tech SoE and Syllabus 2023

(Scheme of Examination w.e.f. 2023-24 onward)

(Department of Computer Science & Engineering)

**SoE No.
23AML-101**

B.Tech. in Artificial Intelligence and Machine Learning

II SEMESTER

23AML1207 : Object Oriented Programming

Course Outcomes:

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

1. Demonstrate the understanding of Object oriented concepts.
2. Analyze problem statement and identify appropriate objects and methods for problem solving.
3. Make use of predefined classes and frameworks for reducing coding efforts and improving performance.
4. Apply features of object oriented programming to write programs to solve real world problems.

Unit:1	Introduction to object oriented programming paradigm	8 Hours
Introduction to object oriented programming paradigm, procedure oriented programming vs OOP, features of OOP, benefits of OOP, defining class, instantiating a class. Declaring Classes and objects, Creating Classes and objects, methods, argument passing, Recursion, this keyword, constructors, Visibility control.		
Unit:2	Other Class Modifiers	7 Hours
Static, final, Abstract, Method overloading, Super keyword, Overriding (polymorphism), nested inner classes, packages (encapsulation), Interfaces (multiple Inheritances)		
Unit:3	Array	8 Hours
Arrays, Strings Arrays, One Dimensional Arrays, Two Dimensional Arrays, variable size arrays, Strings and String Buffer classes, Wrapper Classes		
Unit:4	Exception handling mechanism	7 Hours
Fundamentals exception types, uncaught exception, try-catch Block, displaying description of an exception, multiple catch clauses, nested try-catch statements, throw, throws, finally, built in exceptions, creating own exception subclasses,		
Unit:5	Collection Vector and Framework	7 Hours
Introduction to collection framework, Vectors, Array List, Linked list, Hashset, Treaset, Hashmap		
Unit :6	IO Steam and Thread	8 Hours
Introduction to stream classes, use of stream classes, I/O stream, bytes stream, character stream, predefined stream, reading console input, reading character, reading string, writing console output, the print write class, reading & writing files, transient and volatile modifiers, Introduction to multithreading, life cycle of Thread, Runnable interface and Thread class.		
Total Lecture Hours		45 Hours

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(Scheme of Examination w.e.f. 2023-24 onward)

(Department of Computer Science & Engineering)

SoE No.
23AML-101

B.Tech. in Artificial Intelligence and Machine Learning

Textbooks:

- | | |
|---|--|
| 1 | Thinking in Java, Bruce Eckel , 4th EDITION, Prentice Hall |
|---|--|

Reference Books:

- | | |
|----|---|
| 1 | Java Complete Reference, Herbert Schildt, 7th EDITION, McGraw-Hill |
| 2. | Programming with Java ,E. Balagurusamy, Sixth Edition, TATA McGraw-Hill |

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

- | | |
|---|---|
| 1 | http://103.152.199.179/YCCE/Supported%20file/Supported%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/thinking_in_java_4th_edition.pdf |
| 2 | http://103.152.199.179/YCCE/Supported%20file/Supported%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/JAVA_Complete_Reference_Fifth_Edition.pdf |

MOOCs Links and additional reading, learning, video material

- | | |
|----|---|
| 1 | https://onlinecourses.nptel.ac.in/noc20_cs58/preview |
| 2. | https://archive.nptel.ac.in/courses/106/105/106105224/ |

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(Department of Computer Science & Engineering)

SoE No.
23AML-101

B.Tech. in Artificial Intelligence and Machine Learning

II SEMESTER

23AML1208 : Lab. Object Oriented Programming

Course Outcomes:

1. Demonstrate the understanding of Object oriented concepts.
2. Apply the programming language JAVA efficiently in object oriented software development
3. Able to analyze problem statement and identify appropriate objects and methods
4. Design and implement small programs using classes
5. Design, develop, test, and debug programs using object oriented principles of java

Sr. No.	Experiments based on
1	Implement the concept of Class and its data members and member functions in Java
2	Implement the concept of function overloading in Java
3	Implement the concept of class constructor and its type in Java
4	Implement the concept of Abstraction in Java
5	Implement the concept of all types of inheritance in Java
6	Implement the collection listener to solve the problem in Java
7	Implement the concept of run time polymorphism in Java
8	Implement the concept of Files using command line arguments in Java
9	Implement the concept of exception in Java
10	Implement the concept of Thread in Java

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B. Tech SoE and Syllabus 2023
(Scheme of Examination w.e.f. 2023-24 onward)
(Department of Mathematics & Humanities)

SoE No.
23FY-101

B.Tech First Year

II SEMESTER

23GE1218 : Functional English

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Understand the concept of FE (Functional English) and its application in various real-life scenarios.
2. Develop basic interactive communication skills, including greetings, asking for information, stating opinions, and providing feedback.
3. Acquire knowledge of social networking, texting, instant messaging, blogs, and discussion boards, along with the ethical considerations associated with online communication.
4. Successfully complete quizzes and assignments assessing knowledge in the covered topics of FE, social media, tenses, and effective communication.

Unit:1	Introduction to Functional English	6 Hours
What is FE? And Areas of application. Basic Interactive sentences - Greetings & Replies, Asking for information, Telling people what you do, Asking somebody's opinion, Giving your opinion, Saying someone is correct, Saying that someone is wrong, Apologizing, Praising someone's work, Saying goodbye. Introduction & Basics of Common Expressions – Offer, Request, Gratitude, Apology. Modal Verbs - Words used often: Can- could, Will – would, Shall – should, Ought to-Must, May-might. Practice exercises, Practice Conversations, Script Activity		
Unit:2	Internet & Social Media Communication	6 Hours
Introduction & Basics to Social Networking, Texting & Instant messaging, Blogs & Discussion Board- discussion with examples, Ethics of social media & communication Topic: Introduction to Creative Ads Why Ads, What's in it for me? Characteristics of ads. Assignment Quiz on the above Topics, Exercises for Evaluation		
Unit:3	TENSES	6 Hours
Introduction & Basics, Simple Tense (Past, Present, Future), Continuous Tense (Past, Present, Future) – discussion with examples. Introduction & Basics, Perfect Tense (Past, Present, Future), Perfect Continuous Tense (Past, Present, Future) – discussion with examples Introduction to Movie Magic, Learn English with films, Film Vocabulary, Describing a film, Types of Films Assessment – Letter and Email Writing, Tenses – Quiz		
Unit:4	Written Communication	5 Hours
Introduction & Basics of Writing, five methods of communication, Mind your grammar, Commonly confusing words Letters – Format, Parts of a business letter, When does communication fail?, Things to remember, Positive language not negative language, Active voice not passive voice Effective emailing -How to make an effective e-mail, Few common e-mail habits that cause problems, Parts of an e-mail, Some other important aspects.		

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(Scheme of Examination w.e.f. 2023-24 onward)
(Department of Mathematics & Humanities)

SoE No.
23FY-101

B.Tech First Year

Assignment Presentation on Mad Ads, Quiz on Tenses and social media-Internet Communication
Topic: Activity Extempore

EVALUATION			1 Hour
WRITTEN TEST	TA=60	ESE=40	TOTAL=100
Total Lecture Hours			24 Hours

Reference Books

- 1 How to win friends & influence people – Dale Carnegie
2. Functional English for Communication - Ujjwala Kakarla
- 3 Functional English for Technical Students – Dr Prathibha Mahato & Dr Dora Thompson

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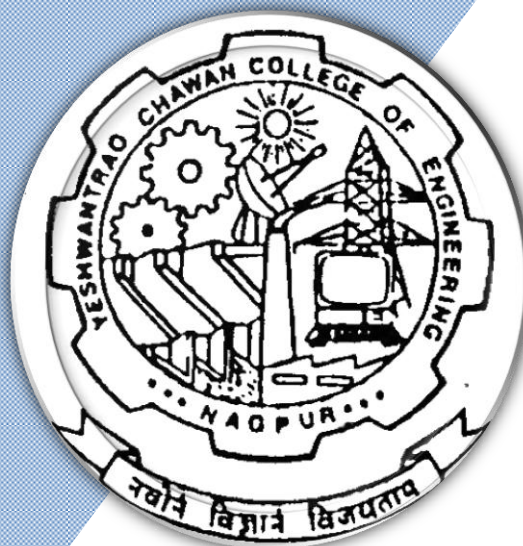
Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

(Accredited 'A++' Grade by NAAC with a score of 3.6)

Hingna Road, Wanadongri, Nagpur - 441 110



Bachelor of Technology SoE & Syllabus 2023 3rd Semester

(Department of Computer Science & Engineering)

B. Tech in Artificial Intelligence and Machine Learning (AIML)



Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
 (An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B.TECH SCHEME OF EXAMINATION 2023

(Scheme of Examination w.e.f. 2023-24 onward)

(Department of Computer Science & Engineering)

B. Tech. in Artificial Intelligence and Machine Learning

SoE No.
23AML-101

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
THIRD SEMESTER															
1	3	BS	GE	23GE1303	Linear Algebra	T	3	0	0	3	3	30	20	50	3
2	3	HSSM-1	GE	23GE1301	Fundamentals of Management & Economics	T	2	0	0	2	2	30	20	50	3
3	3	VEC-1	CV	23CV1311	Environmental Sustainability, Pollution and Management	T	2	0	0	2	2	30	20	50	3
4	3	PC	AML	23AML1301	Computer Architecture & Organisation	T	3	0	0	3	3	30	20	50	3
5	3	PC	AML	23AML1302	Database Management Systems	T	3	0	0	3	3	30	30	40	3
6	3	PC	AML	23AML1303	Lab : Database Management Systems	P	0	0	2	2	1		60	40	
7	3	PC	AML	23AML1304	Lab : Programming with Python	P	0	0	2	2	1		60	40	
8	3	CEP	AML	23AML1305	Community Engagement Project	P	0	0	2	4	2		60	40	
9	3	OE-1	OE		Open Elective -I	T	2	0	0	2	2	30	20	50	3
10	3	MDM	AML		MD Minor Course-I	T	2	0	0	2	2	30	20	50	3
TOTAL							17	0	6	25	21				

List of Mandatory Learning Course (MLC)

1	3	HS	T&P	MLC2123	YCAP3 : YCCE Communication Aptitude Preparation	A	3	0	0	3	0				
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Open Elective - I

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject
1	3	OE1	GE	23OE1301	OE-I : Combinatorics
2	3	OE1	GE	23OE1302	OE-I : Fuzzy Set Theory, Arithmetic And Logic
3	3	OE1	GE	23OE1303	OE-I : Green Chemistry & Sustainability
4	3	OE1	GE	23OE1304	OE-I : Hydrogen Fuel
5	3	OE1	GE	23OE1305	OE-I : Electronic Materials And Applications
6	3	OE1	GE	23OE1306	OE-I : Laser Technology And Applications
7	3	OE1	MGT	23OE1307	OE-I : Finance And Cost Management
8	3	OE1	MGT	23OE1308	OE-I : Operation Research Techniques
9	3	OE1	MGT	23OE1309	OE-I : Project Evaluation & Management
10	3	OE1	MGT	23OE1310	OE-I : Total Quality Management
11	3	OE1	MGT	23OE1311	OE-I : Value Engineering
12	3	OE1	MGT	23OE1312	OE-I : Maintenance Management
13	3	OE1	MGT	23OE1313	OE-I : Industrial Safety
14	3	OE1	MGT	23OE1314	OE-I : Industry 4.0
15	3	OE1	MGT	23OE1315	OE-I : Operation Management
16	3	OE1	MGT	23OE1316	OE-I : Material Management
17	3	OE1	MGT	23OE1317	OE-I : Hospitality Management
18	3	OE1	MGT	23OE1318	OE-I : Human Resource Management & Organizational Behaviour
19	3	OE1	MGT	23OE1319	OE-I : Agri-Business Management
20	3	OE1	MGT	23OE1320	OE-I : Rural Marketing
21	3	OE1	MGT	23OE1321	OE-I : Marketing Management
22	3	OE1	MGT	23OE1322	OE-I : Health Care Management
23	3	OE1	MGT	23OE1323	OE-I : Designated approved online NPTEL/KKSU Course
24	3	OE1	MGT	23OE1324	OE-I : Indian Archeology
25	3	OE1	MGT	23OE1325	OE-I : Social & Positive Psychology
26	3	OE1	MGT	23OE1326	OE-I : Seismology & Earthquake

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(Scheme of Examination w.e.f. 2023-24 onward)

(Department of Computer Science & Engineering)

SoE No.
23CSE-101

B.Tech. in Artificial Intelligence and Machine Learning

III /IV SEMESTER

23GE1303/ 23GE1403 : Linear Algebra

Course Outcomes:

Upon successful completion of the course the students will be able to

- 1 Solve systems of linear equations using rank of matrix.
2. Determine eigen values and eigen vectors and solve eigen value problems.
3. Explain the concepts of vector space and subspace, span and basis.
4. Apply principles of matrix algebra to linear transformations and inner product.

Unit I:

8 Hrs.

Elementary matrix operations: Introduction to Matrices and Determinants, Solution of Linear Equations, Cramer's rule, Inverse of a Matrix.

Unit II:

7 Hrs.

Matrix Algebra: Rank of a matrix, Gaussian elimination, LU Decomposition (Crout's method), Solving Systems of Linear Equations using the tools of Matrices.

Unit III:

7 Hrs.

Diagonalization of Matrix: Eigen Values and Eigen vectors, Linear dependence and independence of Eigen Vectors, Orthogonal Eigen vector, Diagonalization of matrix, Cayley-Hamilton Theorem and Sylvester's Theorem.

Unit IV:

8 Hrs.

Vector Space: Vector Space, Subspace, Sum of Sub space, linear combination, Linear dependence and independence, Span and basis, Spanning sets, Generators.

Unit V:

7 Hrs.

Linear Transformation: Linear transformation, Ranges and Kernel (null space) of linear transformation, Inverse of linear transformation, Algebra of linear transformation, Singular and nonsingular linear transformation.

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(Department of Computer Science & Engineering)

SoE No.
23CSE-101

B.Tech. in Artificial Intelligence and Machine Learning

Unit VI:	8 Hrs.
Inner product Spaces: Inner product space and Norms, orthogonal vector, the Gram Schamidt orthogonalization Process, orthogonal compliment, Adjoint of Linear operator, Normal and self-adjoint operator, Unitary and orthogonal operator, Bilinear and Quadratic form.	
	Total Lecture 45 Hours

Textbooks:	
1	Erwin Kreyzig, Advance Engineering Mathematics, 9 th Edition, John Wiley and Sons, INC.
2	Dr. B. S. Grewal, Higher Engineering Mathematics, 40 th edition, Khanna Publisher.
3	H.K. Dass, Advanced Engineering Mathematics, 8 th revised edition, S. Chand, Delhi.
4	Hoffman and Kunze, Linear Algebra, prentice Hall of India, New Delhi
5	Gilbert Strang, Linear Algebra and its Applications, Nelson Engineering (2007)

Reference Books:	
1	Chandrika Prasad, Mathematics for Engineers (19th edition), , John Wiley & Sons.
2	L.A. Pipes and Harville, Applied Mathematics for Engineers (3rd edition), McGraw Hill.
3	K.B.Datta, Matrix and Linear Algebra, , Prentice Hall of India.
4	Linear Algebra, Schaum's Solved Problem Series, Seymour Lipschutz, McGraw-Hill Book Company.

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1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Applied%20Sciences%20&%20Humanities/Mathematics%20and%20Humanities/

MOOCs Links and additional reading, learning, video material	
1	https://nptel.ac.in/courses/111106051
2	https://archive.nptel.ac.in/courses/111/104/111104137/
3	https://archive.nptel.ac.in/courses/111/106/111106135/

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(Department of Computer Science & Engineering)

**SoE No.
23CSE-101**

B.Tech. in Artificial Intelligence and Machine Learning

III SEMESTER

23GE1301: Fundamentals of Management & Economics

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Develop the Managerial Perspective and perform the various functions of management for optimum utilization of Engineering Resources
2. Identify and Analyze the role of Financial Accountancy and Marketing Management in the Organization
3. Develop perspective about economy based on logical reasoning and estimate the economic outcomes.
4. Interprets comparative advantage of resources.

Unit I:

7 Hrs.

Principles of Management: Evolution of Management Thought: Scientific and Administrative Theory of Management, Definition and Concept of Management, Functions of Management: Planning, Organizing, Directing, Staffing and Controlling, Motivational Theories, Concept of Leadership.

Unit II:

8 Hrs.

Marketing and Financial Management: Marketing and Financial Management –Marketing Theories and Concept-Marketing Mix, Market Segmentation, Targeting and Positioning and Functions Financial Management and Accountancy- Accountancy Rules and Capital, Preparation of Books of Account- Journal posting of Transaction into ledger and preparation of trial Balance, Introduction of Trading Account, Profit and loss account and balance sheet.

Unit III:

7 Hrs.

Introduction to Microeconomics: Nature and Scope of Microeconomics, Demand Analysis: Meaning and determinants of demand, law of demand, Elasticity of Demand - types and degrees, Utility analysis, Law of diminishing marginal utility, supply- law of supply, Law of Variable proportions and Return to Scale, Classification of market structure.

Unit IV:

8 Hrs.

Introduction to Macroeconomics: Nature and Scope of Macroeconomics, Concept of GDP, GNP, NDP, NNP, Measurement of GDP; Economic Growth and development, Money – definition, types and function of money, Inflation – meaning, types, causes and measure to control, concept of deflation, functions of central and commercial bank, Sources of public revenue - direct and indirect taxes.

Total Lecture

30 Hours

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**SoE No.
23CSE-101**

B.Tech. in Artificial Intelligence and Machine Learning

Textbooks:

1	Principle of Management, 9 th edition, Harold Koontz Ramchandra, Tata McGraw hills
2	Marketing Management: Planning, Implementation and Control, 3 rd Edition, Ramaswamy V.S. and Namakumari S, Macmillian
3	Fundamentals of Accounting Gupta R.L. & Radhaswamy ;
4	Modern Economics, 13 th Edition, H. L. Ahuja, S. Chand Publisher, 2009
5	Modern Economic Theory, 3 rd edition, K. K. Devett, S. Chand Publisher, 2007
6	Principle of Economics, 7 th edition, Mankiw N. Gregory, Thomson, 2013

Reference Books:

1	Foundations of Financial Markets and Institutions, 3 rd Edition, Fabozzi, Pretice Hall
2	Fundamentals of Financial Instruments, 2 nd Edition, Parameshwaran, Wiley India
3	Marketing Management, 3 rd Edition, Rajan Saxena, Tata McGraw Hill
4	Advance Economic Theory, 17 th Edition, H. L. Ahuja, S. Chand Publisher, 2009
5	International Trade, 12 th edition, M. L. Zingan, Vindra Publication, 2007
6	Macro Economics, 11 th edition, M. L. Zingan, Vindra Publication, 2007
7	Monitory Economics:, 1 st Edition, M. L. Sheth, Himayalaya Publisher, 1995

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1	http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0
2	https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042

MOOCs Links and additional reading, learning, video material

1	https://onlinecourses.nptel.ac.in/noc22_mg104/preview
2	https://archive.nptel.ac.in/courses/110/101/110101131/
3	https://onlinecourses.nptel.ac.in/noc23_mg122/preview
4	https://onlinecourses.nptel.ac.in/noc21_hs52/preview
5	https://onlinecourses.nptel.ac.in/noc22_hs67/preview

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23CSE-101

B.Tech. in Artificial Intelligence and Machine Learning

III/IV SEMESTER

23CV1311/23CV1411

Environmental Sustainability, Pollution and Management

Course Outcomes :

Upon successful completion of the course, the students will be able to

The student will be able to

1. Gain insights into the efforts to safeguard the Earth's environment and resources.
2. Develop a critical understanding of the contemporary environmental issues of concern
3. Have an overview of pollution, climate change and national and global efforts to address adaptation and mitigation to changing environment through environmental management.
4. Learn about the major international treaties and our country's stand on and responses to the major international agreements.

Unit:1	Environment and Sustainable Development	8 Hours
The man-environment interaction; Overview of natural resources: renewable, and non-renewable energy resources; Introduction to sustainable development: Sustainable Development Goals (SDGs)- targets and indicators, challenges and strategies for SDGs; Environmental issues: Global change, Climate Change and Mitigation.		
Unit:2	Environmental Pollution and Health	7 Hours
Understanding pollution: Production processes and generation of wastes, Air pollution, Water pollution, Soil pollution and solid waste, Noise pollution, Thermal and Radioactive pollution. Impact on biotic and abiotic things.		
Unit:3	Environmental Management	8 Hours
Environmental management system: ISO 14001, Concept of Circular Economy, Life cycle analysis; Cost-benefit analysis, Environmental audit and impact assessment; Waste Management and sustainability; Ecolabeling /Eco mark scheme		
Unit:4	Environmental Treaties and Legislation	7 Hours
Introduction to environmental laws and regulation, An overview of instruments of international cooperation, Major International Environmental Agreements, Major Indian Environmental Legislations, Major International organizations, and initiatives		
Total Lecture		30 Hours

Text books

1	Chiras, D. D and Reganold, J. P. (2010). Natural Resource Conservation: Management for a Sustainable Future. 10th edition, Upper Saddle River, N. J. Benjamin/Cummins/Pearson
2	Rajagopalan, R. (2011). Environmental Studies: From Crisis to Cure. India: Oxford University Press
3	Krishnamurthy, K.V. (2003) Textbook of Biodiversity, Science Publishers, Plymouth, UK
4	Jackson, A. R., & Jackson, J. M. (2000). Environmental Science: The Natural Environment and Human Impact. Pearson Education
5	Pittock, Barrie (2009) Climate Change: The Science, Impacts and Solutions. 2nd Edition. Routledge.
6	Theodore, M. K. and Theodore, Louis (2021) Introduction to Environmental Management, 2nd Edition. CRC Press
7	Kanchi Kohli and Manju Menon (2021) Development of Environment Laws in India, Cambridge University Press

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Reference Books

1	Headrick, Daniel R. (2020) Humans versus Nature- A Global Environmental History, Oxford University Press
2	Gilbert M. Masters and W. P. (2008). An Introduction to Environmental Engineering and Science, Ela Publisher (Pearson)
3	William P. Cunningham and Mary A. (2015). Cunningham Environmental Science: A global concern, Publisher (Mc-Graw Hill, USA)
4	Varghese, Anita, Oommen, Meera Anna, Paul, Mridula Mary, Nath, Snehlata (Editors) (2022) Conservation through Sustainable Use: Lessons from India. Routledge.
5	Central Pollution Control Board Web page for various pollution standards. https://cpcb.nic.in/standards
6	Barnett, J. & S. O'Neill (2010). Maladaptation. Global Environmental Change—Human and Policy Dimensions 20: 211–213
7	Richard A. Marcantonio, Marc Lane (2022). Environmental Management: Concepts and Practical Skills. Cambridge University Press
8	Ministry of Environment, Forest and Climate Change (2019) A Handbook on International Environment Conventions & Programmes. https://moef.gov.in/wp-content/uploads/2020/02/convention-V-16-CURVE-web.pdf

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

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MOOCs Links and additional reading, learning, video material

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B.Tech. in Artificial Intelligence and Machine Learning

III SEMESTER

23AML1301 : Computer Architecture & Organisation

Course Outcome

On completion of the course, student will be able to

1. Understand and demonstrate the basic computer architecture concepts related to the working of processors, memory systems, and input output systems.
2. Differentiate among various addressing modes and develop ability to write assembly language programs.
3. Comprehend information representation in computer and perform arithmetic operations using algorithms suitable for hardware implementation.
4. Explain and compare techniques for improving the performance of a computer system components like CPU, main memory, input/output system and pipelining.

UNIT I: Basic Structure of Computer Hardware and Software

7

Functional Units, Basic Operational Concepts, Bus Structures, Software, processor clock and basic performance evaluation, number systems, and arithmetic operations, Memory Locations, addressing and encoding of information, instruction and instruction sequencing, branching, condition codes, zero, one and two address instructions, RISC vs CISC computers.

UNIT II: Processing Unit

7

Addressing modes, Stacks, and Subroutines, Processing Unit- Some fundamental concepts, Execution of a complete instruction, One, two, and three bus organization, Sequencing of control Signals, Assembly language programming.

UNIT III: Processor Design, hardwired control, Micro programmed Control

8

Processor Design, hardwired control, Microprogrammed Control: Microinstructions, Grouping of control signals, Microprogram sequencing, Micro Instructions with next Address field, prefetching microinstructions.

UNIT IV: Arithmetic (Fixed and Floating point)

8

Arithmetic (Fixed and Floating point): Number Representation, Addition of Positive numbers, Logic Design for fast adders, Addition and Subtraction, Arithmetic and Branching conditions, Multiplications of positive numbers, Signed- Operand multiplication, Booth's Algorithm, fast Multiplication, Integer Division algorithms, Floating point numbers and operations, IEEE floating point standards

UNIT V: Main Memory and Cache Memory

8

The Main Memory: Basic concepts, Memory Hierarchy, semiconductor RAM memories, Static RAM vs Dynamic RAM, semiconductor ROM memories, DDRAM, Memory system considerations, Speed, Size and Cost. Cache Memory: cache memory mapping techniques, secondary storage devices, HDD vs SSD, Performance Considerations.

UNIT VI: Computer Peripherals, I/O modules and I/O Devices, I/O transfers

7

Computer Peripherals, I/O modules and I/O Devices, I/O transfers: program controlled, memory mapped and I/o mapped I/O, Interrupt handling and Interrupt driven I/O, DMA.

Pipelining: Basic Concepts, Data Hazards and Instruction Hazards. Introduction to GPU and GPU Computing.

Total Lectures

45

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Text Books

1. Computer Organization , 5th edition , V. Carl Hamacher, Zvonko Vranesic, McGraw Hill Publications.
2. Computer Architecture: A Quantitative approach, 6th edition, John L. Hennessy, David A. Patterson ,MK series in computer architecture and design

Reference Books

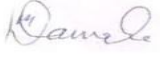
1. Computer Organization and Architecture , 6th edition , Willaiaam Staliing, Pearson Education
2. Computer Architecture & Organization , 3rd edition ,J.P. Hayes , McGraw Hill Publications

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

- 1 file:///172.16.1.10/cse/Ebooks/COmputer%20Organization%20Zaky%205th%20.pdf
- 2 http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Technology/53-CAO_V.%20Carl%20Hamacher-GKY.pdf

MOOCs Links and additional reading, learning, video material

1. <https://nptel.ac.in/courses/106105163>

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III SEMESTER

23AML1302 : Database Management Systems

Course Outcome

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

1. Analyze & compare different levels of abstraction & data independence.
2. Design Entity Relationship Diagram for any scenario.
3. Solve queries based on relational algebra & SQL.
4. Identify functional dependencies & normalize the database and apply ACID properties.
5. Analyze transaction management, various concurrency control protocols and crash recovery methods.

UNIT I: Introduction to Database Management System

7

General File System and Database system Concepts and Architecture, Data Models, Schemas and Instances, Abstraction & Different Levels of Data Abstraction, Data Independence: Logical & Physical Independence.

UNIT II: Entity-Relationship Model

7

Entities and Entity Sets, Relationships and Relationship Sets, Attributes, Mapping Constraints, Keys, Entity Relationship Diagram, Reducing E-R Diagrams to Tables, Generalization, Aggregation, Design of an E-R Database Scheme

UNIT III: SQL & Advanced SQL

8

SQL: Data definition language (DDL), Data Manipulation Language (DML), Basic structure of SQL Queries, Set operations, Null Values, Nested subqueries, views, modification of database, transaction, Joins.
Advanced SQL: SQL data types & schemas, Integrity Constraints, Domain Constraints, Assertions, triggers, Advanced SQL Features.

UNIT IV: Relational Data Model

8

Structure of Relational Databases, Relational Database Design: Pitfalls in Relational Database Design, Functional Dependencies, Normalization using Functional Dependencies, Alternative Approaches to Database design. Relational Algebra: Structure of relational databases, Fundamental Relational-Algebra Operations, Additional relational algebra operations, extended relational algebra operations, modification of the databases

UNIT V: Data Storage and Querying & Transaction Management

8

Data Storage and Querying: Storage and File Structure, Indexing and Hashing, Query Processing, query-evaluation.

Transaction Management: ACID Properties, Implementation of ACID Properties, Database processes to support ACID Properties, Schedules, and Testing of Serializability.

UNIT VI: Concurrency Control & Crash Recovery

7

Concurrency Control: Lock-based Protocols, Timestamp Based Protocols, Validation Techniques, Multiple Granularity, Multi version Timestamp Protocol, Transaction isolation levels, Read consistency.

Crash Recovery: Failure Classification, Log Based Recovery, Buffer Management, Checkpoints, Shadow Paging.

Total Lectures

45

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Text Books:

1. Database System Concepts by Korth, Silberschatz, sudarshan , McGraw-Hill publication
2. Fundamentals of Database Systems by Elmasri, Navathe & Gupta, Pearson Education.

Reference Books

1. SQL & PL / SQL for Oracle 11g Black Book by Dr. P.S. Deshpande, Kindle Edition, Dreamtech Press
2. Database Systems by Connolly Begg, 3rd Edition, Pearson Education
3. Database Systems by S. K. Singh, 6th Edition ,Pearson Education

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

- 1 http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/35.Database_Management_Systems_2nd_Ed_.pdf
- 2 <http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/36.dbms%20book%20of%20Raghu%20Ramakrishnan.pdf>

MOOCs Links and additional reading, learning, video material

1. https://onlinecourses.nptel.ac.in/noc21_cs04/preview
2. https://onlinecourses.nptel.ac.in/noc20_cs03/preview

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23CSE-101

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III SEMESTER

23AML1303 : Lab. Database Management Systems

Sr. No.	List of Experiment
1	Creating a schema -To implement different basic Data Definition Language (DDL) & Data Manipulation Language(DML) Commands in SQL.
2	To design an ER Diagram.
3	1. Answer each of the following questions. The questions are based on the following relational schema: Emp(<i>eid</i>: integer, <i>ename</i>: string, <i>age</i>: integer, <i>salary</i>: real) Works(<i>eid</i>: integer, <i>did</i>: integer, <i>pctime</i>: integer) Dept(<i>did</i>: integer, <i>dname</i>: string, <i>budget</i>: real, <i>managerid</i>: integer) a. Give an example of a foreign key constraint that involves the Dept relation. What are the options for enforcing this constraint when a user attempts to delete a Dept tuple? b. Write the SQL statements required to create the preceding relations, including appropriate versions of all primary and foreign key integrity constraints. c. Define the Dept relation in SQL so that every department is guaranteed to have a manager. d. Write an SQL statement to add John Doe as an employee with <i>eid</i> = 101, <i>age</i> = 32 and <i>salary</i> = 15,000. e. Write an SQL statement to give every employee a 10 percent raise. f. Write an SQL statement to delete the Toy department.
4	Given a schema , apply BETWEEN...AND, NOT BETWEEN, IN, NOT IN, IS NULL, IS NOT NULL clause on created database.
5	Given a schema , implement aggregate function & grouping commands.
6	Given a schema , implement basic set operations in SQL
7	Write the following queries in SQL for the following schema. Suppliers(<i>sid</i>: integer, <i>sname</i>: string, <i>address</i>: string) Parts(<i>pid</i>: integer, <i>pname</i>: string, <i>color</i>: string) Catalog(<i>sid</i>: integer, <i>pid</i>: integer, <i>cost</i>: real) 1. Find the pnames of parts for which there is some supplier. 2. Find the snames of suppliers who supply every part. 3. Find the snames of suppliers who supply every red part. 4. Find the pnames of parts supplied by Acme Widget Suppliers and by no one else. 5. Find the sids of suppliers who supply a red part and a green part. 6. Find the sids of suppliers who charge more for some part than the average cost of that part (averaged over all the suppliers who supply that part). 7. For each part, find the sname of the supplier who charges the most for that part. 8. Find the sids of suppliers who supply only red parts.

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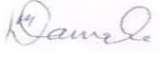
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8	To create and manipulate various database object of table using views.
9	To implement Transaction Control Language (TCL) commands.
10	To display file database connectivity using JDBC.
11	Write a program in PL/SQL to check given number is even or odd

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III SEMESTER

23AML1304 : Lab . Programming with Python

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Develop and execute basic Python programs using variables, operators, and control structures.
2. Implement functions and modules to improve code reusability and modular programming.
3. Apply data structures such as lists, tuples, dictionaries, and sets for efficient data manipulation.
4. Utilize file handling techniques to read, write, and process data files in Python.
5. Design and develop Python programs for real-world applications using libraries such as NumPy, Pandas, and Matplotlib

Practicals based on following syllabus

Unit:1	Introduction to Python	6 Hours
Why python, python syntax compare with other language, print statement, comments, python Data Structure and Data Types, string Operation, simple input and output, output Formatting, operators in python, Python Program Flow: indentation, if –statement, while loop, for loop, range statement, break & continue, assert.		
Unit:2	Function, Module and Exception Handling	6 Hours
Function, Function Parameters, Variable Arguments, Scope of Function, Function Documentation, Lambda Function and Map, Create Module, Standard Module, Exception Handling: Error, Exception Handling with try, Handling Multiple Exception, writing own Exception		
Unit:3	File Handling, Classes in Python	7 Hours
File Handling Modes, Reading File, Writing & Appending Files, Handling File Exception, the with Statement. Classes in Python: - Creating Class, Instance Method, Inheritance, Polymorphism, Exception classes & Custom Exception, Iterator, Generators		
Unit:4	Python SQL Database Access	7 Hours
Introduction, Installation DB Connection, Creating DB Table, INSERT, UPDATE, DELETE, READ Operations, COMMIT & ROLLBACK Operation, Handling Errors.		
Total Lecture Hours		28 Hours

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B.Tech. in Artificial Intelligence and Machine Learning

Textbooks:

1	Python For Beginners: 2 Books In 1: Python Programming For Beginners, Python Workbook
2	

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1	https://books.goalkicker.com/PythonBook/

Reference Books:

1	ReemaThareja, "Python Programming using problem solving approach", Oxford University press, 2017. ISBN-13: 978-0199480173
2.	Charles R. Severance, "Python for Everybody: Exploring Data Using Python 3", 1 st Edition, Shroff Publishers, 2017. ISBN: 978-9352136278.
3.	Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 2015, ISBN: 978-9352134755.

MOOCs Links and additional reading, learning, video material

1	https://nptel.ac.in/courses/106106145
2	https://onlinecourses.nptel.ac.in/noc22_cs32/preview
3	https://onlinecourses.swayam2.ac.in/cec22_cs20/preview

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III SEMESTER

23AML1305 : Community Engagement Project

Course Outcome

1. Understand hardware and software components of the computer.
2. Understand and create high-level documentation, reports, and PPTs using different tools

Practicals based on following Syllabus

UNIT I: Introduction to Computer: Hardware and Software	5
Computer and Latest IT gadgets, Basics of Hardware and Software	
UNIT II: Introduction to Operating System	6
Operating System Installation, Operating System Simple Setting, File and Folder Management, Types of file Extensions	
UNIT III: MS Word and PowerPoint	7
Word Processing Basics and advanced, PPT Processing Basics and advanced, Introduction to open office	
UNIT IV: MS Excel	7
MS Excel: Basics and advanced, Formulation in MS Excel: Basics and advanced, Pivot Tables, Dashboard Creation and data Representation.	
Total Lectures	24

Text Books

1. Computer Basics Absolute Beginner's Guide, Michael Miller
2. Computer Fundamentals: Concepts, Systems & Applications- 8th Edition, Priti Sinha, Pradeep K, Sinha
3. BPB's Computer Course Windows 10 with MS Office, Prof Satish Jain

Reference Book:

1. Microsoft Office 2016 Step by Step (pearsoncmg.com)
- 2 Lesson_01.pdf (nios.ac.in)

MOOCs Links and additional reading, learning, video material

1. https://onlinecourses.swayam2.ac.in/cec21_cs15/preview

III SEMESTER

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B.Tech. in Artificial Intelligence and Machine Learning

Multidisciplinary Minor Courses

Track 1

MDMT1AML101 : Artificial Intelligence and Machine learning

Courses	Sem	MDMT1AML101 : Artificial Intelligence and Machine learning
MDM-I	3	(MDM1AML101) Fundamentals of Data Structures
MDM-II	4	(MDM2AML102) Introduction to Analysis of Algorithms
MDM-III	5	(MDM3AML103) Data analysis and Statistics
MDM-IV	6	(MDM4AML104) Fundamentals of Artificial Intelligence
MDM-V	7	(MDM5AML105) Machine Learning and its Applications
MDM-VI	8	(MDM6AML106) Practical Machine Learning for Data analysis

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(Scheme of Examination w.e.f. 2023-24 onward)

(Department of Computer Science & Engineering)

SoE No.
23CSE-101

B.Tech. in Artificial Intelligence and Machine Learning

III Semester

Track1 : MDMT1AML101 : Artificial Intelligence and Machine learning (MDM1AML101) Fundamentals of Data Structures

Course Outcome

1. To review programming concepts and understand fundamental concepts in data structures
2. To apply and analyse algorithms for performing operations on data structures
3. To Evaluate the performance of data structures and its applications.
4. Simulate the algorithms for performing operations on data structures.

UNIT I: Introduction

7

Introduction: Function, Recursion, Array, Introduction to data structures- Need of data structures, Types of data structures, recursion, Arrays, sorting – Bubble sort, Insertion sort, Selection sort, Merge sort, Quick sort and searching techniques- Linear Search and Binary Search.

UNIT II: Stack and Queue

7

The stack as an ADT, Representation, Stack operation, Application. Queue: The Queue as an ADT, Representation, Queue operation, Circular and Priority queue, Applications of stacks and queues

UNIT III: Linked List

7

Linked list as an ADT, Singly-linked lists, doubly linked lists and circular linked lists. Operations on linked list etc., Linked stacks and Queues, Applications of lists in polynomial representation,

UNIT IV: Trees and Graphs

7

Binary trees, binary trees- basic algorithms and various traversals. Binary Search Trees (BSTs) and insertion, deletion in BSTs, Introduction to Graphs: Graph Terminologies, Graph Traversal Methods.

Total Lectures

28

Text Books

1	Data Structures and Program Design in C, Robert Kruse, G. L. Tondo and B. Leung
2	Fundamentals of Data Structures in C, Ellis Horowitz, Satraj Sahni and Susan Anderson-Freed
3	Programming in ANSI C, E. Balaguruswamy, a 2 Programming in ANSI C E. Balaguruswamy Tata McGraw-Hill

Reference Books

1	Data Structures with C, Seymour Lipschutz, TMH
2	Fundamentals of Algorithms, Fundamentals of Algorithms, Prentice Hal

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23CSE-101

B.Tech. in Artificial Intelligence and Machine Learning

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1	http://103.152.199.179/YCCE/Supported%20file/Supported%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/Book%20Fundamentals%20of%20Data%20Structure%20(1982)%20by%20Ellis%20Horowitz%20and%20Sartaj%20Sahni.pdf
2	http://103.152.199.179/YCCE/Supported%20file/Supported%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/Data%20Structures%20Succinctly%20Part%201.pdf

MOOCs Links and additional reading, learning, video material

1.	https://youtu.be/zWg7U0OEAoE
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SoE No.
23CSE-101

B.Tech. in Artificial Intelligence and Machine Learning

III SEMESTER

Open Elective -I : Basket

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject
1	3	OE1	GE	23OE1301	OE-I : Combinatorics
2	3	OE1	GE	23OE1302	OE-I : Fuzzy Set Theory, Arithmetic And Logic
3	3	OE1	GE	23OE1303	OE-I : Green Chem. & Sustainability
4	3	OE1	GE	23OE1304	OE-I : Hydrogen Fuel
5	3	OE1	GE	23OE1305	OE-I : Electronic Materials And Applications
6	3	OE1	GE	23OE1306	OE-I : Laser Technology And Applications
7	3	OE1	MGT	23OE1307	OE-I : Finance And Cost Management
8	3	OE1	MGT	23OE1308	OE-I : Operation Research Techniques
9	3	OE1	MGT	23OE1309	OE-I : Project Evaluation & Management
10	3	OE1	MGT	23OE1310	OE-I : Total Quality Management
11	3	OE1	MGT	23OE1311	OE-I : Value Engineering
12	3	OE1	MGT	23OE1312	OE-I : Maintenance Management
13	3	OE1	MGT	23OE1313	OE-I : Industrial Safety
14	3	OE1	MGT	23OE1314	OE-I : Industry 4.0
15	3	OE1	MGT	23OE1315	OE-I : Operation Management
16	3	OE1	MGT	23OE1316	OE-I : Material Management
17	3	OE1	MGT	23OE1317	OE-I : Hospitality Management
18	3	OE1	MGT	23OE1318	OE-I : Human Resource Management & Organizational Behaviour
19	3	OE1	MGT	23OE1319	OE-I : Agri-Business Management
20	3	OE1	MGT	23OE1320	OE-I : Rural Marketing
21	3	OE1	MGT	23OE1321	OE-I : Marketing Management
22	3	OE1	MGT	23OE1322	OE-I : Health Care Management

Link for Open Electives syllabus: <https://ycce.edu/syllabus/>

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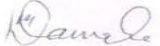
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23CSE-101**

B.Tech. in Artificial Intelligence and Machine Learning

III SEMESTER

Mandatory Learning Course (MLC)

MLC2123 : YCAP3

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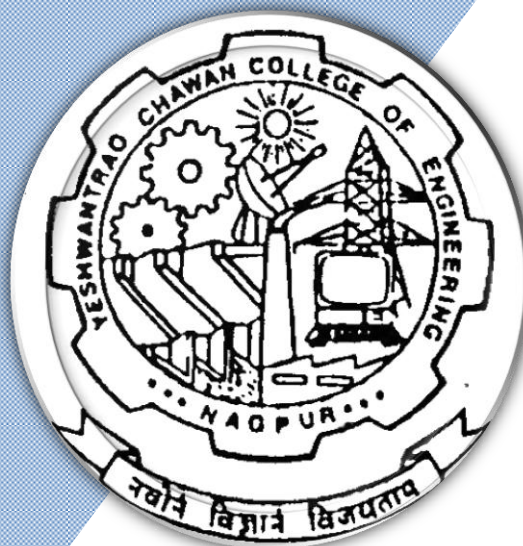
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(Accredited 'A++' Grade by NAAC with a score of 3.6)

Hingna Road, Wanadongri, Nagpur - 441 110



Bachelor of Technology SoE & Syllabus 2023 4th Semester

(Department of Computer Science & Engineering)

B. Tech in Artificial Intelligence and Machine Learning (AIML)



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B.TECH SCHEME OF EXAMINATION 2023

(Scheme of Examination w.e.f. 2023-24 onward)

(Department of Computer Science & Engineering)

B. Tech. in Artificial Intelligence and Machine Learning

SoE No.
23AML-101

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
FOURTH SEMESTER															
1	4	HSSM-2	GE	23GE1401	Entrepreneurship Development	T	2	0	0	2	2	30	20	50	3
2	4	AEC-2	GE	23GE1405 23GE1406	Marathi Language Hindi Language	T	2	0	0	2	2	30	20	50	3
3	4	PC	AML	23AML1401	Operating Systems	T	3	0	0	3	3	30	20	50	3
4	4	PC	AML	23AML1402	Lab : Operating Systems	P	0	0	2	2	1		60	40	
5	4	PC	AML	23AML1403	Discrete Mathematics and Probability theory	T	3	0	0	3	3	30	20	50	3
6	4	PC	AML	23AML1404	Statistics for data science	T	3	0	0	3	3	30	20	50	3
7	4	PC	AML	23AML1405	Lab : Statistics for data science	P	0	0	2	2	1		60	40	
8	4	VEC-2	AML	23AML1406	Digital & Technological Solution- Open source tools	T	2	0	0	2	2	30	20	50	3
9	4	VSEC-3	AML	23AML1407	Lab : Vocational & Skill Enhancement - Web Application development	P	0	0	2	4	2		60	40	
10	4	OE-2	OE		Open Elective -II	T	2	0	0	2	2	30	20	50	3
11	4	MDM	AML		MD Minor Course-II	T	2	0	0	2	2	30	20	50	3
TOTAL							19	0	6	27	23				

List of Mandatory Learning Course (MLC)

1	4	HS	T&P	MLC2124	YC4P4 : YCCE Communication Aptitude Preparation	A	3	0	0	3	0				
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Open Elective - II

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject
1	4	OE2	GE	23OE2401	OE-II : Combinatorics
2	4	OE2	GE	23OE2402	OE-II : Fuzzy Set Theory, Arithmetic And Logic
3	4	OE2	GE	23OE2403	OE-II : Green Chem. & Sustainability
4	4	OE2	GE	23OE2404	OE-II : Hydrogen Fuel
5	4	OE2	GE	23OE2405	OE-II : Electronic Materials And Applications
6	4	OE2	GE	23OE2406	OE-II : Laser Technology And Applications
7	4	OE2	MGT	23OE2407	OE-II : Finance And Cost Management
8	4	OE2	MGT	23OE2408	OE-II : Operation Research Techniques
9	4	OE2	MGT	23OE2409	OE-II : Project Evaluation & Management
10	4	OE2	MGT	23OE2410	OE-II : Total Quality Management
11	4	OE2	MGT	23OE2411	OE-II : Value Engineering
12	4	OE2	MGT	23OE2412	OE-II : Maintenance Management
13	4	OE2	MGT	23OE2413	OE-II : Industrial Safety
14	4	OE2	MGT	23OE2414	OE-II : Industry 4.0
15	4	OE2	MGT	23OE2415	OE-II : Operation Management
16	4	OE2	MGT	23OE2416	OE-II : Material Management
17	4	OE2	MGT	23OE2417	OE-II : Hospitality Management
18	4	OE2	MGT	23OE2418	OE-II : Human Resource Management & Organizational Behaviour
19	4	OE2	MGT	23OE2419	OE-II : Agri-Business Management
20	4	OE2	MGT	23OE2420	OE-II : Rural Marketing
21	4	OE2	MGT	23OE2421	OE-II : Marketing Management
22	4	OE2	MGT	23OE2422	OE-II : Health Care Management
23	4	OE2	MGT	23OE2423	OE-II : Designated approved online NPTEL/KKSU Course
24	4	OE2	MGT	23OE2424	OE-II : Indian Archeology
25	4	OE2	MGT	23OE2425	OE-II : Social & Positive Psychology
26	4	OE2	MGT	23OE2426	OE-II : Seismology & Earthquake

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**SoE No.
23CSE-101**

B.Tech. in Artificial Intelligence and Machine Learning

IV SEMESTER

23GE1401 : Entrepreneurship Development

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Appreciate role of entrepreneurs in society and develop entrepreneurial abilities by providing information about skill sets.
2. Develop an understanding of how and what form of business organization to choose for start up.
3. Stimulate to innovate, develop prototypes or ideas by applying theory into practice.
4. Identify the Support rendered by various Government Agencies.

Unit I:

7 Hrs.

Entrepreneur & Entrepreneurship: Meaning of Entrepreneur, Evolution of the concept – Theories and Models, Types of Entrepreneur, Stages in entrepreneurial process- Idea Generation, Screening, Selection and Managing Resources.

Unit II:

8 Hrs.

Legal Compliances for Incorporating Start up: Fundamentals of choosing the Business Organization form for startup, Incorporation of Partnership, LL.P & Co – operative, Incorporation of One Person Company, Pvt. Ltd., Pub. Ltd. and not for profit company, Financing the legal Venture and Legal Compliances.

Unit III:

7 Hrs.

Entrepreneurship and IP Strategy: Intellectual Property : Definition and Concept of Trade Mark, Patent, Copyright, Industrial Design, IP Strategy and Entrepreneurship.

Unit IV:

8 Hrs.

Support to Entrepreneurs: Financing new ventures, Business Incubators – Government Policy for Small Scale Enterprises, Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Subcontracting.

Total Lecture

30 Hours

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SoE No.
23CSE-101

B.Tech. in Artificial Intelligence and Machine Learning

Student activities:

1. Interview at least four entrepreneurs or businessman and identify Traits of successful entrepreneurs.
2. Analyse case studies of any two successful entrepreneurs.
3. Download product development and innovative films from internet.
4. Identify your hobbies and interests and convert them into business idea

Textbooks

1. Khanka. S.S., "Entrepreneurial Development" S.Chand & Co. Ltd., Ram Nagar, New Delhi, 2013.
2. Donald F Kuratko, "Entrepreneurship – Theory, Process and Practice", 9th Edition, Cengage Learning 2014.
3. Corporate Law, 33rd ed. 2016, Taxman New Delhi.
4. Narayanan, V. K., Managing technology and innovation for competitive advantage, first edition, Pearson education, New Delhi, (2006)
5. Idris, K. (2003), Intellectual property: a power tool for economic growth, second edition, WIPO publication no. 888, Switzerland
6. Khanka. S.S., "Entrepreneurial Development" S.Chand & Co. Ltd., Ram Nagar, New Delhi, 2013.
7. Ramaiya's Guide to the Companies Act, 18th ed. 2014, Lexis Nexis New Delhi.

Reference Books

1. Mehta, Monica- The Entrepreneurial Instinct : How everyone has the innate ability to start a successful small business – McGraw – Hill Education, New Delhi 2012, ISBN 978-0-07-179742-9
2. Prasanna Chandra "Protect Preparation, Appraisal, Implementation" Tata McGraw Hill. New Delhi
3. S Anil Kumar "Entrepreneurship Development" New Age International Publishers
4. Nishith Dubey "Entrepreneurship Development" PHI Learning

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

- 1 <http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0>
- 2 <https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042>

MOOCs Links and additional reading, learning, video material

- 1 https://onlinecourses.swayam2.ac.in/cec23_mg24/course- entrepreneurship development
- 2 https://onlinecourses.nptel.ac.in/noc23_mg74/announcements?force=true-entrepreneur
- 3 https://onlinecourses.nptel.ac.in/noc23_mg126/announcements?force=true-Business fundamentals for entrepreneurship

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SoE No.
23CSE-101

B.Tech. in Artificial Intelligence and Machine Learning

IV SEMESTER

23GE1405 : Marathi Language

Course Objectives		
- मराठी भाषेच्या समृद्धीची जाणीव करून देणे. - विद्यार्थ्यांमध्ये भाषा कौशल्याचा विकास करणे आणि त्यातून रोजगाराच्या संधींचा शोध घेणे.		
Course Outcomes		
- भाषेचा जीवन व्यवहारात योग्य पद्धतीने वापर करण्याचा प्रयत्न करणे. - संत साहित्याच्या शिकवणुकीमुळे मानवता आणि मानवी व्यवहाराची सांगड घालणे, नैतिक मूल्ये रुजविणे. - विद्यार्थ्यांना रोजगाराभिमुख बनविणे.		
Unit:1	गद्य विभाग	8 Hours
१. भारतीय लोकशाहीचे भवितव्य काय?	- डॉ. बाबासाहेब आंबेडकर	
२. काळी आई	- व्यंकटेश माडगूळकर	
३. संत तुकारामांचे अभंग	- निर्मलकुमार फडकुले	
४. माझी शाळा	- प्रकाश खरात	
५. समतेचे वारकरी संत गाडगेबाबा आणि राष्ट्रसंत तुकडोजी महाराज	- अशोक राणा	
६. लोककल्याणकारी राजा :	- शरयू तायवाडे	
Unit:2	पद्य विभाग	8 Hours
१. ज्ञानेश्वरांचे अभंग	- संत ज्ञानेश्वर	
२. वनसुधा	- वामन पंडित	
३. नवा शिपाई	- केशवसुत	
४. मेंढरं	- विठ्ठल वाघ	
५. पोरी	- अनुराधा पाटील	
६. गाव	- हेमंतकुमार कांबळे	

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Unit:3	व्यावहारिक मराठी	7 Hours
१. म्हणी		
२. मुलाखतलेखन	- डॉ. वैशाली धनविजय	
३. वाक्प्रचार		
४. जाहिरातलेखन	- डॉ. अजय देशपांडे	
Unit:4	रोजगाराभिमुख मराठी व्यावहारिक कौशल्ये	7 Hours
१. प्रत्यक्ष मुलाखत कौशल्य		
२. वाचन कौशल्य - (अ) बातमी वाचन (ब) कथा वाचन		
३. ऑनलाईन कौशल्य - (अ) ग्राहक सेवा केंद्राशी संवाद, (ब) ऑनलाईन अर्ज करणे		

Reference Books

- पाठ्यपुस्तक : शब्दसाधना - भाग १
- रोजगाराभिमुख मराठी व्यावहारिक कौशल्ये

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B.Tech. in Artificial Intelligence and Machine Learning

IV SEMESTER

23GE1406 : Hindi Language

Course Objectives

- विद्यार्थियों में देशभक्तिपरक एवं पारिवारिक मूल्यों का विकास |
- विद्यार्थियों पर्यावरण-संरक्षण के प्रति सजग करना |
- एकांकी, कहानी, निबंध आदि विधाओं के मध्य का अंतर अवगत कराना |
- हिंदी के प्रयोजनमूलक स्वरूप से परिचित कराना |
- विद्यार्थियों को आधुनिक प्रौद्योगिकी (तकनीक) का प्रयोग करने में सक्षम बनाना |.

Course Outcomes

- पौराणिक अथवा ऐतिहासिक घटनाओं को तार्किक आधार पर स्वीकार करेंगे | अपने परिवेश के उचित और अनुचित व्यवहारों के प्रति आकलन शक्ति बढ़ेगी |
- एकांकी, कहानी, निबंध आदि विधाओं के मध्य का अंतर बताने में सक्षम होंगे |
- कविता का रसास्वादन करने में समर्थ होंगे |
- 'अनुवाद' के स्वरूप एवं प्रक्रिया से अवगत होंगे |
- 'मार्गिक नक्शे' का दैनिक जीवन में उपयोग करने में सक्षम होंगे |

Unit:1	गद्य विभाग	8 Hours
१. भाईसाहब (कहानी)	- प्रेमचंद	
२. स्मृति (निबंध)	- श्रीराम शर्मा	
३. गिल्लू (रेखाचित्र)	- महादेवी वर्मा	
४. अभाव (कहानी)	- विष्णु प्रभाकर	
५. महाभारत की साँझ (एकांकी)	- भारतभूषण	
६. उखड़े खंबे (व्यंग्य)	- हरिशंकर परसाई	

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B.Tech. in Artificial Intelligence and Machine Learning

Unit:2	पद्य विभाग	8 Hours
१. कबीर के दोहे	- कबीरदास	
२. ले चल यहाँ भुलावा देकर	- जयशंकर प्रसाद	
३. स्नेह-निर्झर बह गया	- हैसूर्यकांत त्रिपाठी "निराला"	
४. प्रथम रश्मि	- सुमित्रानंदन पंत	
५. जीवन का झरना	- आरसीप्रसाद सिंह	
६. कविता के साथ	- दामोदर खड़से	
Unit:3	अन्य पाठ्य सामग्री	7 Hours
१. मुहावरे और लोकोक्तियाँ: पाठ्यपुस्तक में मुहावरे और लोकोक्तियाँ का अर्थ एवं वाक्य प्रयोग		
२. विज्ञापन कला : अर्थ, परिभाषा, प्रकार, शीर्षक का महत्त्व, विज्ञापन के प्रयोजन, सत्य, लक्ष्य, विज्ञापन की भाषा, अच्छे विज्ञापन के गुण इत्यादि ।		
Unit:4	कौशल्य आधारित घटक	7 Hours
१. वाचन कौशल्य (समाचार-वाचन, कहानी-वाचन)		
२. सोशल मीडिया के शिष्टाचार		
३. ऑनलाइन आवेदन, ग्राहक-सेवा केंद्र से संवाद		

Reference Books

3. पाठ्यपुस्तक : "पलाश"

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**SoE No.
23CSE-101**

B.Tech. in Artificial Intelligence and Machine Learning

IV SEMESTER

23AML1401: Operating Systems

Course Outcome

After undergoing this course student will be able to

1. Understand the fundamental concepts in Operating Systems (OS) and understand how various hardware features support OS functionality.
2. Explain various OS mechanisms and policies for managing system resources.
3. Analyse algorithms and techniques for managing various OS resources in a multiprogramming and other environments.
4. Evaluate the performance of algorithms for managing various OS resources.

UNIT I: Introduction to OS

7

Evolution of OS, basic hardware support necessary for modern operating systems, Layered Structural of OS, process concept, process state transitions, Services provided by OS, system calls, privileged instructions, Dual mode of operation, I/O bound and CPU bound processes, concept of multiprogramming and multiprocessing.

UNIT II: Process management

8

Process control block, process context switch, process versus threads, CPU scheduling, goals of scheduling, CPU scheduling algorithms, Algorithmic evaluation of CPU scheduling algorithms, multi-queue scheduling, multithreading

UNIT III: Interprocess communication and Synchronization

8

Operations on processes, Interprocess communication, process cooperation and synchronization, race condition, critical region, mutual exclusion and implementation, semaphores, classic problems of Synchronization using semaphores, other synchronization constructs.

UNIT IV: Memory management techniques

8

Contiguous allocation, static and dynamic partitioning, non-contiguous allocation, paging, translation look aside buffer (TLB) and overheads, segmentation.

UNIT V: Virtual memory

7

Demand paging, page replacement algorithms, thrashing, and working set model. Deadlocks: necessary conditions, deadlock detection, deadlock avoidance, deadlock prevention, recovery from deadlock.

UNIT VI: File systems

7

Introduction, Access methods, Directory Structure disk space management and space allocation strategies, disk arm scheduling strategies: FCFS, SSTF, SCAN, CSACN, LOOK, CLOOK, Selecting a disk scheduling algorithm.

Total Lectures

45

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Text Books

- | |
|--|
| 1. Operating system Principles, 9th Edition, A. Silberchatz and P. Galvin, John Wiley & Sons Inc. |
| 2. Operating Systems Internals and Design Principles, 2 nd Edition, William Stalling, Pearson |

Reference Books

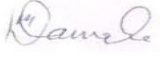
- | |
|--|
| 1. Operating Systems: A Design-Oriented Approach, Charles Crowley, McGraw Hill |
| 2. Operating system concepts and Design, 2 nd Edition, Milan Milenkovic, Tata McGraw Hill |

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

- | | |
|---|---|
| 1 | http://103.152.199.179/YCCE/Supported%20file/Supported%20file/e-copies%20of%20books/Computer%20Technology/45-Operating%20System%20Concepts%20(%20PDFDrive%20).pdf |
|---|---|

MOOCs Links and additional reading, learning, video material

- | | |
|----|---|
| 1. | https://onlinecourses.nptel.ac.in/noc20_cs04/preview |
| 2. | https://onlinecourses.nptel.ac.in/noc21_cs88/preview |
| 3. | https://onlinecourses.nptel.ac.in/noc21_cs72/preview |

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B.Tech. in Artificial Intelligence and Machine Learning

IV SEMESTER

23AML1402: Lab. Operating Systems

Course Outcome

After undergoing this course student will be able to

1. Understand the fundamental concepts in Operating Systems (OS) and understand how various hardware features support OS functionality.
2. Explain various OS mechanisms and policies for managing system resources.
3. Analyse algorithms and techniques for managing various OS resources in a multiprogramming and other environments.
4. Evaluate the performance of algorithms for managing various OS resources.

List of Experiment

Sr. No.	Experiments Based On
1	Study of Window task manger(Exploring various tabs: application, processes, services, networking, performance)
2	Study of Advanced Linux shell commands (Process management, memory management, networking, etc.)
3	Write a program that illustrates the creation of child process using fork system call. Each child and parent Processes perform different task.
4	Write a multithreaded program to multiply two given matrices.
5	Simulate: a) Any preemptive CPU Scheduling Algorithm b) Any Non-preemptive CPU Scheduling Algorithm
6	Write a program to perform Inter-Process-Communication using shared memory or, pipes or message queues.
7	Write a program that solves two process Producer-Consumer problem with bounded buffer using semaphores. OR Write a program that gives a deadlock and starvation free solution to the Dining Philosophers problem using semaphores.
8	Simulate: a) First Fit(Static Memory allocation algorithm) and b) Worst Fit(Dynamic Memory allocation algorithm)
9	Simulate any one of the following page replacement algorithms: FIFO, LRU, Optimal
10	Write a program to simulate Banker's Deadlock avoidance algorithm.

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B.Tech. in Artificial Intelligence and Machine Learning

IV SEMESTER

23AML1403: Discrete Mathematics and Probability theory

Course Outcome

1. Explain the basic concept of classical sets, fuzzy sets, Relations, functions and logical methods
2. identify the nature of different algebraic structures such as Group, Ring, field
3. Determine the probability functions of one and two random variables
4. Calculate the Statistical parameters for random variables

UNIT I: Mathematical Logic and Set Theory

7

Statement and Notation: Negation, Conjunction, Disjunction, Tautologies, Truth Tables, Basic Concepts of Set Theory, Inclusion & equality of set, Power Set, Ordered Pairs and n-tuples, Operations on Sets, mathematical induction. Propositions, Predicate logic, formal mathematical systems.

UNIT II: Relations and Functions

6

Relation and Ordering, Properties of Binary in a set, Relation Matrix and Graphs, Partition and Covering of a set, Equivalence relation, Partial order relations, Partially Ordered sets, Function (Definition and Introduction), Composition of functions, Inverse Functions, Characteristics function of a set.

UNIT III: Group Theory

7

Groups (Definitions and Examples) Subgroups and Homomorphism, Cosets and Lagrange's theorem, Normal subgroups, Codes and Group Codes. Semi groups and Monoids (definitions and examples). Homomorphism of semi groups and monoids, Subsemi groups and monoids.

UNIT IV: Rings (Definitions and Examples)

6

Integral domain, field, ring homomorphism Fuzzy Sets and Fuzzy Logic: Fuzzy sets and systems, crisp sets, overview of fuzzy logic and classical logic, fuzzy compliment, fuzzy union, fuzzy intersection and combinations of these fuzzy sets operations crisp and fuzzy relations.

UNIT V: Random variables and probability distribution

7

Random variables: discrete and continuous; probability density function of one and two variables; Probability distribution function for discrete and continuous random variables (one and two variables), Joint distributions, conditional distributions.

UNIT VI: Mathematical Expectation

6

Definition of mathematical expectation, functions of one and two random variables, The variance and standard deviations, moment generating function other measures of central tendency and dispersion, Skewness and Kurtosis.

Total Lectures

39

Text Books

1. Discrete Mathematics Structure with application to Computer Science by J. P. Tremblay & R. Manohar, 23rd re-print, 2005, Tata McGraw-Hills Publication Company Limited, New Delhi.
2. Probability and Statistics – M R Spiegel, John Schiller, R. AluShrinivasan, 2nd edition, Tata McGraw-Hills Publication Company Limited, New Delhi.
3. Advanced Engineering Mathematics - by H.K. Dass, 8th revised edition, 2007, S.Chand and Company Limited, Delhi.

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Reference Books

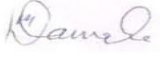
1. Discrete Mathematics by Lipschutz Schaums's Outline series, 2nd edition, Tata McGraw-Hills Publication Company Limited, New Delhi.
2. Discrete Mathematical structures :- By Bernard Kolman, Robert C. Busby, Sharon Ross, 3rd edition, 2001, Prentice Hall of India, New Delhi

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1. <http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0>
2. <https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042>

MOOCs Links and additional reading, learning, video material

1. https://onlinecourses.nptel.ac.in/noc20_cs82/preview
2. https://onlinecourses.nptel.ac.in/noc20_cs37/preview

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B.Tech. in Artificial Intelligence and Machine Learning

IV SEMESTER

23AML1404: Statistics for data science

Course Outcomes

Upon successful completion of the course students will be able to:

1. Apply fundamental concepts of statistics and probability for data analysis.
2. Apply appropriate statistical methods on simple datasets.
3. Formulate and solve problems in a systematic manner.
4. Conduct investigation and Interpret output obtained from statistical analysis on datasets.
5. Obtain hands on experience with some popular software (like R)for analysis and visualization of data.

UNIT I: INTRODUCTION TO STATISTICS & PROBABILITY

7

The role of statistics. Grouping and displaying data. Measures of central tendency and dispersion, Basic terminology in probability, probability rules, Probabilities under conditions of statistical independence, probabilities under conditions of statistical dependence.

UNIT II: PROBABILITY DISTRIBUTION:

6

What is probability distribution, random variables, use of expected value in decision making, and various probability distributions :Binomial, Poisson, Uniform and Normal distributions.

UNIT III: SAMPLING DISTRIBUTION:

7

Introduction to sampling distributions, sampling distribution of mean and proportion, application of central limit theorem, sampling techniques.

ESTIMATION THEORY: Estimation: Point and Interval estimates ,confidence intervals ,calculating interval estimates for population parameters of large sample and small samples, determining the sample size

UNIT IV: TESTING OF HYPOTHESIS

7

Introduction, null hypothesis, tests of hypothesis and significance, type I and type II errors, one tailed and two tailed tests, p-value one sample tests for means and proportions of large samples (z-test), one sample tests for means of small samples (t-test), Chi-square tests for goodness of fit. Analysis of variance.

UNIT V: NON-PARAMETRIC METHODS

6

Sign test for paired data. Rank sum test. Mann –Whitney U test and Kruskal Wallis H test. One sample run test, rank correlation. Kolmogorov-Smirnov –test.

UNIT VI: REGRESSION and CORRELATION

6

Estimation of regression line by least square method, linear regressions, Multivariate regression ,Correlation analysis, nonlinear regression, logistic regression

Total Lectures

39

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B.Tech. in Artificial Intelligence and Machine Learning

Text Books:

1. Introduction to probability and statistics for engineers and scientist, Sheldon M. Ross ,3rd Edition,Elsevier
2. Statistics for Management, Richard I. Levin & David S. Rubin, 7th Edition, Pearson Education
3. Probability and Statistics , Murray R. Spiegel, John J.Schiller, R AluSrinivasan, Third Edition, Mc Graw Hill education

Reference Book:

1. Practical Statistics for Data Scientists, 50 Essential Concepts, Peter Bruce & Andrew Bruce
2. An Introduction to Statistical Learning with Applications in R, Gareth James, Daniela Witten, Trevor Hastie & Robert Tibshirani

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

- 1 [http://103.152.199.179/YCCE/Supported%20file/Supported%20file/SERIES%20WISE%20BOOKS/COMPUTER%20SCIENCE/COMPUTER%20SCIENCE%20\(E%20Series\).pdf](http://103.152.199.179/YCCE/Supported%20file/Supported%20file/SERIES%20WISE%20BOOKS/COMPUTER%20SCIENCE/COMPUTER%20SCIENCE%20(E%20Series).pdf)
- 2 <http://103.152.199.179/YCCE/Supported%20file/Supported%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/The%20Art%20of%20R%20Programming.pdf>
- 3

MOOCs Links and additional reading, learning, video material

1. https://onlinecourses.nptel.ac.in/noc21_ma74/preview
- 2.
- 3.

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IV SEMESTER

23AML1405: Lab. Statistics for data science

List of Experiment

Sr. No.	Experiments based on
1.	Implement basic functionality of R
2.	Implement data import and export functionality in R
3.	Implement R functions to calculate basic statistics of data source
4.	Apply the visualization techniques in R to understand data
5.	Solve the problems using probability distributions in R
6.	Analyze the data using sampling technique
7.	Analyze the data to find out estimated value
8.	Analyze the data using hypothesis testing
9.	Implement integration of R and java using packages
10.	Case study on data analysis and visualization

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IV SEMESTER

23AML1406: Digital & Technological Solution- Open source tools

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Recognize the benefits and features of Open Source Tools & Technologies and to interpret, contrast and compare open source products.
2. Use appropriate open source tools based on the nature of the problem.
3. Acquire skills for the installation and configuration of open source softwares and tools.
4. Write code and compile different open-source softwares.

Unit:1	Introduction to open source tools	7 Hours
About open source tools, Examples, Need of open source tools, Open source principles, Standard requirements, Understanding open source Ecosystem, Free Softwares-FOSS, Licenses - GPL, LGPL, Copyrights, Patents, Contracts & Licenses and Related Issues, Income generation opportunities.		
Unit:2	Open source programming tools	8 Hours
Programming Tools And Techniques, Usage of design tools like Argo, UML or similar, Version Control Systems like Git or similar, Boot Strap, Bug Tracking Systems like BugZilla, Trac.		
Unit:3	Open Source Ethics	7 Hours
Open Vs Closed Source, Government – Ethics, Impact of Open source Technology, Shared Software – Shared Source		
Unit:4	Case Studies	8 Hours
Apache, Berkeley Software Distribution, Mozilla(Firefox), Wikipedia, Joomla, GNU Compiler Collection, LibreOffice.		
Total Lecture Hours		30 Hours

Textbooks

1	Kailash Vadera, Bhavyesh Gandhi, "Open Source Technology", Laxmi Publications Pvt Ltd 2012, 1st Edition.
2	Fadi P. Deek and James A. M. McHugh, "Open Source: Technology and Policy", Cambridge Universities Press 2007.

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Reference Books

1 "Free and Open Source Software: Policy, Law, and Practice" by Noam Shemtov and Ian Walden

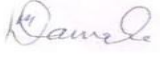
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1 <http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0>

2 <https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042>

MOOCs Links and additional reading, learning, video material

1 <https://www.coursera.org/learn/open-source-software-development-methods>

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IV SEMESTER

23AML1407: Lab : Vocational & Skill Enhancement - Web Application development

Course Objectives

- To understand the functionality and utility of PHP along with the usage of syntax, variables and data
- To understand the concept of object oriented programming with PHP.

Course Outcomes

- Develop program using control statement.
- Perform operations based on arrays and graphics.
- Develop programs by applying various object oriented concepts.
- Use form controls with validation to collect user's input.
- Perform database operations in PHP

Practicals based on following syllabus :

UNIT I: Expressions and control statements in PHP: History and Advantages of PHP, Syntax of PHP, Variables, Data types, Expressions and operators, constants, Decision making control statements – if, if-else, nested if, switch, break and continue statement, Loop control structures-while, do-while, for and foreach.	6
UNIT II: Arrays, Functions and Graphics: Creating and Manipulating Array, Types of Arrays-Indexed, Associative and Multi-dimensional arrays, Function and its types-User defined function, variable function and Anonymous function. Operations on String and String functions: str_word_count(), strlen(), str_rev(), stripslashes(),str_replace(), ucwords(),strtoupper(), strtolower(), strcmp(). Basic Graphics Concepts: Creating Images, Images with text, Scaling Images, Creation of PDF document.	6
UNIT III: Apply Object Oriented Concepts in PHP: Creating Classes and Objects, Constructor and Destructor. Inheritance, Overloading and Overriding, Cloning Object.	6
UNIT IV: Creating and validating forms: Creating a webpage using GUI Components, Browser Role-GET and POST methods, Server Role, Form controls: text box, text area, radio button, check box, list, buttons, multiple forms, Web page validation, Cookies, Session. Database Operations: Introduction to MySQL, Database operations: Insert data, Retrieving the Query result, Update and Delete Operations on table.	8
Total Lectures	26

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Text Books:

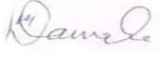
1. Kevin Tatroe, Peter MacIntyre, Rasmus Lerdorf, "Programming PHP", O'Reilly Media, 2013.
2. Steven Holzner, "PHP: The Complete Reference", McGraw-Hill Education, 2008.

Reference Book:

1. Lynn Beighley, Michael Morrison, "Head First PHP & MySQL", O'Reilly Media, Incorporated, 2009.
2. A B Nimbalkar, "Advanced Web Technologies", Nirali Prakashan, 2017.
3. W Jason Gilmore, "Beginning PHP and MySQL 5", Apress, 2006.

MOOCs Links and additional reading, learning, video material

1. <https://www.nptelvideos.com/video.php?id=2312&c=32>
2. <https://www.digimat.in/nptel/courses/video/109104198/L45.html>

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IV SEMESTER

Multidisciplinary Minor Courses

Track 1

MDMT1AML101 : Artificial Intelligence and Machine learning

Courses	Sem	MDMT1AML101 : Artificial Intelligence and Machine learning
MDM-I	3	(MDM1AML101) Fundamentals of Data Structures
MDM-II	4	(MDM2AML102) Introduction to Analysis of Algorithms
MDM-III	5	(MDM3AML103) Data analysis and Statistics
MDM-IV	6	(MDM4AML104) Fundamentals of Artificial Intelligence
MDM-V	7	(MDM5AML105) Machine Learning and its Applications
MDM-VI	8	(MDM6AML106) Practical Machine Learning for Data analysis

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IV Semester

Track1 : MDMT1AML101 : Artificial Intelligence and Machine learning (MDM2AML102) Introduction to Analysis of Algorithms

Course Objectives

- To develop the algorithmic techniques, time requirements of an algorithm and mathematical techniques used in analysis of algorithms.

Course Outcomes

CO1: Understand time requirements of an algorithm and mathematical techniques used in analysis of algorithms.

CO2: Analyze the Complexities of different algorithms for a wide variety of foundational problems occurring in computer science applications.

CO3: To be able to prove the hardness of NP-Hard problems using simple reductions.

Unit:1	ANALYSIS OF ALGORITHM:	7 Hours
Algorithm, pseudo code for expressing algorithms, performance analysis-space complexity, time complexity, asymptotic notation- big (O) notation, omega notation, theta notation and little (o) notation, recurrences. Analysis of sorting algorithms such as selection sort, insertion sort, bubble sort.		
Unit:2	DIVIDE AND CONQUER, GREEDY METHOD	7 Hours
DIVIDE AND CONQUER: General method, Applications-analysis of Binary search, Quick Sort. GREEDY METHOD: General method, Applications-job sequencing with deadlines, Fractional knapsack problem, minimum cost spanning trees, Single source shortest path problem.		
Unit:3	GRAPHS, DYNAMIC PROGRAMMING	7 Hours
GRAPHS (Algorithm and Analysis): Breadth first search and traversal, Depth first search and traversal. DYNAMIC PROGRAMMING: General method, applications - 0/1 knapsack problem, Single source shortest paths, All pair shortest path, LCS.		
Unit:4	BACKTRACKING	7 Hours
BACKTRACKING: General method, Applications- n-queen problem, Sum of subsets problem, Graph coloring and Hamiltonian cycles. INTRODUCTION TO NP-COMPLETENESS: The class P and NP, Polynomial reduction, NP- Completeness Problem, NP-Hard Problems.		
Total Lecture Hours		28 Hours

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Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	



Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B. Tech SoE and Syllabus 2023

(Scheme of Examination w.e.f. 2023-24 onward)

(Department of Computer Science & Engineering)

SoE No.
23CSE-101

B.Tech. in Artificial Intelligence and Machine Learning

Text Books:

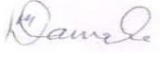
- | | |
|----|--|
| 1. | H. Cormen, Introduction to Algorithms, 3rd Edition, Thomas Publisher Prentice Hall of India. |
| 2. | Ellis Horowitz, Satraj Sahni, Rajasekharam (2007), Fundamentals of Computer Algorithms, 2nd edition, University Press, New Delhi |

Reference Book:

- | | |
|---|---|
| 1 | Fundamentals of Algorithms, Brassard and Bratley, Second Edition, Prentice Hall |
| 2 | https://dl.ebooksworld.ir/books/Introduction.to.Algorithms.4th.Leiserson.Stein.Rivest.Cormen.MIT.Press.9780262046305.EBooksWorld.ir.pdf |

MOOCs Links and additional reading, learning, video material

- | | |
|----|---|
| 1. | https://onlinecourses.nptel.ac.in/noc21_cs22/preview |
| 2. | https://archive.nptel.ac.in/courses/106/101/106101060/ |

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(Department of Computer Science & Engineering)

SoE No.
23CSE-101

B.Tech. in Artificial Intelligence and Machine Learning

III SEMESTER

Open Elective -I : Basket

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject
1	4	OE2	GE	23OE2401	OE-II : Combinatorics
2	4	OE2	GE	23OE2402	OE-II : Fuzzy Set Theory, Arithmetic And Logic
3	4	OE2	GE	23OE2403	OE-II : Green Chem. & Sustainability
4	4	OE2	GE	23OE2404	OE-II : Hydrogen Fuel
5	4	OE2	GE	23OE2405	OE-II : Electronic Materials And Applications
6	4	OE2	GE	23OE2406	OE-II : Laser Technology And Applications
7	4	OE2	MGT	23OE2407	OE-II : Finance And Cost Management
8	4	OE2	MGT	23OE2408	OE-II : Operation Research Techniques
9	4	OE2	MGT	23OE2409	OE-II : Project Evaluation & Management
10	4	OE2	MGT	23OE2410	OE-II : Total Quality Management
11	4	OE2	MGT	23OE2411	OE-II : Value Engineering
12	4	OE2	MGT	23OE2412	OE-II : Maintenance Management
13	4	OE2	MGT	23OE2413	OE-II : Industrial Safety
14	4	OE2	MGT	23OE2414	OE-II : Industry 4.0
15	4	OE2	MGT	23OE2415	OE-II : Operation Management
16	4	OE2	MGT	23OE2416	OE-II : Material Management
17	4	OE2	MGT	23OE2417	OE-II : Hospitality Management
18	4	OE2	MGT	23OE2418	OE-II : Human Resource Management & Organizational Behaviour
19	4	OE2	MGT	23OE2419	OE-II : Agri-Business Management
20	4	OE2	MGT	23OE2420	OE-II : Rural Marketing
21	4	OE2	MGT	23OE2421	OE-II : Marketing Management
22	4	OE2	MGT	23OE2422	OE-II : Health Care Management

Link for Open Electives syllabus: <https://ycce.edu/syllabus/>

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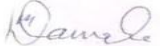
**SoE No.
23CSE-101**

B.Tech. in Artificial Intelligence and Machine Learning

III SEMESTER

Mandatory Learning Course (MLC)

MLC2124 : YCAP4

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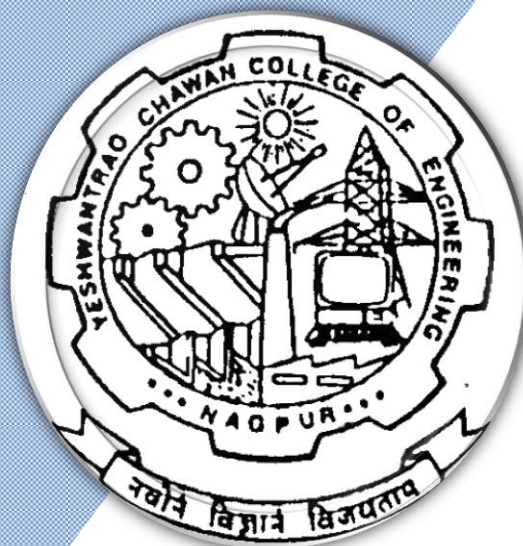
Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

(Accredited 'A++' Grade by NAAC with a score of 3.6)

Hingna Road, Wanadongri, Nagpur - 441 110



Bachelor of Technology

SoE & Syllabus 2023

1st Semester

(Department of Computer Science & Engineering)

B. Tech in Artificial Intelligence and Machine Learning (AIML)



Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
B.TECH SCHEME OF EXAMINATION 2023
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(Department of Computer Science & Engineering)
B. Tech. in Artificial Intelligence and Machine Learning

SoE No.
23AML-101

SN	Sem	Type	BoS/Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration in Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
FIFTH SEMESTER															
1	5	PC	AML	23AML1501	Formal Language & Automata Theory	T	3	0	0	3	3	30	20	50	3
2	5	PC	AML	23AML1502	Lab : Formal Language & Automata Theory	P	0	0	2	2	1		60	40	
3	5	PC	AML	23AML1503	Design & Analysis of Algorithms	T	3	0	0	3	3	30	30	40	3
4	5	PC	AML	23AML1504	Lab : Design & Analysis of Algorithms	P	0	0	2	2	1		60	40	
5	5	PC	AML	23AML1505	Fundamentals of Artificial Intelligence	T	3	0	0	3	3	30	40	3	
6	5	PC	AML	23AML1506	Lab : Fundamentals of Artificial Intelligence	P	0	0	2	2	1	1	60	40	
7	5	PE	AML		Professional Elective-I	T	3	0	0	3	3	30	30	40	3
8	5	PE	AML		Lab : Professional Elective-I	P	0	0	2	2	1	1	60	40	
9	5	OE-3	OE		Open Elective-III	T	3	0	0	3	3	30	20	50	3
10	5	MDM	AML		MD Minor Course-III	T	3	0	0	3	3	30	20	50	3
11	5	STR	AML	23AML1507	Internship, Seminar and Report	P	0	0	2	2	1		60	40	
TOTAL							18	0	10	28	23				

List of Mandatory Learning Course (MLC)															
1	5	HS	T&P	MLC2125	YCAP5 : YCCE Communication Aptitude Preparation	A	3	0	0	3	0				

Professional Elective - I					
1	5	PE-I	AML	23AML1521	PE-I : Neural Network algorithms and applications
2	5	PE-I	AML	23AML1522	PE-I : Lab : Neural Network algorithms and applications
3	5	PE-I	AML	23AML1523	PE-I : Digital Image Processing
4	5	PE-I	AML	23AML1524	PE-I : Lab : Digital Image Processing
5	5	PE-I	AML	23AML1525	PE-I : Business Intelligence and Analytics
6	5	PE-I	AML	23AML1526	PE-I : Lab : Business Intelligence and Analytics
7	5	PE-I	AML	23AML1527	PE-I : Internet of Things
8	5	PE-I	AML	23AML1528	PE-I : Lab : Internet of Things
Coursera Electives					
1	5	PE-I	PC	23AML1529	PE-I : IBM Generative AI Engineering Professional Certificate
2	5	PE-I	PC	23AML1530	PE I : Lab.: IBM Generative AI Engineering Professional Certificate

Open Elective - III								
SN	Sem	Type	BoS/Deptt	Sub. Code	Subject	FACULTY		
1	5	OE3	CSE	23OE3501	OE-III : Social Reformers in Modern Maharashtra	ARTS		
2	5	OE3	CSE	23OE3502	OE-III : Independent India 1948-2010	ARTS		
3	5	OE3	CT	23OE3503	OE-III : Introduction To Cognitive Psychology	ARTS		
4	5	OE3	CT	23OE3504	OE-III : Introduction To Engineering Psychology	ARTS		
5	5	OE3	CT	23OE3505	OE-III : Introduction To Behavioural Psychology	ARTS		
6	5	OE3	CT	23OE3506	OE-III : Introduction To Emotional Psychology	ARTS		
7	5	OE3	EL	23OE3507	OE-III : Elements of Public Administration	ARTS		
8	5	OE3	ETC	23OE3508	OE-III : Ancient Indian History	ARTS		
9	5	OE3	IT	23OE3509	OE-III : Consciousness Studies	ARTS		
10	5	OE3	IT	23OE3510	OE-III : Psychology for Professionals	ARTS		
11	5	OE3	IT	23OE3511	OE-III : Introduction to Sociology and Human Behavior	ARTS		
12	5	OE3	GE	23OE3512	OE-III : Economics of Money and Banking	ARTS		
13	5	OE3	GE	23OE3513	OE-III : Economics of Capital Market	ARTS		
14	5	OE3	GE	23OE3514	OE-III : Digital Humanities	ARTS		
15	5	OE3	GE	23OE3515	OE-III : Introduction to Political Science	ARTS		
16	5	OE3	CT	23OE3516	OE-III : Bhagwat Geeta - An Engineer's Interpretation	ARTS - IKS		
17	5	OE3	CT	23OE3517	OE-III : Artha shastra by Kautiliya	ARTS - IKS		
18	5	OE3	CSD	23OE3518	OE-III : Glimpses of Ancient science and Technology	ARTS - IKS		
19	5	OE3	CV	23OE3519	OE-III : Indian taxation system	COMMERCE		
20	5	OE3	CV	23OE3520	OE-III : Elements of share trading	COMMERCE		
21	5	OE3	EE	23OE3521	OE-III : Introduction to Fintech	COMMERCE		
22	5	OE3	EE	23OE3522	OE-III : Financial Analytics	COMMERCE		
23	5	OE3	ETC	23OE3523	OE-III : Fundamentals of Investments	COMMERCE		
24	5	OE3	EE	23OE3524	OE-III : Lifestyle Diseases	HEALTHCARE & MEDICINE		
25	5	OE3	EE	23OE3525	OE-III : Holistic Nutrition	HOME SCIENCE		
26	5	OE3	EL	23OE3526	OE-III : Community Organization & Development	HOME SCIENCE		
27	5	OE3	CSE	23OE3527	OE-III : Human Rights & International Laws	LAW		
28	5	OE3	CSE	23OE3528	OE-III : Cyber Crime Administration	LAW		
29	5	OE3	MATHS	23OE3529	OE-III : Finite Differences & Numerical Methods	SCIENCE		
30	5	OE3	MATHS	23OE3530	OE-III : Business Statistics	SCIENCE		
31	5	OE3	PHY	23OE3531	OE-III : Crystalline Solids: Properties and Applications.	SCIENCE		
32	5	OE3	PHY	23OE3532	OE-III : Nanotechnology: Fundamental to Applications	SCIENCE		
33	5	OE3	CHE	23OE3533	OE-III : Chemistry in daily life	SCIENCE		
34	5	OE3	CHE	23OE3534	OE-III : Battery Systems and Management	SCIENCE		
35	5	OE3	NPTL	23OE3535	OE-III : Designated approved online NPTEL Course	NPTEL		
Chairperson					Dean (Acad. Matters)	July, 2023	1.00	Applicable for AY 2023-24 Onwards
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Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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B. Tech SoE and Syllabus 2023

(Scheme of Examination w.e.f. 2023-24 onward)

(Department of Computer Science & Engineering)

B.Tech. in Artificial Intelligence and Machine Learning

SoE No.
23AML-101

V Semester

23AML1501: Formal Language & Automata Theory

Course Outcomes:

Upon successful completion of the course the students will be able to:

- CO1. Understand the basic properties of formal languages and Finite Automata, Regular expression and Regular Grammar.
- CO2. Study the different types of Grammars and the properties of Context Free Grammar.
- CO3. Understand and apply the basic properties of CFL and Designing of Push Down Automata.
- CO4. Understand and apply the basic properties of Turing Machine.
- CO5. Study and analyse the Recursive Language, Decidability, Post Correspondence Problem and Recursive Enumerable Language.

Unit:1		6 Hours
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Alphabet, Symbols, Sets, Strings, Language, Operations, Relations, Design of Finite State Machines, Acceptance of strings and languages, Non Deterministic Finite Automation, Deterministic Finite Automation, Equivalence between NFA and DFA, NFA with ϵ -transition, Minimization of FA.

Unit:2		7 Hours
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Regular sets, Regular expressions, Manipulation of regular expressions, Equivalence between RE and FA. Pumping Lemma, closure properties of regular sets, Regular grammars, Right linear and left linear regular grammars, inter-conversion between LLG & RLG, Equivalence between regular grammar and F.A., Inter-conversion between RE and RG.

Unit:3		6 Hours
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Context free grammar, Derivation trees (Syntax tree and Parse tree), Ambiguous Grammar, Context Free Language (CFL), Normal Form of grammar: Chomsky Normal form, Greibach normal form.

Unit:4		7 Hours
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Push Down Automata(PDA), definition, and model, acceptance of CFL by empty Stack and by final state, equivalence CFL and PDA, Inter-conversion, Closure of properties of CFL, DPDA & NDPDA.

Unit:5		6 Hours
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Turing machine (TM), Definition, Model of TM, Design of Turing Machine, Computable functions, Recursive Enumerable Language, Recursive Language, Properties of Recursive Enumerable Language, Church's hypothesis, Chomsky hierarchy of language, Linear bounded automata and context sensitive language, Universal Turing Machine

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SoE No.
23AML-101

Unit :6		7 Hours
Un-decidability Problems related to Recursive enumerable language and Turing Machine, post correspondence problem. Recursive function Theory –Basis functions and operations on them. Bounded minimization pre-emptive μ recursive function unbounded minimization and recursive function		
Total Lecture Hours		39 Hours
Textbooks		
1.	Introduction to Automata Theory, Languages, and computation,3 rd Edition, Hopcroft J.E., Rajeev Motwani, Jeffrey D. Ullman, Pearson Education	
2.	Introduction to languages and the Theory of Computation, 3 rd Edition, John C. Martin, Mc Graw Hill	
Reference Books		
1.	Introduction to the Theory of Computation,2 nd Edition, Michael Sipser, GALE CENGAGE Learning	
2.	Theory of Computation, 1 st Edition, Dr. O. G. Kakde , Laxmi Publication	
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]		
1	<u>Introduction to Languages and the Theory of Computation</u>	
MOOCs Links and additional reading, learning, video material		
1	https://onlinecourses.nptel.ac.in/noc22_cs63/preview	
2	https://ocw.mit.edu/courses/18-404j-theory-of-computation-fall-2020/pages/lecture-notes/	

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SoE No.
23AML-101

V Semester

23AML1502: Lab : Formal Language & Automata Theory

Course Outcomes:

Upon successful completion of the course the students will be able to:

1. To understand the basic properties of formal languages and Finite Automata, Regular expression and Regular Grammar.
2. To study the different types of Grammars and the properties of Context Free Grammar.
3. To understand and apply the basic properties of CFL and Designing of Push Down Automata.
4. To understand and apply the basic properties of Turing Machine.
5. To study and analyse the Recursive Language, Decidability, Post Correspondence Problem and Recursive Enumerable Language.

Sr. No	List of Practical's	
1	Study of JFLAP tool.	CO1
2	Study of other FLAT tools.	CO1
3	Design NFA for a string starting with '0' over the alphabet $\Sigma = \{0,1\}$ using JFLAP.	CO1
4	Using JFLAP, construct NFA for a string ending with 'b' over the alphabet $\Sigma = \{a, b\}$.	CO1
5	Construct a DFA for a string containing '00' over the alphabet $\Sigma = \{0,1\}$ using any tool.	CO1
6	Construct a DFA for a string having second last symbol as 'a' over the alphabet $\Sigma = \{a, b\}$ using JFLAP.	CO1
7	Build a PDA for a palindrome of even length over the alphabet $\Sigma = \{0,1\}$.	CO3
8	Build a PDA for a palindrome of odd length over the alphabet $\Sigma = \{a,b\}$.	CO3
9	Enter the following CFG into JFLAP $S \rightarrow T T S \rightarrow U T \rightarrow 0 T T \rightarrow T 0 T \rightarrow \# U \rightarrow 0 U 0 U \rightarrow \#$	CO3
10	Design a Turing Machine that concatenates the given strings on the input tape.	CO4

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B.Tech. in Artificial Intelligence and Machine Learning

SoE No.
23AML-101

V Semester

23AML1503: Design & Analysis of Algorithms

Course Outcomes:

Upon successful completion of the course the students will be able to

CO-1 Understand time requirements of an algorithm and mathematical techniques used in analysis of algorithms.

CO-2 Develop an understanding of mathematical concepts such as summation of arithmetic and geometric series, asymptotic notations.

CO-3 Analyze the Complexities of different algorithms for a wide variety of foundational problems occurring in computer science applications.

CO-4 Apply the knowledge of different algorithms with discussions on complexity.

CO-5 Evaluate the knowledge of algorithms with Complexity and NP-completeness

Unit:1 Introduction

7 Hours

Algorithm, pseudo code for expressing algorithms, performance analysis-space complexity, time complexity, asymptotic notation- big (O) notation, omega notation, theta notation and little (o) notation, recurrences, probabilistic analysis, disjoint set operations, union and find algorithms. Analysis of sorting algorithms such as selection sort, insertion sort, bubble sort, heap sort, external Sorting, lower bound proof.

Unit:2 Recursive Functions

6 Hours

Recursive functions and recurrence relations, solutions of recurrence relations using technique of characteristic equation and generating functions, elementary and advanced data structures with operations on them and their time complexity, Amortized analysis.

Unit:3 Divide and conquer

7 Hours

DIVIDE AND CONQUER: General method, applications-analysis of binary search, quick sort, merge sort, AND OR Graphs. **GREEDY METHOD:** General method, Applications-job sequencing with deadlines, Fractional knapsack problem, minimum cost spanning trees, Single source shortest path problem.

Unit:4 Dynamic Programming

7 Hours

GRAPHS: Breadth first search and traversal, Depth first search and traversal, connected components and bi-connected components, Articulation points. **DYNAMIC PROGRAMMING:** General method, applications – LCS, Matrix Chain Multiplication, optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem, Reliability design.

Unit:5 Backtracking

7 Hours

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SoE No.
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Backtracking: General method, Applications- n-queen problem, Sum of subsets problem, Graph coloring and Hamiltonian cycles. **BRANCH AND BOUND:** General method, applications - travelling sales person problem, 0/1 knapsack problem.

Unit :6	NP-hard and NP-complete problems	6 Hours
NP-hard and NP-complete problems, basic concepts, non-deterministic algorithms, NP-hard and NP-complete, Cook's Theorem, decision and optimization problems, polynomial reduction.		
Total Lecture Hours		39 Hours

Textbooks

1	Computer Algorithms, Third edition, Horowitz, Sahani, Rajsekharan , Galgotia Publications Pvt. Ltd.
2	Introduction to Algorithms, Third edition, Thomas H. Cormen, Prentice Hall of India.
3	Ellis Horowitz, Satraj Sahni, Rajasekharam (2007), Fundamentals of Computer Algorithms, 2nd edition, University Press, New Delhi.

Reference Books

1	Aho, Ullman, Hopcroft (2009), Design and Analysis of algorithms, 2nd edition, Pearson education, New Delhi
2	R. C. T. Lee, S. S. Tseng, R.C. Chang and T. Tsai (2006), Introduction to Design and Analysis of Algorithms A strategic approach, McGraw Hill, India.
3	Allen Weiss (2009), Data structures and Algorithm Analysis in C++, 2nd edition, Pearson education, New Delhi.

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1	http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0
2	https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042

MOOCs Links and additional reading, learning, video material

1	https://archive.nptel.ac.in/courses/106/101/106101060/
2	https://nptel.ac.in/courses/106101060

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B.Tech. in Artificial Intelligence and Machine Learning

SoE No.
23AML-101

V Semester

23AML1504: Lab: Design & Analysis of Algorithms

Sr. No.	List of Experiment
1	To Compute and Analyze its time complexity of various sorting algorithm. - Bubble sort - Insertion sort - Selection Sort - Heap sort
2	To implement and compute time complexity of given problem using Divide and Conquer algorithm. - Merge sort - Quick sort - Binary Search
3	To implement and compute time complexity of Job sequencing problem using Greedy Method for different number of inputs.
4	To implement and compute time complexity of Knapsack Problem using Greedy Method for different number of inputs.
5	To implement and compute time complexity of Dijkstra Problem using Greedy programming for different number of inputs.
6	To implement the given problem using minimum cost spanning trees. - Kruskal Algorithm - Prim Algorithm
7	To implement the given problem using Graph traversal - Breadth first search - Depth First Search
8	To implement and compute time complexity of All Pair Shortest Path using dynamic programming for different number of inputs.
9	To implement and compute time complexity of Travelling Salesman Problem using dynamic programming for different number of inputs.
10	To implement and compute time complexity of LCS Problem using dynamic programming for different number of inputs.
11	To implement and compute time complexity of Sum of Subset Problem using dynamic programming for different number of inputs.
12	To implement and compute time complexity of 0/1 Knapsack Problem using dynamic programming for different number of inputs.

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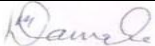
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(Department of Computer Science & Engineering)

SoE No.
23AML-101

B.Tech. in Artificial Intelligence and Machine Learning

13	To implement and compute time complexity of Matrix Chain Multiplication using dynamic programming for different number of inputs.
14	To implement and compute time complexity of 8 Queens's problem using backtracking for different number of inputs.
15	To implement and compute time complexity of Graph coloring problem using backtracking for different number of inputs.

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B.Tech. in Artificial Intelligence and Machine Learning

SoE No.
23AML-101

V Semester

23AML1505: Fundamentals of Artificial Intelligence

Course Outcomes:

Upon successful completion of the course the students will be able to

CO1: Understand Agents and Environments of AI domain in order to relate with real world problem

CO2 Compare and contrast the characteristics of traditional and heuristic based searching algorithm in order to implement real world.

CO3 Apply AI techniques to solve problems of game playing

CO4: Demonstrate knowledge representation using the appropriate technique for a given problem

CO5: Apply uncertainty theory based on techniques like probability theory

Unit:1	Introduction to AI	6 Hours
Introduction to AI, The History of Artificial Intelligence, Strong AI, Weak AI, Intelligent Agents: Agents & environments, Concept of Rationality, Nature of Environments, The Structure of Agents, Application of AI.		
Unit:2	Solving Problems by Searching	7 Hours
Problem Solving Agents, Searching for Solutions, Uninformed Search Strategies, Informed Search Strategies, Heuristic Functions, Local Search Algorithms and Optimization Problems, Local Search in Continuous Space, Searching with Non deterministic actions.		
Unit:3	Adversarial Search	7 Hours
Games Theory, Optimal decision in games, The Mini-Max Algorithm, Alpha-Beta pruning, Constraint Satisfaction Problem, Constraint Propagation, Backtracking Search, Local Search for Constraint Satisfaction Problems.		
Unit:4	Knowledge representation:	6 Hours
Issues, representation and mapping approaches, procedural vs. declarative knowledge, Introduction to propositional logic, Forward Reasoning, Backward Chaining, unification and resolution algorithms. frames		
Unit:5	First Order Logic	6 Hours
Syntax, Semantic of first order logic, Symbols of Interpretations, Quantifiers, Equality, Using First Order Logic, Assertions and Queries in first order logic, Knowledge engineering in first order logic, propositional vs. first order logic, Unification and lifting, Forward chaining, Backward Chaining.		

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Unit :6	Reasoning in Uncertain Domain	7 Hours
Uncertainty, Handling uncertain knowledge, rational decisions, basics of probability, axioms of probability, inference using full joint distributions, independence, Bayes' Rule and conditional independence, Bayesian networks, Semantics of Bayesian networks, Exact inference in Bayesian Networks.		
Total Lecture Hours		39 Hours
Textbooks		
1	Peter Norvig and Stuart Russel Artificial Intelligence: A Modern Approach Pearson Education, Inc, 2010.	
Reference Books		
1	Elaine Rich, Kevin Knight, Shivasankar B. Nair Artificial Intelligence The McGraw Hill publications, Third Edition, 2014	
2	Introduction to Artificial Intelligence and Expert System, D. W. Patterson, PHI	
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]		
1	http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0 2	
2	https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042	
MOOCs Links and additional reading, learning, video material		
1	https://onlinecourses.nptel.ac.in/noc23_ge40/preview	
2	https://onlinecourses.nptel.ac.in/noc23_cs92/preview	

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**SoE No.
23AML-101**

V Semester

23AML1506: Lab: Fundamentals of Artificial Intelligence

Course Outcomes:

Upon successful completion of the course the students will be able to

CO1: Apply various AI search algorithms

CO2: Understand the fundamentals of theorem proving using AI tools.

CO3: Demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information.

CO4: Apply AI techniques and technologies to solve real world business problems.

Sr.No.	Experiment based on
1	Implementation of Breadth First Search for Water Jug Problem
2	Implementation of Depth First Search for 8 Puzzle Problem
3	Implementation of Minimax algorithm for Tic Tac Toe problem
4	Implementation of Constraint satisfaction problem for given Cryptarithmic
5	Implementation of A* algorithm for 8 puzzle problem
6	Implementation of Best First Search for given problem
7	Implementation of Alpha Beta Pruning for given problem
8	Implementation of Hill climbing algorithm for 8 queen problem
9	Implementation of Resolution in First Order Logic for given problem
10	Implementation of Semantics of Bayesian Network
11	Implementation of unification and resolution for real world problems.
12	Developing agent programs for real world problems.
13	Build a bot which provides all the information related to you in college.
14	Write a program to find the solution for wampus world problem.

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**B.Tech. in Artificial Intelligence and Machine Learning****V Semester****23AML1521: PE-I : Neural Network algorithms and applications****Course Outcomes:****Upon successful completion of the course the students will be able to**

1. Understand biological and artificial neural networks, neuron models, perceptrons, learning rules, and network types.
2. Apply single-layer perceptron algorithms and machine learning concepts for tasks like classification and regression.
3. Implement multilayer perceptrons with backpropagation and advanced optimization techniques.
4. Apply regularization techniques to improve neural network generalization and reduce overfitting.
5. Understand and analyze deep learning models, including CNNs and autoencoders, using modern architectures and transfer learning.

Unit:1	Introduction to Biological and Artificial Neural Networks:	6 Hours
Biological Neurons, General Artificial Neuron Model, MP Neuron, Perceptrons, Neural Network learning Rules, types of neural networks, feedforward vs recurrent neural networks		
Unit:2	Perceptrons and Machine Learning Basics:	7 Hours
Single Discrete Perceptron algorithm, linear machine and minimum distance classification, gradient descent and Single Continuous Perceptron algorithm Machine learning basics: supervised vs unsupervised learning, various Machine learning tasks like classification, regression, machine Translation, Anomaly detection, etc. Capacity, Overfitting and Underfitting, bias and variance.		
Unit:3	Multilayer Perceptrons and Backpropagation Algorithm	7 Hours
Multilayer Perceptrons (MLPs), Representation Power of MLPs, Feed forward Neural Networks, Backpropagation, algorithm, Momentum Based Gradient Descent (GD), Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMSProp, Adam, Applications of MLPs for classification and regression, Performance measures.		
Unit:4	Regularization:	6 Hours
L1, L2 Regularization, Early stopping, Dataset augmentation, Parameter sharing and tying, Injecting noise at input, any other recent topics.		
Unit:5	Introduction to Deep Networks:	7 Hours
History of deep learning, Types of deep networks, Introduction to Convolutional Neural Networks, LeNet, Alex Net, ZF-Net, VGGNet, GoogLeNet, ResNet, Transfer learning using CNNs, comparison of shallow and deep networks.		

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Unit :6	Autoencoders:	6 Hours
Auto encoders, Regularization in auto encoders, Denoising auto encoders, Sparse auto encoders, Contractive auto encoders.		
Total Lecture Hours		39 Hours
Textbooks		
1	Deep Learning, Ian Goodfellow, Yoshua Bengio, Aaron Courville, MIT Press	
2	Introduction to artificial neural system, Jacek M. Zurada	
Reference Books		
1	Deep learning with python, Francois Chollet, Manning	
2	Pattern Recognition and Machine Learning, Christopher Bishop, Springer	
3	Neural Networks: A Systematic Introduction, Raul Rojas, Springer	
4	Deep Learning, Amit Das, Saptarshi Goswami, Prabir Mitra, Amlan Chakrabarti, Pearson	
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1	http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0	
2	https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042	
MOOCs Links and additional reading, learning, video material		
1	Deep Learning – Prof. Mitesh Khapra (IIT Ropar), Swayam Course https://onlinecourses.nptel.ac.in/noc22_cs124/preview	
2	Neural Networks and Deep Learning, Andrew Ng https://www.coursera.org/learn/neural-networks-deep-learning#syllabus	

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SoE No.
23AML-101

V Semester

23AML1522: Lab: PE-I : Neural Network algorithms and applications

Sr.No.	List of Experiment
1	Design and Implement 3-input gates using Mc Culloch Pit's Model of a neuron.
2	Find the weights for 3-input NAND gate using Single Discrete Perceptron Training Algorithm.
3	Implement a Linear Machine using discrete perceptron to classify binary image patterns.
4	Implementing a classifier using feed forward Neural Network using Scikit learn
5	Implementing a feed forward Neural Network based regression using Scikit learn
6	Experiment on classification using Pre-trained deep network
7	Comparing Shallow and Deep Networks(CNN) for digit classification using MNIST dataset
8	Developing a real-world application using CNN.

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SoE No.
23AML-101

V Semester

23AML1523: PE-I : Digital Image Processing

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Describe Basic relationships between pixels.
2. Compare various image enhancement techniques in spatial domain and frequency domain.
3. Illustrate different image compression techniques to understand the advantage of image compression
4. Demonstrate the applications of similarity based and dissimilarity-based approaches for image segmentation.
5. Interpret various representation techniques

Unit:1 Introduction 6 Hours

Fundamental Steps in Image Processing, Elements of DIP systems, Elements of Visual Perception, Fundamentals of Image processing, A Simple Image Model, Sampling and Quantization, Some Basic Relationships between Pixels.

Unit:2 Image Enhancement in the Spatial Domain 7 Hours

Introduction to Spatial and Frequency methods, Basic Gray Level Transformations, Histogram Equalization, Image Subtraction, Image Averaging, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters.

Unit:3 Transforms & Image Enhancement in the frequency Domain 7 Hours

Transforms: Introduction to the Fourier Transform, Discrete Fourier Transformation, Fourier Properties, 2DFT, inverse Fourier transform, **Image Enhancement in the frequency Domain:** Filtering in the Frequency Domain, Correspondence between Filtering in the Spatial and Frequency Domain, Smoothing Frequency-Domain Filters, Sharpening Frequency-Domain Filters, Homomorphic Filtering.

Unit:4 Image Compression 6 Hours

Fundamentals of Image compression, coding redundancy, spatial and temporal redundancy, Measuring Image Information, Fidelity criteria, Image compression models, Basic compression methods, Huffman coding, arithmetic coding, LZW coding, run length coding.

Unit:5 Image Segmentation 6 Hours

Point Detection, Line Detection, Edge Detection, Gradient Operator, Edge Linking and Boundary Detection, Thresholding, Region-oriented Segmentation.

Unit :6 Image Representation 6 Hours

Chain Codes, Polygonal Approximations, Signatures, Boundary Segments, Skeleton of a Region.

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Description: Boundary Descriptors, Shape Numbers, Regional Descriptors, Topological Descriptors.
Introduction to color image processing: RGB and HSI color models.

Total Lecture Hours

39 Hours

Textbooks

- 1 Digital Image Processing, 3rd edition 2007, Rafael C. Gonzalez and Richard, E. Woods, Prentice Hall
- 2 Digital Image Processing, 2009, S Jayaraman, Tata McGraw Hill

Reference Books

- 1 Fundamentals of Digital Image Processing, A K Jain, Prentice Hall, 1988
- Image Processing Principles & Applications 2005, Tinku Acharya & Ajoy K. Ray, Wiley Inter-Science

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- 1 <http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/37.Digital.Image.Processing.4th.Edition.www.EBooksWorld.ir.pdf>
- 2 Index of /YCCE/DTEL Material/6.Computer Technology/DTEL PPT's with copyrights/DIP

MOOCs Links and additional reading, learning, video material

- 1 https://onlinecourses.nptel.ac.in/noc21_ee78/preview
- 2 https://onlinecourses.nptel.ac.in/noc21_ee100/preview

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SoE No.
23AML-101

V Semester

23AML1524: Lab: PE-I : Digital Image Processing

Sr. No.	Experiments based on
1	1. Write a program in MATLAB for following Point processing techniques in spatial domain a. Negation of an image b. Thresholding of an image c. Contrast Stretching of an image
2	. Write a Program in MATLAB to Create a Histogram of a given Image OR <i>https://cse19-iiith.vlabs.ac.in/objective.php?exp=histo</i>
3	Write a program in MATLAB to perform following smoothing operations on an image a. Average filter b. Ordered Statistics filter
4	. Write a program in MATLAB to sharp an image using Laplacian mask.
5	. Write a program in MATLAB to segment an image using multilevel thresholding OR <i>https://cse19-iiith.vlabs.ac.in/objective.php?exp=segment</i>
6	. Write a program in MATLAB to apply split and merge algorithm on a given image.
7	Write a program in MATLAB to find the code chain of a given image.
8	Write a program in MATLAB to find Euler number of image a given image.
9	Write a program using OpenCV tool to detect the object present in an image.
10	Write a program using OpenCV tool to detect and track the object present in video.

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SoE No.
23AML-101

V Semester

23AML1525: PE-I : Business Intelligence and Analytics

Course Outcome

After completion of the course Students will be able to :

1. Explain the fundamental concepts, architecture, trends and applications of Business Intelligence and its role in decision-making
2. Design data warehousing solutions, including ETL processes, to support BI applications.
3. Explore and analyze the Business Intelligence (BI) lifecycle and its phases, to support data-driven decision-making.
4. Apply predictive analytics on real time datasets

Unit No.	Contents	Max. Hrs.
1	Introduction to Business Intelligence and Analytics :	7
What is business intelligence, The role of BI and analytics in modern businesses, Types of Analytics: Descriptive, Diagnostic, Predictive, and Prescriptive, Key components of BI systems: Data warehouses, OLAP, ETL, OLTP vs. OLAP, BI in various domains and functional area, role of datawarehousing in BI.		
2	Basics of data Integration (Extraction ,Transformation, Loading- ETL)	7
Concepts of data integration, need and advantages of using data integration, introduction to common data integration approaches, introduction to ETL, introduction to data quality, data profiling concepts and applications		
3	Principles of Dimensional modelling:	7
Introduction to multidimensional data model , ER modelling vs Multidimensional modelling, concepts of dimensions, facts, cubes, attributes, hierarchies , Foundation for fact based decision making, star and snowflake schema, Pros& cons of the star/snowflake schema dimensional model, Slowly changing dimension tables, Fact-less fact strategy, Time dimension.		
4	Business Intelligence system architecture:	6
Need for enterprise class business intelligence infrastructure, The BI ecosystem, Building blocks of a n- tier BI system-servers & communication protocols, The central repository-metadata, Information consumption user interfaces-desktop vs. web vs. Mobile. Open architecture, Scalability, performance in BI-in memory analytics.		
5	BI Project Lifecycle :	6

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Typical BI project lifecycle, Requirements gathering & analysis-functional & non- functional requirements, reports and dashboards design- mock – up and storyboarding, Testing in a BI project, BI project deployment, Post production support, Applications of BI, BI best practices

6	Introduction to Predictive Analytics	6
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Predictive modeling: Linear regression, Logistic regression, Time series analysis for forecasting ,Evaluating model performance: Accuracy, Precision, Recall

Total Lectures	39 hrs
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Text Books

- | | |
|---|--|
| 1 | Fundamentals of Business Analytics, R.N.Prasad, Seema Acharya, wiley |
| 2 | Data Warehousing ETL toolkit, Indian edition, Ralph Kimball and Margy Ross, wiley |
| 3 | Business Intelligence Roadmap: The Complete Project Lifecycle for Decision-Support Applications (Addison-Wesley Information Technology Series) 1st Edition, Kindle Edition by Larissa T. Moss (Author), Shaku Atre (Author), Edward Yourdon (Foreword) |

Reference Books

- | | |
|---|---|
| 1 | Business Intelligence: The Savvy Manager's Guide, David Loshin |
| 2 | Data Warehousing in the real world A practical guide for building Decision Support System , Sam Anahory, Dennis Murray, PEARSON |

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|----|---|
| 1. | http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/26.Business%20Intelligence_%20The%20Sav%20-%20David%20Loshin_1391.pdf |
| 2. | http://103.152.199.179/YCCE/Suported%20file/Suprtd%20file/book%20details/CSD.aspx |

MOOCs Links and additional reading, learning, video material

- | | |
|---|---|
| 1 | https://onlinecourses.nptel.ac.in/noc21_mg65/preview |
| 2 | https://nptel.ac.in/courses/110107092 |

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B.Tech. in Artificial Intelligence and Machine Learning

V Semester

23AML1526: Lab: PE-I : Business Intelligence and Analytics

Sr. No.	Name of Practical
1	Implementation of queries based on Joins (joining 2 or more tables), sub queries.
2	Implementation of top n , range queries
3	a. Design a multidimensional data cube for given data Using EXCEL b. Perform OLAP- slicing operation on it
4	Creation Of Dashboard Using EXCEL
5	Exploring Tableau OR/ MICROSTRATEGY ANALYTIC DESKTOP (MSTR) : Installation tool, Importing Data from file, Data Wrangling (Editing Data).
6	Visualization Of Data Using different visualizations in Tableau/ MSTR analytic desktop, Filtering data, and delivering Insights from data
7	Create reports and Dashboard with defined insights /requirements in Tableau/MSTR analytic desktop. (Sample Data to be provided)
8	Creating pipelines / DAX

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SoE No.
23AML-101

V Semester

23AML1527: PE-I : Internet of Things

Course Outcomes:

Upon successful completion of the course the students will be able to :

1. Demonstrate IOT architecture and its enabling technologies
2. Apply various IOT enabling technologies for creation of IOT environments
3. Analyze IOT environments using various communication technologies
4. Develop various IOT environments

Unit:1	Introduction	6 Hours
Concepts behind the Internet of Things, Characteristics of IoT, IoT enabling technologies, IoT Communication Model, IoT architecture, Applications of IoT, Transducers, Sensors, Sensor classes, Sensor types, Actuators and its types.		
Unit:2	IOT Protocols	6 Hours
Application layer: MQTT, COAP, XMPP, AMQP, Network Layer: IPv4, IPv6, 6LoWPAN, IoT Communication protocols: IEEE802.15.4, ZigBee, Wireless HART, Zwave, Bluetooth, NFC, RFID.		
Unit:3	Wireless Sensor networks	7 Hours
Components of sensor nodes, Node Behavior in WSNs, Applications, WSN Coverage, OGDC algorithm, Stationary and Mobile Wireless Sensor Networks.		
Unit:4	Cloud Computing	7 Hours
Recent Trends in Computing, Characteristics, Components of Cloud Computing, Service Models, Deployment Models, Service Management, Cloud Security, IoT Data analytics, Case studies, Middleware for IoT		
Unit:5	Machine to Machine Communication	7 Hours
Node types, IP and Non IP based M2M network Interoperability in Internet of Things: Current Challenges in IoT, Interoperability, Types of Interoperability		
Unit :6	Software-Defined Networking	6 Hours
Current Network to SDN, SDN Architecture, Challenges, OpenFlow Protocol, APIs in SDN, Controller Placement, Recent Advances of SDN in IoT, Industrial internet of things, Case studies		
Total Lecture Hours		39 Hours

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23AML-101

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Textbooks

1. Internet of Things: A Hands-On Approach, Arsheep Bahga, Vijay Madiseti

Reference Books

1. Introduction to IOT Latest S.Misra , A. Mukherjee, A.Roy, 2020
2. Introduction to Industrial Internet of Things and Industry S. Misra, C. Roy, and A. Mukherjee, 2020.

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- 1 <http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/21.405352151-Industry-4-0-The-Industrial-Internet-of-Things-Apress-2016.pdf>

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- 1 https://onlinecourses.nptel.ac.in/noc21_cs17/preview
- 2 https://onlinecourses.nptel.ac.in/noc21_ee85/preview

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B.Tech. in Artificial Intelligence and Machine Learning

SoE No.
23AML-101

V Semester

23AML1528: Lab: PE-I : Internet of Things

Course Outcomes:

Upon successful completion of the course the students will be able to:

CO1: Demonstrate proficiency in interfacing sensors and actuators with Arduino and Raspberry Pi platforms.

CO2: Develop and implement embedded system applications for real-time data acquisition, processing, and display.

CO3: Design communication protocols for data exchange between embedded systems and cloud platforms for remote data storage and analysis.

CO4: Integrate IoT hardware with web technologies to enable real-time monitoring and control through online interfaces.

CO5: Evaluate and troubleshoot complete IoT systems comprising embedded devices, cloud connectivity, and user interfaces for optimized performance.

Sr.No.	Experiment based on
1	Familiarization with Arduino / Raspberry pi and perform necessary software installation.
2.a	To interface LED/ Buzzer with Arduino and write a program to turn ON LED for 1 sec after every 2 seconds.
2.b	To interface Push button / Digital sensor(IR/LDR) with Arduino and write a program to turn on LED when push button is presses at sensor detection
3	To interface DHT11 sensor with Arduino and write a program to print temperature and humidity on Liquid Crystal Displays (LCD).
4	To interface motor using relay with Arduino and write a program to turn ON motor when push button is pressed.
5.a	To interface Bluetooth with Arduino and write a program to send sensor data to smartphone using Bluetooth.
5.b	To interface Bluetooth with Arduino and write a program to turn LED ON /OFF when '1' / '0' is received from smartphone using Bluetooth.
6.a	Design a sketch on Arduino to upload temperature and humidity data to thingspeak cloud.
6.b	Design a sketch on Arduino to retrieve temperature and humidity data to thingspeak cloud.
7.a	Design a sketch on Arduino to publish temperature data to MQTT broker.
7.b	Design a sketch on Arduino to subscribe to MQTT broker for temperature data and print it.
8	Create 000webhost account and create MySQL Database.
9	Develop PHP Code to retrieve data from 000webhost account using MySQL Database.
10	Develop application using with Arduino / ESP 32 / Raspberry pi.

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(Department of Computer Science & Engineering)

B.Tech. in Artificial Intelligence and Machine Learning

SoE No.
23AML-101

V Semester

MDM3AML103: DATA ANALYSIS AND STATISTICS

Course Outcomes:

Upon successful completion of the course the students will be able to

CO1- Understand Fundamental Concepts and methods of statistics

CO2 -Apply descriptive and inferential statistical techniques and model relationships between variables.

CO3- Evaluate statistical significance.

CO4- Interpret patterns, trends, and distributions.

Unit:1	Introduction to data analysis and statistics	6 Hours
Introduction to statistics and its types , types of data , Summary statistics and graphical methods: Summarizing and Exploring Data: Concept of frequency distribution, measures of central tendency, moments, measures of dispersion/variability, measures of skewness and kurtosis.		
Unit:2	Introduction to Probability and probability distributions	7 Hours
Basic concept of probability, conditional probability and independence , Random variable and their properties, important data distributions – binomial. Poisson, Normal		
Unit:3	Sampling and Sampling distributions	6 Hours
Sampling , types of sampling , sampling distributions, Central Limit theorem,		
Unit:4	Estimation	6Hours
Basic concepts of inference (estimation & hypothesis testing), point estimation & interval estimation.		
Unit:5	Hypothesis testing: practical and statistical significance	7 Hours
Hypothesis testing : null and alternative hypotheses, 1 tail, 2 tail tests , Type I and II errors, practical significance of rejection of null hypothesis . Testing hypotheses about μ : z-test, t-test, Nonparametric alternatives :sign tests ,Mann-Whitney test		
Unit :6	Regression analysis	7 Hours
Simple linear regression, least squares fit and correlation analysis. Tests for slope & correlation, prediction problem, residual plots. Multiple linear regression. Analysis of Variance. Statistical models in R.		
Total Lecture Hours		39 Hours

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B.Tech. in Artificial Intelligence and Machine Learning

Textbooks

1	Sheldon M. Ross, Introduction to probability and statistics for engineers and scientist, 3rd edition Elsevier
2	Richard I. Levin & David S. Rubin Statistics for Management, 7th edition Pearson Education
3	Sanjeet singh, Business Statistics for contemporary decision making, tenth edition, an Indian adaptation

Reference Books

1	Murray R. Spiegel, John J. Schiller, R. AluSrinivasan Probability and Statistics 3rd edition Mc Graw Hill education
2	Introduction to Probability and Statistics by J. Susan Milton & J.C. Arnold, 4th Ed., Tata McGraw-Hill Pub. Co. Ltd
3	Gareth James, Daniela Witten, Trevor Hastie & Robert Tibshirani An Introduction to Statistical Learning with Applications in R, Springer

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1	http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0
2	https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042

MOOCs Links and additional reading, learning, video material

1	https://onlinecourses.nptel.ac.in/noc24_ma30/preview
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B.Tech. in Artificial Intelligence and Machine Learning

SoE No.
23AML-101

V SEMESTER

Open Elective -III : Basket

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	FACULTY
1	5	OE3	CSE	23OE3501	OE-III : Social Reformers in Modern Maharashtra	ARTS
2	5	OE3	CSE	23OE3502	OE-III : Independent India 1948-2010	ARTS
3	5	OE3	CT	23OE3503	OE-III : Introduction To Cognitive Psychology	ARTS
4	5	OE3	CT	23OE3504	OE-III : Introduction To Engineering Psychology	ARTS
5	5	OE3	CT	23OE3505	OE-III : Introduction To Behavioural Psychology	ARTS
6	5	OE3	CT	23OE3506	OE-III : Introduction To Emotional Psychology	ARTS
7	5	OE3	EL	23OE3507	OE-III : Elements of Public Administration	ARTS
8	5	OE3	ETC	23OE3508	OE-III : Ancient Indian History	ARTS
9	5	OE3	IT	23OE3509	OE-III : Consciousness Studies	ARTS
10	5	OE3	IT	23OE3510	OE-III : Psychology for Professionals	ARTS
11	5	OE3	IT	23OE3511	OE-III : Introduction to Sociology and Human Behavior	ARTS
12	5	OE3	GE	23OE3512	OE-III : Economics of Money and Banking	ARTS
13	5	OE3	GE	23OE3513	OE-III : Economics of Capital Market	ARTS
14	5	OE3	GE	23OE3514	OE-III : Digital Humanities	ARTS
15	5	OE3	GE	23OE3515	OE-III : Introduction to Political Science	ARTS
16	5	OE3	CT	23OE3516	OE-III : Bhagwat Geeta - An Engineer's Interpretation	ARTS - IKS
17	5	OE3	CT	23OE3517	OE-III : Artha shastra by Kautiliya	ARTS - IKS
18	5	OE3	CSD	23OE3518	OE-III : Glimpses of Ancient science and Technology	ARTS - IKS
19	5	OE3	CV	23OE3519	OE-III : Indian taxation system	COMMERCE
20	5	OE3	CV	23OE3520	OE-III : Elements of share trading	COMMERCE
21	5	OE3	EE	23OE3521	OE-III : Introduction to Fintech	COMMERCE
22	5	OE3	EE	23OE3522	OE-III : Financial Analytics	COMMERCE
23	5	OE3	ETC	23OE3523	OE-III : Fundamentals of Investments	COMMERCE
24	5	OE3	EE	23OE3524	OE-III : Lifestyle Diseases	HEALTHCARE & MEDICINE
25	5	OE3	EE	23OE3525	OE-III : Holistic Nutrition	HOME SCIENCE
26	5	OE3	EL	23OE3526	OE-III : Community Organization & Development	HOME SCIENCE
27	5	OE3	CSE	23OE3527	OE-III : Human Rights & International Laws	LAW
28	5	OE3	CSE	23OE3528	OE-III : Cyber Crime Administration	LAW
29	5	OE3	MATHS	23OE3529	OE-III : Finite Differences & Numerical Methods	SCIENCE
30	5	OE3	MATHS	23OE3530	OE-III : Business Statistics	SCIENCE
31	5	OE3	PHY	23OE3531	OE-III : Crystalline Solids: Properties and Applications.	SCIENCE
32	5	OE3	PHY	23OE3532	OE-III : Nanotechnology: Fundamental to Applications	SCIENCE
33	5	OE3	CHE	23OE3533	OE-III : Chemistry in daily life	SCIENCE
34	5	OE3	CHE	23OE3534	OE-III : Battery Systems and Management	SCIENCE
35	5	OE3	NPTEL	23OE3535	OE-III : Designated approved online NPTEL Course	NPTEL

Link for Open Electives syllabus: <https://ycce.edu/syllabus/>

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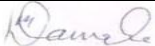
B.Tech. in Artificial Intelligence and Machine Learning

**SoE No.
23AML-101**

V SEMESTER

Mandatory Learning Course (MLC)

MLC2125 : YCAP5

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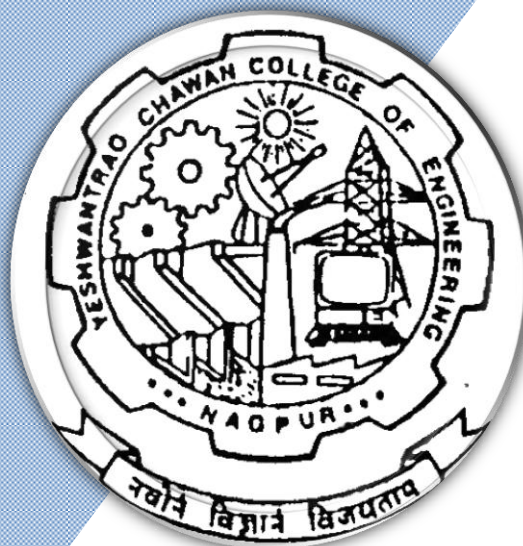
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(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

(Accredited 'A++' Grade by NAAC with a score of 3.6)

Hingna Road, Wanadongri, Nagpur - 441 110



Bachelor of Technology SoE & Syllabus 2023 6th Semester

(Department of Computer Science & Engineering)

B. Tech in Artificial Intelligence and Machine Learning (AIML)



SN	Sem	Type	BoS/Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration n Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
SIXTH SEMESTER															
1	6	PC	AML	23AML1601	Machine Learning Essentials	T	3	0	0	3	3	30	30	40	3
2	6	PC	AML	23AML1602	Lab : Machine Learning Essentials	P	0	0	2	2	1		60	40	
3	6	PC	AML	23AML1603	Computer Networks	T	3	0	0	3	3	30	30	40	3
4	6	PC	AML	23AML1604	Advanced Artificial Intelligence	T	3	0	0	3	3	30	30	40	3
5	6	PC	AML	23AML1605	Lab : Advanced Artificial Intelligence	P	0	0	2	2	1	30	30	40	3
6	6	PC	AML	23AML1606	Design Thinking and Research Methodology	T	2	0	0	2	2	30	20	50	3
7	6	PE	AML		Professional Elective-II	T	3	0	0	3	3	30	30	40	3
8	6	PE	AML		Professional Elective-III	T	3	0	0	3	3	30	30	40	3
9	6	MDM	AML		MD Minor Course-IV	T	3	0	0	3	3	30	20	50	3
10	6	VSEC-4	AML	23AML1607	Lab : Vocational & Skill Enhancement - Linux administration and shell programming	P	0	0	2	4	2		60	40	
11	6	STR	AML	23AML1608	Project Phase-I	P	0	0	4	4	2		60	40	
TOTAL							20	0	10	32	26				

List of Mandatory Learning Course (MLC)															
1	6	HS	T&P	MLC126	YCAP6 : YCCE Communication Aptitude Preparation	A	3	0	0	3	0				

Professional Elective - II					
1	6	PE-II	AML	23AML1621	PE-II : Game Theory
2	6	PE-II	AML	23AML1622	PE-II : Blockchain Technology
3	6	PE-II	AML	23AML1623	PE-II : Industry 4.0
4	6	PE-II	AML	23AML1624	PE-II : Augmented Reality
5	6	PE-II	AML	23AML1625	PE-II : Customer Relationship Management

Professional Elective - III					
1	6	PE-III	AML	23AML1641	PE-III : Robotics and its Applications
2	6	PE-III	AML	23AML1642	PE-III : Distributed systems
3	6	PE-III	AML	23AML1643	PE-III : Software defined networking
4	6	PE-III	AML	23AML1644	PE-III : Cloud computing
5	6	PE-II	AML	23AML1645	PE-III : Product Development

Coursera Electives					
1	6	PE-II	AML	23AML1646	PE-II: IBM Deep Learning with PyTorch, Keras and Tensorflow Professional Certificate
		PE-II	AML	23AML1647	PE-II: Lab. IBM Deep Learning with PyTorch, Keras and Tensorflow Professional Certificate

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**B.Tech. in Artificial Intelligence and Machine Learning****VI Semester****23AML1601: Machine Learning Essentials****Course Outcomes:****Upon successful completion of the course the students will be able to:**

CO1. To understand the basic principles of supervised and unsupervised machine learning algorithms, and strategies for the design of ML experiments.

CO2. To apply supervised to the given dataset and predict the model outcome.

CO3. To apply unsupervised learning algorithms to the given dataset and predict the model outcome.

CO4. To analyse a given problem and classify it as supervised(regression or classification), or unsupervised learning and select the appropriate algorithm(s) to solve the problem

CO5.To evaluate the performance of ML models using appropriate performance measures.

Unit:1	Introduction to Machine learning:	6 Hours
Overview of Machine Learning, Types of Machine Learning: Supervised, Unsupervised, Reinforcement learning, Classification, Regression, Supervised and Unsupervised Learning, Learning Associations, Machine Learning Workflow, Examples of Machine Learning Applications.		
Unit:2	Supervised Learning-1:	7 Hours
Linear and polynomial regression, classification with k-Nearest Neighbors, Naive Bayes Classifiers, Decision Trees, Generalization, Overfitting, and Underfitting.		
Unit:3	Supervised Learning-2:	6 Hours
Random forests, Kernelized Support Vector Machines, Uncertainty in Multiclass Classification, feature engineering and selection, evaluation metrics for supervised learning.		
Unit:4	Unsupervised Learning:	7 Hours
k-Means Clustering, Choosing the Number of Clusters, Semi-Supervised Learning, Evaluation metrics for unsupervised learning		
Unit:5	Design and Analysis of Machine Learning Experiments :	6 Hours
Factors, Response, and Strategy of Experimentation, Randomization, Hypothesis testing, Replication, and Blocking, Guidelines for Machine Learning Experiments, Cross-Validation and Resampling Methods, K-Fold Cross-Validation, Comparing, Two Classification Algorithms.		
Unit :6	Advances in Machine Learning :	7 Hours
Introduction to learning using Neural networks, types of artificial neuron and activation functions, Feedforward vs. Recurrent networks, multi-layer feedforward networks.		
Total Lecture Hours		39 Hours

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SoE No.
23AML-101

B.Tech. in Artificial Intelligence and Machine Learning

Textbooks

1. 'Introduction to Machine Learning', Ethem Alpaydin, The MIT Press, second edition
2. 'Applied Machine Learning', M. Gopal, McGraw-Hill

Reference Books

1. 'Machine Learning', Tom Mitchell, McGraw-Hill
2. 'Introduction to Machine Learning with Python, A Guide for Data Scientists', Andreas C. Müller and Sarah Guido, O'REILLY
3. 'Pattern Recognition and Machine Learning', Christopher M. Bishop, Springer New York, NY

YCCE e-library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1

MOOCs Links and additional reading, learning, video material

- 1 https://onlinecourses.nptel.ac.in/noc21_cs24/preview
- 2 https://onlinecourses.nptel.ac.in/noc21_cs85/preview

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B.Tech. in Artificial Intelligence and Machine Learning

SoE No.
23AML-101

VI Semester

23AML1602: Lab: Machine Learning Essentials

Course Outcomes:

Upon successful completion of the course the students will be able :

- To understand the basic principles of supervised and unsupervised machine learning algorithms, and strategies for the design of ML experiments.
- To apply supervised to the given dataset and predict the model outcome.
- To apply unsupervised learning algorithms to the given dataset and predict the model outcome.
- To analyse a given problem and classify it as supervised(regression or classification), or unsupervised learning and select the appropriate algorithm(s) to solve the problem
- To evaluate the performance of ML models using appropriate performance measures. and Recursive Enumerable Language.

Sr. No	Experiments based on:
1	a) Linear regression using linear least squares fit method b) Linear regression with Ordinary least squares method using ML Library
2	a) Implementing linear classifier using Linear discriminant function b) Implementing polynomial regression
3	Program for Classification using KNN algorithm
4	Implementing KNN for regression
5	Implementing Naïve Bayes Classifier
6	Decision Trees using Scikit-learn
7	Implementing SVM Classifier
8	Implementing K-means clustering
9	PBL based on the ML Model used for Research Paper based TAActivity.

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**B.Tech. in Artificial Intelligence and Machine Learning****VI Semester****23AML1603: Computer Networks****Course Outcome****Upon successful completion of the course the students will be able to :**

1. Identify appropriate design issues and explain network reference model.
2. Select appropriate protocol at various layers for the given application.
3. Solve problems in the networking domain.
4. Analyze the performance of network using different tools
5. Design computer networks and sub-networks

Unit No.	Contents	Max. Hrs.
1	Introduction to computer networks and Internet: Introduction to computer networks and Internet, The uses of computer networks, LAN's, MAN's, WAN's, Heterogeneous Networks Network Topologies, Physical Mediums, Concept of Network Protocols, design issues for layers. Layered Architecture: The OSI reference model. TCP/IP reference model, Comparison of OSI & TCP/IP reference models, Various Losses in the Internet, Brief History of Computer Network.	7
2	Application Layer: Basics of Socket Programming, Transport Layer Programming Interface(TCP, UDP) , Protocols: HTTP (Overview, Persistent and Non-Persistent, Message Format, Cookies, Caches) , SMTP (Overview, Message Formats) , IMAP, POP, DNS; FTP; Telnet, SSH; Peer-to-Peer Applications, BitTorrent Protocol; Content Distribution Networks;	6
3	Transport Layer: Relationship Between Transport and Network Layer, TCP and UDP; Multiplexing and Demultiplexing; Principles of Reliable Data Transfer; Go-Back-N and Selective Repeat; TCP: Segment Structure, Round Trip Time Estimation, Reliable Data Transfer, State Transitions, Flow Control, Congestion Control, UDP: Segment Structure	7
4	Network Layer, Subnets: Concept of IP Address, Netmask, Subnet; CIDR; Design of a LAN and WAN, Routers, Functions of a Router; Switching; Queueing: Causes, Delays; IPV4: Datagram Format, Fragmentation; Network Address Translation; IPV6 Introduction; Multicasting, , Routing algorithms: Link State, Distance Vector Routing; OSPF, BGP, RIP; Routing Policies	7
5	Link Layer: Review of fundamentals of link layer protocols; Error-Detection and -Correction Techniques Ethernet Switches, LANs, LinkLayer Switches, VLANs, Complete tracking of traversal of a packet over internet between two application, MAC	6

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23AML-101

6	Transmission Impairments, Transmission Media:	6
Transmission Impairments, Transmission Media: Guided, unguided, Architecture of the Internet, Wireless LANs: IEEE 802.11, IEEE 802., The Public Switched Telephone Network, Switching: circuit, packet and message switching, Modems.		
Total Lectures		39

Text Books	
1	Computer Networking: A Top-Down Approach, Kurose and Ross, Pearson Publication
2	Computer Networks, Behrouz A. Forouzan, McGraw-Hill Publication
3	Computer Networks, A.S. Tanenbaum, Pearson Publication

Reference Books	
1	Computer Networks A Systems Approach, ISBN: 9780123850591, Larry Peterson Bruce Davie, Elsevier
2	Data and computer Communication, ISBN-81-297-0206-1, William Stallings, Pearson Education

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1.	https://beta.computer-networking.info/syllabus/default/index.html
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MOOCs Links and additional reading, learning, video material

1.	https://onlinecourses.nptel.ac.in/noc23_cs35/preview
2.	https://onlinecourses.nptel.ac.in/noc21_cs18/preview

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SoE No.
23AML-101

VI Semester

23AML1604: Advanced Artificial Intelligence

Course Outcomes:

Upon successful completion of the course the students will be able to

C01: Understand concepts of Artificial Intelligence and different types of intelligent agents and their architecture.

C02: To give understanding of the main abstractions and reasoning for intelligent systems.

C03: Formulate problems as state space search problem & efficiently solve them.

C04: Solve various constraint satisfaction problem and game playing techniques.

C05: Learn the fundamental concepts of XAI and its use to build various use cases in engineering domain.

Unit:1	Planning Techniques	6 Hours
Introduction, Classical Planning, Algorithms for planning as state space search, Planning Graph, Time, Schedule and resources, Hierarchical planning, Planning & acting in Non deterministic domain, Multiagent Planning.		
Unit:2	Knowledge Learning	7 Hours
Logical Formulation of Learning, Knowledge in Learning, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming, Probabilistic Models, Statistical Learning, Learning with Complete Data, Learning with Hidden Variables.		
Unit:3	Reinforcement Learning	7 Hours
Introduction, Active and Passive Reinforcement learning, Generalization in Reinforcement Learning, Policy Searching, Applications of Reinforcement Learning, Q Learning, Genetic Algorithm for Reinforcement Learning.		
Unit:4	Robotics	7 Hours
Introduction, Robot Hardware, Robotics Perception, Planning to move, Planning Uncertain Movement, Moving, Robotics Software Architecture, Application Domains, Case Studies.		
Unit:5	Explainable AI	6 Hours
Introduction to XAI, Explainability vs. Interpretability, Explainability Types: Intrinsic explanation, Post-hoc explanation, Model specific, Model agnostic, Local interpretation, Global interpretation, Sub local interpretation, Textual explanations, Visual explanations. Tools & case studies.		

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SoE No.
23AML-101

Unit :6	Expert System	6 Hours
Expert System, Knowledge representation, Expert System Shells, Knowledge Acquisition of an Expert System, Applications of Expert System, Case Studies.		
Total Lectures		39
Textbooks		
1.	Artificial Intelligence A Modern Approach, Third Edition by Stuart J. Russell and Peter Norvig	
2.	Practical Explainable AI Using Python: Artificial Intelligence Model Explanations Using Python based Libraries, Extensions, and Frameworks Pradeepta Mishra	
Reference Books		
1.	ARTIFICIAL INTELLIGENCE Third Edition, by Kevin Knight (Author), Elaine Rich (Author), Shivashankar B. Nair (Author)	
2.	Artificial Intelligence: Concepts and Applications, by Lavika Goel	
3.	Hands-On Explainable AI (XAI) with Python: Interpret, visualize, explain, and integrate reliable AI for fair, secure, and trustworthy AI apps by Denis Rothman	
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]		
MOOCs Links and additional reading, learning, video material		
1.	https://onlinecourses.nptel.ac.in/noc23_ge40/announcements?force=true#registration_confirmation	
2.	https://www.youtube.com/watch?v=OZJ1IgSgP9E&list=PLV8yxwGOxvvovp-j6ztxhF3QcKXT6vORU	

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**SoE No.
23AML-101**

B.Tech. in Artificial Intelligence and Machine Learning

VI Semester

23AML1605: Lab: Advanced Artificial Intelligence

Sr. No.	Experiments based on
1	1a. Implement and compare different state space search algorithms (A*, BFS, DFS) for solving planning problems. 1b. Implementation of Block World Problem using Planning Technique.
2	Design a hierarchical planning problem and develop a hierarchical planner to solve it.
3	Implementation a basic logic learning system that can learn from set of logical rules and example.
4	Implement an inductive logic programming system that can learn from first order logic.
5	Built a learning system based on probabilistic graphical model like Bayesian Network.
6	Implement Q-Learning algorithm to solve simple problem (Grid Navigation).
7	Choose a specific application domain (robotics or game playing) and design a reinforcement learning system.
8	Implement simple programs to control the robot's movements and demonstrate the basic functionalities of the hardware.
9	Integrate sensors such as cameras or LiDAR onto the robot and develop perception algorithms to process sensor data.
10	Implement computer vision or point cloud processing techniques to enable the robot to perceive its environment.
11	Implement methods to generate textual explanations for model predictions.
12	Develop visual explanations for model predictions using techniques such as saliency maps or LIME. - CNN is required.
13	Implement a basic expert system using a chosen shell, focusing on the features and capabilities of the selected tool.
14	Select and develop an expert system for real-world application domain (e.g., medical diagnosis, financial analysis).

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B.Tech. in Artificial Intelligence and Machine Learning

SoE No.
23AML-101

VI Semester

23AML1606: Design Thinking in AIML and Research Methodology

Course Outcomes:

Upon successful completion of the course the students will be able to:

1. To Understand the principles and approach of design thinking.
2. Comprehend the foundational concepts of research methodology
3. Identify and formulate research problems and conduct effective literature reviews and adhere to ethical research practices
4. Collect and analyze data using appropriate methods.
5. Interpret research findings and write scientific reports.

Unit:1	Introduction to Design Thinking	6 Hours
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History and evolution of Design Thinking, Why Design Thinking for engineers? Overview of the 5 stages: Empathize, Define, Ideate, Prototype, Test, Human-centred AI: opportunities and challenges.

Unit:2	Integration with ML Models	6 Hours
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ML Models and Design Thinking, Design sprints in AIML projects, UX/UI and backend considerations, Responsible AI design: bias, privacy, inclusiveness, a real-world problem using Design Thinking and AIML

Unit:3	Research Fundamentals, Research Problem and Design, Literature Review	7 Hours
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Research Fundamentals: Definition, objectives, and significance of research, Types of research: Basic, Applied, Descriptive, Analytical, Quantitative, and Qualitative.

Research Problem and Design: Criteria of good research, Techniques for defining and identifying a research problem, Features of good research problem/design, Necessity of defining the problem, Meaning of research design, Types of research design – Exploratory, Descriptive, Diagnostic, and Experimental

Literature Review: Importance and methods of conducting a literature review, Sources of information: Journals, conferences, patents, etc., Technical reading strategies.

Unit :4	Sampling and Data Collection, Data Analysis and Interpretation, Technical Writing, Research Ethics	7 Hours
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Sampling and Data Collection: Sampling techniques: Probability and Non-probability sampling, Characteristics of a good sample, Sample size determination, Data types: Primary and Secondary, Methods of primary data collection: Observation, Interview, Questionnaire, Schedule, Secondary data sources

Data Analysis and Interpretation: Processing and analyzing data, Statistical tools: Measures of central

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tendency, Dispersion, Correlation, Regression, Hypothesis testing: Null and alternative hypothesis, Type I and II errors, Use of software tools (e.g., Excel/SPSS/MATLAB for analysis), Interpretation of results

Technical Writing, Research Ethics: Publication ethics and responsibilities of researchers, Structure and components of research report, Types of technical reports and papers, Writing thesis and dissertations, Referencing and citation styles (APA, IEEE, etc.), Ethical considerations in engineering research., Plagiarism and research ethics

Total Lecture Hours**26 Hours****Textbooks**

- | | |
|----|--|
| 1. | H. S. Fogler and S. E. LeBlanc, Strategies for Creative Problem Solving, 2nd edition, Pearson, Upper Saddle River, NJ, 2008. |
| 2. | <i>Human-Centered AI</i> by Ben Shneiderman |
| 3. | C.R. Kothari – <i>Research Methodology: Methods and Techniques</i> , New Age International |
| 4. | Ranjit Kumar – <i>Research Methodology: A Step-by-Step Guide for Beginners</i> , Sage Publications. |

Reference Books

- | | |
|----|--|
| 1. | Activities for Teaching creativity and Problem Solving - By Arthur B Vangundy - Pfeiffer |
| 2. | Whimbey and J. Lochhead, Problem Solving & Comprehension, 6th edition, Lawrence Erlbaum, Mahwah, NJ, 1999. |
| 3. | R. Panneerselvam – <i>Research Methodology</i> , PHI Learning |
| 4. | Dawson, C. – <i>Practical Research Methods</i> , UBS Publishers. |
| 5. | Trochim, W.M.K. – <i>Research Methods: The Concise Knowledge Base</i> . |

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- | | |
|---|--|
| 1 | www.nptelvideos.in |
| 2 | www.coursera.com |
| 3 | www.udemy.com |
| 4 | swayam.gov.in |

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SoE No.
23AML-101

VI Semester

23AML1607: Lab : Vocational & Skill Enhancement -Linux Administration and shell programming

Course Outcomes:

Upon successful completion of the course the students will be able to

CO1	To demonstrate the basic knowledge of Linux commands and file handling utilities by using Linux shell environment
CO2	To evaluate the concept of shell scripting programs by using an AWK and SED commands.
CO3	To create the directory, how to change and remove the directory
CO4	To analyze the process of how the parent and child relationships and IPC mechanism
CO5	To understand the concept of client-server communication by using sockets.

Sr. No.	Experiment based on
1	- Write a shell script that accept a file name starting and ending line numbers as arguments and display all the lines between given line no: - Write a shell script that delete all lines containing a specified word
2	- Write a shell script that displays a list of all the files in the current directory - Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or a directory and reports accordingly. Whenever the argument is a file or directory.
3	- Write a shell script that accept a list of file names as arguments count and report the occurrence of each word. - Write a shell script to find the factorial of given integer - Write a shell script that list the all files in a directory.
4	- Write an awk script to find the number of characters, words and lines in a file? Linked list respectively. - Write a C Program that makes a copy of a file using standard I/O and system calls? - Implement in C the following Unix commands using system calls A) cat B)mv
5	- Write a C program to emulate the Unix ls-l command? - Write a C program to list for every file in a directory, its inode number and file name.? - Write a C Program that demonstrates redirection of standard output to a file .EX:ls>fl.?

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6	1. Write a C program to create a child process and allow the parent to display “parent” and the child to display “child” on the screen. 2. Write a C program to create a child process and allow the parent to display “parent” and the child to display “child” on the screen. 3. Write a C program to create a Zombie process.
7	1. Write a C program that illustrates how an orphan is created 2. Write a program that illustrates how to execute two commands concurrently with a command pipe. 3. Write a C program that illustrate communication between two unrelated processes using named pipe.
8	1. Write a C program to create a message queue with read and write permissions to write 3 messages to it with different priority numbers. 2. Write a C program that receives the messages(From the above message queue as specified in (21) and display them.?
9	3. Write a C program that illustrates suspending and resuming processes using signals 4. Write client and server programs(using c) for interaction between server and client processes using Unix Domain sockets
10	1. Write a client and server programs (using c) for interaction between server and client processes using Internet Domain sockets? 2. write a program to implement the shared memory 3. Write a client and server programs (using c) for interaction between server and client processes using Internet Domain sockets? 4. Write a C program that illustrates two processes communicating using shared memory?

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**B.Tech. in Artificial Intelligence and Machine Learning****VI Semester****23AML1621: PE-II : Game Theory****Course Outcomes:****Upon successful completion of the course the students will be able to :**

CO1: Understanding Game Theory Fundamentals

CO2: Applying Non-Cooperative Game Theory

CO3: Analyzing Games with Perfect Information

CO4: Exploring Games with Imperfect Information

CO5: Designing Mechanisms for Collective Decision-Making

Unit:1	Introduction	6 Hours
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Introduction – Making rational choices: basics of Games – strategy - preferences – payoffs – Mathematical basics - Game theory – Rational Choice - Basic solution concepts-noncooperative versus cooperative games - Basic computational issues - finding equilibria and learning in games- Typical application areas for game theory (e.g. Google's sponsored search, eBay auctions, electricity trading markets).

Unit:2	Games with Perfect Information	7 Hours
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Games with Perfect Information - Strategic games - prisoner's dilemma, matching pennies Nash equilibria-theory and illustrations - Cournot's and Bertrand's models of oligopoly- auctions mixed strategy equilibrium-zero-sum games- Extensive Games with Perfect Information repeated games (prisoner's dilemma)- subgame perfect Nash equilibrium; computational issues.

Unit:3	Games with Imperfect Information	7 Hours
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Games with Imperfect Information - Bayesian Games – Motivational Examples – General Definitions – Information aspects – Illustrations - Extensive Games with Imperfect Information - Strategies- Nash Equilibrium – Beliefs and sequential equilibrium – Illustrations - Repeated Games – The Prisoner's Dilemma – Bargaining

Unit:4	Non-cooperative Game Theory	6 Hours
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Non-cooperative Game Theory - Self-interested agents- Games in normal form - Analyzing games: from optimality to equilibrium - Computing Solution Concepts of Normal-Form Games – Computing Nash equilibria of two-player, zero-sum games -Computing Nash equilibria of two player, general-sum games - Identifying dominated strategies

Unit:5	Game Theory and Collective Decision-Making	7 Hours
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Cournot's Oligopoly, Bertrand's Oligopoly, Electoral Competition, Median Voter Theorem, Auctions, role of knowledge, Decision making and Utility Theory, Mixed Strategy Equilibrium, Extensive Games with Perfect Information, Stackelberg's model of Duopoly, Buying Votes, Committee Decision making

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Unit :6	MECHANISM DESIGN	6 Hours
Aggregating Preferences-Social Choice – Formal Model- Voting - Existence of social functions - Ranking systems - Protocols for Strategic Agents: Mechanism Design - Mechanism design with unrestricted preferences- Efficient mechanisms - Vickrey and VCG mechanisms (shortest paths) - Combinatorial auctions - profit maximization Computational applications of mechanism design - applications in Computer Science - Google's sponsored search - eBay auctions		
Total Lecture Hours		39 Hours
Textbooks		
1.	M. J. Osborne, “An Introduction to Game Theory”, Oxford University Press, 2003.	
2.	2. N. Nisan, T. Roughgarden, E. Tardos, and V. V. Vazirani, “Algorithmic Game Theory”, Cambridge University Press, 2007	
Reference Books		
1.	Thomas Ferguson, Game Theory, World Scientific, 2018.	
2.	YoavShoham, Kevin Leyton-Brown, “Multi agent Systems: Algorithmic, Game- Theoretic, and Logical Foundations”, Cambridge University Press, 2008.	
3	Zhu Han, Dusit Niyato, Walid Saad, Tamer Basar and Are Hjorungnes, “Game Theory in Wireless and Communication Networks”, Cambridge University Press, 2012	
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS] –		
1	https://egyankosh.ac.in/bitstream/123456789/76109/1/Unit-6.pdf	
2		
MOOCs Links and additional reading, learning, video material		
1	https://onlinecourses.nptel.ac.in/noc19_ge32/preview	

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SoE No.
23AML-101

VI Semester

23AML1622: PE-II : Blockchain Technology

Course Outcomes:

Upon successful completion of the course the students will be able to

CO1: Recognize a conceptual understanding of blockchain technology and its potential to innovate and improve business processes

CO2: Implement cryptographic hashing techniques required in blockchain systems

CO3: Develop smart contract-based applications by applying the underlying principles

CO4: Design and develop public blockchains using Ethereum and private blockchains using Hyperledger, demonstrating the ability to analyze requirements and build solutions.

CO5: Select and utilize appropriate tools for building and deploying blockchain applications, assessing their suitability for specific use cases

Unit:1	Introduction to Blockchain	6 Hours
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CIA triangle, What is a blockchain, Origin of blockchain (cryptographically secure hash functions), Foundation of blockchain: Merkle trees, Components of blockchain, Block in blockchain, Types: Public, Private, and Consortium, Consensus Protocol, Limitations and Challenges of blockchain

Unit:2	Cryptocurrency & Bitcoin blockchain	7 Hours
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Cryptocurrency: Cryptocurrency: Bitcoin, Altcoin, and Tokens (Utility and Security), Cryptocurrency wallets: Hot and cold wallets, Cryptocurrency usage, Transactions in Blockchain, UTXO and double spending problem.

Bitcoin blockchain: Consensus in Bitcoin, Proof-of-Work (PoW), Proof-of-Burn (PoB), Proof-of-Stake (PoS), and Proof-of-Elapsed Time (PoET), Life of a miner, Mining difficulty, Mining pool and its methods

Unit:3	Programming for Blockchain & Introduction to Programming	6 Hours
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Programming for Blockchain: Introduction to Smart Contracts, Types of Smart Contracts, Structure of a Smart Contract, Smart Contract Approaches, Limitations of Smart Contracts.

Introduction to Programming: Solidity Programming – Basics, functions, Visibility and Activity Qualifiers, Address and Address Payable, Bytes and Enums, Arrays- Fixed and Dynamic Arrays, Special Arrays-Bytes and strings, Struct, Mapping, Inheritance, Error handling.

Unit:4	Public Blockchain	6 Hours
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Introduction to Public Blockchain, Ethereum and its Components, Mining in Ethereum, Ethereum Virtual Machine (EVM), Transaction, Accounts, Architecture and Workflow, Comparison between Bitcoin and Ethereum. Types of test-networks used in Ethereum, Transferring Ethers using Metamask, Mist Wallet, Ethereum frameworks.

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Unit:5	Private Blockchain	7 Hours
Introduction, Key characteristics, Need of Private Blockchain, Smart Contract in Private Environment, State Machine Replication, Consensus Algorithms for Private Blockchain - PAXOS and RAFT, Byzantine Faults: Byzantine Fault Tolerant (BFT) and Practical BFT. Introduction to Hyperledger, Tools and Frameworks, Comparison between Hyperledger Fabric & Other Technologies. Hyperledger Fabric Architecture, Components of Hyperledger Fabric: MSP, Chain Codes, Transaction Flow,		
Unit :6	Tools and Applications of Blockchain	6 Hours
Corda, Ripple, Quorum and other Emerging Blockchain Platforms, Blockchain in DeFi: Case Study on any of the Blockchain Platforms.		
Total Lecture Hours		39 Hours

Textbooks	
1	Blockchain Technology, Chandramouli Subramanian, Asha A. George, Abhillash K. A and Meena Karthikeyen Universities Press
2	Mastering Ethereum, Building Smart Contract and Dapps, Andreas M. Antonopoulos Dr. Gavin Wood, O'reilly
Reference Books	
1	Blockchain for Beginners, Yathish R and Tejaswini N, SPD
2	Blockchain with Hyperledger Fabric, Luc Desrosiers, Nitin Gaur, Salman A. Baset, Venkatraman Ramakrishna Packet Publishing
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/
MOOCs Links and additional reading, learning, video material	
1	https://nptel.ac.in/courses/106105235
2	https://nptel.ac.in/courses/106104220

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SoE No.
23AML-101

VI Semester

23AML1623: PE-II : Industry 4.0

Course Outcomes:

Upon successful completion of the course the students will be able to:

CO1: Understand the Fundamentals of Industry 4.0 and IIoT

CO2: Analyze IIoT Architectures and Business Models

CO3: Implement Data Analytics and Machine Learning in Industrial Applications

CO4: Assess Security Challenges and Implement Solutions in IIoT Systems

CO5: Design and Evaluate IIoT Applications Across Various Industries

Unit:1	Introduction	6 Hours
Introduction to Sensing & Actuation, IoT Connectivity, IoT Networking, Industry 4.0: Globalization and Emerging Issues, The Fourth Revolution, LEAN Production Systems, Smart and Connected business perspective, smart factories.		
Unit:2	Basics of Industry 4.0	7 Hours
Cyber Physical Systems and Next Generation Sensors, Collaborative Platform and Product Lifecycle Management, Augmented Reality and Virtual Reality, Artificial Intelligence, Big Data and Advanced Analysis, Cyber-Security in Industry 4.0, Industrial Processes, Industrial Sensing & Actuation, Industrial Internet Systems.		
Unit:3	Business Model and Reference ture	6 Hours
Business Model and Reference Architecture: IIoT-Business Models, IIoT Reference Architecture, Industrial IoT- Layers: IIoT Sensing, IIoT Processing, IIoT Communication, IIoT Networking.		
Unit:4	Business issues in Industry 4.0	6 Hours
Business issues in Industry 4.0:IIoT case studies, Opportunities and Challenges, Future of Works and Skills for Workers in the Industry 4.0 Era, Strategies for competing in an Industry 4.0 world.		
Unit:5	Security and Fog Computing	7 Hours
Cloud Computing in IIoT, Fog Computing in IIoT, Security in IIoT, Industrial IoT- Application Domains: Factories and Assembly Line, Food Industry, Healthcare, Power Plants, Inventory Management & Quality Control, Plant Safety and Security (Including AR and VR safety applications), Facility Management.		

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Unit :6	Industrial IOT Case Studies	7 Hours
Industrial IOT- Application domain: Milk Processing and Packaging Industries, Manufacturing Industries, Virtual Reality Lab, Steel Technology Lab, Oil, chemical and pharmaceutical industry, Applications of UAVs in Industries.		
Total Lecture Hours		39 Hours
Textbooks		
1.	“Industry 4.0: The Industrial Internet of Things”, by Alasdair Gilchrist (Apress)	
2.	“Industrial Internet of Things: Cybermanufacturing Systems” by Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer)	
Reference Books		
1.	Introduction to IOT Latest S.Misra , A. Mukherjee, A.Roy, 2020	
2.	Introduction to Industrial Internet of Things and Industry S. Misra, C. Roy, and A. Mukherjee, 2020.	
3.	Industry 4.0 Sustainable Industrial Approach, Bansal Dr. Vikram, Deepthi B., 2025	
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1	http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/21.405352151-Industry-4-0-The-Industrial-Internet-of-Things-Apress-2016.pdf	
MOOCs Links and additional reading, learning, video material		
1	https://onlinecourses.nptel.ac.in/noc20_cs69/preview	
2	https://onlinecourses.nptel.ac.in/noc21_ee85/preview	

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**B.Tech. in Artificial Intelligence and Machine Learning****VI Semester****23AML1624: PE-II : Augmented Reality****Course Outcomes:****After completion of this course, students will be able to****CO1:** Understand the fundamental concepts, architecture, and evolution of Augmented Reality systems and distinguish them from Virtual Reality and Mixed Reality..**CO2:** Demonstrate knowledge of AR development platforms, tools (e.g., Unity, ARKit, ARCore), and technologies (e.g., computer vision, sensor fusion) involved in building AR applications.**CO3:** Design and develop simple AR applications by integrating 3D models, animations, and real-world data using mobile or wearable AR devices.**CO4:** Analyze and evaluate usability, performance, and user interaction strategies in AR systems for various real-world domains like education, healthcare, and gaming.**CO5:** Apply creative and technical skills to propose innovative AR solutions addressing specific industry or societal needs through a capstone project or case study.

Unit:1	Introduction to Augmented Reality (A.R)	7Hours
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What Is Augmented Reality - Defining augmented reality, history of augmented reality, The Relationship Between Augmented Reality and Other Technologies-Media, Technologies, Other Ideas Related to the Spectrum Between Real and Virtual Worlds, applications of augmented reality Augmented Reality Concepts- How Does Augmented Reality Work? Concepts Related to Augmented Reality, Ingredients of an Augmented Reality Experience.

Unit:2	Augmented Reality Hardware	7Hours
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Augmented Reality Hardware – Displays – Audio Displays, Haptic Displays, Visual Displays, Other sensory displays, Visual Perception , Requirements and Characteristics, Spatial Display Model. Processors – Role of Processors, Processor System Architecture, Processor Specifications. Tracking & Sensors - Tracking, Calibration, and Registration, Characteristics of Tracking Technology, Stationary Tracking Systems, Mobile Sensors, Optical Tracking, Sensor Fusion

Unit:3	Computer Vision for Augmented Reality & A.R. Software	7Hours
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Computer Vision for Augmented Reality - Marker Tracking, Multiple-Camera Infrared Tracking, Natural Feature Tracking by Detection, Simultaneous Localization and Mapping, Outdoor Tracking Augmented Reality Software - Introduction, Major Software Components for Augmented Reality Systems, Software used to Create Content for the Augmented Reality Application.

Unit :4	AR Techniques- Marker based & Markerless tracking	6Hours
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Marker-based approach- Introduction to marker-based tracking, types of markers, marker camerapose and identification, visual tracking, mathematical representation of matrix multiplication Marker types- Template markers, 2D barcode markers, imperceptible markers. Marker-less approach- Localization based augmentation, real world examples Tracking methods- Visual tracking, feature based tracking, hybrid tracking, and initialisation and recovery.

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Unit :5	AR Devices & Components	7Hours
AR Components – Scene Generator, Tracking system, monitoring system, display, Game scene AR Devices – Optical See- Through HMD, Virtual retinal systems, Monitor bases systems, Projection displays, Video see-through systems		
Unit :6	Beyond A. R. - Mixed Reality	6Hours
Introduction to mixed reality, Applications of mixed reality, Input and Output in Mixed reality, Computer Vision and Mixed Reality, simultaneous localization and mapping (SLAM), variants of SLAM- dense tracking and mapping (DTAM), parallel tracking and mapping (PTAM) and semi-direct monocular visual odometry (SVO).		
Total Lecture Hours		39 Hours

Textbooks	
1	Allan Fowler-AR Game Developmentll, 1st Edition, A press Publications, 2018, ISBN 978-1484236178
2	Augmented Reality:Principles & Practice by Schmalstieg/Hollerer, Pearson Education India; First edition (12 October 2016),ISBN-10: 9332578494
Reference Books	
1	Designing for Mixed Reality, Kharis O'Connell Published by O'Reilly Media, Inc., 2016, ISBN: 9781491962381
2	Sanni Siltanen- Theory and applications of marker-based augmented reality. Julkaisija – Utgivare Publisher. 2012. ISBN 978-951-38-7449-0
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1	https://www.vttresearch.com/sites/default/files/pdf/science/2012/S3.pdf
2	https://docs.microsoft.com/en-us/windows/mixed-reality/
MOOCs Links and additional reading, learning, video material	
1	https://www.coursera.org/learn/ar
2	https://www.coursera.org/learn/ar

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**B.Tech. in Artificial Intelligence and Machine Learning****VI Semester****23AML1641: PE-III : Robotics and its Applications****Course Outcomes:****Upon successful completion of the course the students will be able to :****CO1:** Explain the historical development, basic concepts, classifications, and components of robotic systems, along with the principles and levels of automation.**CO2:** Analyze various types of robotic grippers and sensors, and evaluate their roles in robotic control and design based on system requirements.**CO3:** Classify different robotic drives, actuators, and control systems, and select suitable components for robot design.**CO4:** Develop basic robot programs using structured programming techniques and robotic languages such as VAL, RAIL, AML, Python, and ROS.**CO5:** Formulate and solve forward/inverse kinematics and dynamics problems using transformation matrices, Jacobians, and Lagrangian/Newton-Euler methods.**Unit:1 Introduction to Robotics : 6 Hours**

Brief History, Basic Concepts of Robotics such as Definition , Three laws, Elements of Robotic Systems i.e. Robot anatomy, DOF, Misunderstood devices etc., Classification of Robotic systems on the basis of various parameters such as work volume, type of drive, etc., Associated parameters i.e. resolution, accuracy, repeatability, dexterity, compliance, RCC device etc., Introduction to Principles & Strategies of Automation, Types & Levels of Automations, Need of automation, Industrial applications of robot.

Unit:2 Grippers and Sensors for Robotics: 7 Hours

Grippers for Robotics - Types of Grippers, Guidelines for design for robotic gripper, Force analysis for various basic gripper system. Sensors for Robots - Types of Sensors used in Robotics, Classification and applications of sensors, Characteristics of sensing devices, Selections of sensors. Need for sensors and vision system in the working and control of a robot.

Unit :3 Programming and Languages for Robotics: 6 Hours

Robot Programming: Methods of robot programming, WAIT, SIGNAL and DELAY commands, subroutines, Programming Languages: Generations of Robotic Languages, Introduction to various types such as VAL, RAIL, AML, Python, ROS etc., Development of languages since WAVE till ROS.

Unit:4 Rigid-body motions and twists 7 Hours

Rotations and angular velocities: Homogeneous transformation matrices. Twists, Formulation of forward and inverse kinematics: Forward kinematics in space frame and end effector frame, Analytical and numerical inverse kinematics .Velocity kinematics and statics: Manipulator Jacobian; relationship between space and body Jacobian and statics of open chains; Singularity analysis

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SoE No.
23AML-101

B.Tech. in Artificial Intelligence and Machine Learning

Unit :5	Dynamics of open chain robot manipulators	6 Hours
Lagrangian Formulation, Dynamics of single rigid body, Newton -Euler inverse dynamics, Dynamic of open chains, Constrained dynamics; Numerical algorithm for forward and inverse dynamics.		
Unit :6	Robotics Applications	7 Hours
Material Handling: pick and place, palletizing and depalletizing, machining loading and unloading, welding & assembly, Medical, agricultural and space applications, unmanned vehicles: ground, Ariel and underwater applications, robotic for computer integrated manufacturing. Types of robots: Manipulator, Legged robot, wheeled robot, aerial robots, Industrial robots, Humanoids, Robots, Autonomous robots, and Swarm robots		
Total Lecture Hours		39 Hours

Textbooks

- “Robotics and Control”, R.K. Mittal and I.J. Nagrath, 1st Edition, Tata McGraw Hill Education (2003)**
- “Introduction to Robotics: Mechanics and Control”, John J. Craig, 4th Edition (2021), Pearson**

Reference Books

- “Robot Modeling and Control”, Mark W. Spong, Seth Hutchinson, M. Vidyasagar, 1st Edition (2005) Wiley**
- “Introduction to Autonomous Robots: Mechanisms, Sensors, Actuators, and Algorithms”, Nikolaus Correll, Bradley Hayes, David Coleman, Latest Open Source Edition, CreateSpace**

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

- http://103.152.199.179/YCCE/Supported%20file/Supported%20file/e-copies%20of%20books/Computer%20Technology/26-2018_Book_Robotics_and_its_Application.pdf

MOOCs Links and additional reading, learning, video material

- https://onlinecourses.nptel.ac.in/noc21_ge20/preview
- https://onlinecourses.nptel.ac.in/noc22_cs67/preview

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B.Tech. in Artificial Intelligence and Machine Learning

SoE No.
23AML-101

VI Semester

23AML1642: PE-III : Distributed systems

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Identify the advantages and challenges in designing distributed algorithms for different primitives like mutual exclusion, deadlock detection, agreement, etc.
2. Design and develop distributed programs using sockets and RPC/RMI.
3. Differentiate between different types of faults and fault handling techniques in order to implement fault tolerant systems.
4. Analyze different algorithms and techniques for the design and development of distributed systems subject to specific design and performance constrain

Unit:1	Characterization of Distributed Systems	6 Hours
Architecture of Distributed Systems: Characteristics of Distributed System, Motivation, challenges /Issues in the design & development of Distributed System. System Models: Architecture Model, System Architecture, Types of Architectural Model: Client server model, Search engine, Proxy server & caches, Variation on client server model: mobile code, mobile agents. Fundamental Models: Interaction model, failure model, Security model. Distributed Objects & Distributed file System: Inter-process communication, Sockets, middle ware, Group communication, and Remote procedure calls. CORBA, RMI, Distributed file system, Name services, Directory services, File Service types, download/upload model, File sharing semantics, session semantics, Server design: stateless & stateful server, Cache update policies.		
Unit:2	Theoretical Foundations	6 Hours
Inherent limitations of distributed systems, Timing issues, clock synchronization, Network time protocol, Lamport's logical clocks, Vector clocks, Casual ordering of messages, Global state, Cuts of Distributed computation, Termination detection.		
Unit:3	Distributed Mutual Exclusion	6 Hours
Leader election: Chang Robert Ring based leader election algorithm, Bully algorithm. Classification of mutual exclusion algorithms, Requirements and performance measures of mutual exclusion algorithms, Non Token Based Algorithms: Lamport's Algorithm, The Ricart-Agrawala Algorithm, Maekawa's Algorithm. Token Based Algorithms: SuzukiKasami's Algorithm, Raymond's Algorithm, Comparative performance analysi		
Unit:4	Distributed Deadlock Detection	7 Hours
Resource vs Communication deadlocks, graph theoretic model, deadlock prevention, avoidance, detection, Issues in deadlock detection and resolution, Centralized deadlock detection algorithms, distributed deadlock detection algorithms		

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23AML-101**

B.Tech. in Artificial Intelligence and Machine Learning

Unit:5	Agreement Protocols	7 Hours
Synchronous vs. asynchronous computations, model of process failures, authenticated vs. non-authenticated messages. A classification of Agreement problems, Solutions to Byzantine Agreement problem, Applications of Agreement algorithms.		
Unit :6	Failure recovery and Fault Tolerance	7 Hours
Classification of failures. Backward and forward error recovery, Basic approaches of backward error recovery, recovery in concurrent systems, consistent set of checkpoints, synchronous check pointing and recovery, asynchronous check pointing and recovery. Fault Tolerance: Atomic actions and committing, commit protocols, non-blocking commit protocols, Voting protocols, Dynamic voting protocols, Dynamic Vote Reassignment Protocols		
Total Lecture Hours		39 Hours
Textbooks		
1	Advanced Concepts In Operating Systems: Distributed, Multiprocessor and Database Operating Systems Mukesh Singhal and Niranjana G. Shivaratri McGraw Hill	
2	Distributed Operating Systems Concepts and Design, G Coulouris, Jean Dollimore, Tim Kindberg Addison Wesley	
Reference Books		
1	Distributed Algorithms, Nancy Lynch ,Morgan Kaufman	
2	Modern Operating Systems , Andrew S. Tanenbaum, Pearson Education	
3	Distributed Operating Systems: Concepts and Design, Pradeep K. Sinha, Prentice-Hall of India	
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]		
1	http://103.152.199.179/YCCE/Supported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Technology/45/Operating%20System%20Concepts%20(%20PDFDrive%20).pdf	
2	http://103.152.199.179/YCCE/Supported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/Operating%20System%20Concept%208thedition.pdf	
MOOCs Links and additional reading, learning, video material		
1	https://onlinecourses.nptel.ac.in/noc21_cs87/preview	

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B.Tech. in Artificial Intelligence and Machine Learning

SoE No.
23AML-101

VI Semester

23AML1643: PE-III : Software Defined Networking

Course Outcomes:

Upon successful completion of the course the students will be able

CO1 Examine the challenges and opportunities associated with adopting SDN compared to traditional approaches to networking

CO2 Analyse the functions and components of the SDN architecture

CO3 Discuss the major requirements of the design of an SDN protocol.

CO4 Design and create an SDN network consisting of SDN switches and a centralized controller.

CO5 Analyze the performance of the SDN network by using verification and troubleshooting techniques.

Unit:1	INTRODUCTION TO SDN	6 Hours
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Overview; History and evolution of SDN; Architecture of SDN; SDN Flavours; Scalability (Data Centres, Service provider networks, ISP Automation); Reliability (QoS, and Service Availability); Consistency (Configuration management, and Access Control Violations); Opportunities and Challenges

Unit:2	ARCHITECTURE	7 Hours
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Network Operating System (NOS). SDN Architecture. Planes - data, management and control. Interfaces - northbound and southbound.

Unit:3	PROTOCOLS	6 Hours
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Languages and functions available for programming SDNs, northbound API. Mininet. Software vs. Hardware SDN switch implementations - Open vSwitch, WhiteBox, ONL. Controller implementations - POX, NOX, Beacon, Floodlight. Special Purpose controllers - Flowvisor, RouteFlow.

Unit:4	DESIGN AND DEVELOPMENT	7 Hours
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Network Programmability - Network Function Virtualization - NetApp Development, Network Slicing, SDX; Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs.

Unit:5	PROGRAMMING	6 Hours
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Network Virtualization, Network Topology and Topological Information Abstraction, Data Centric Traffic Management, Wide Area Traffic Management, Wireless networks

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Unit :6	SDN APPLICATIONS AND USE CASES	7 Hours
SDN in the Data Center - SDN in Other Environments - SDN Applications - SDN Use Cases - The Open Network Operating System 3		
Total Lecture Hours		39 Hours
Textbooks		
1	Goransson, Paul, Chuck Black, and Timothy Culver. Software defined networks: a comprehensive approach, 1st edition, Morgan Kaufmann, 2016.	
Reference Books		
1	Stallings, William. Foundations of modern networking: SDN, NFV, QoE, IoT, and Cloud, 1st edition, Addison-Wesley Professional, 2015.	
2	Oswald Coker, Siamak Azodolmolky. Software-Defined Networking with OpenFlow - Second Edition, Packt Publishing, 2017	
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]		
1	http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0	
2	https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042	
MOOCs Links and additional reading, learning, video material		
1	nptel.ac.in/courses/106105183	
2	https://www.bing.com/videos/riverview/relatedvideo?q=Software+Defined+Networking+NPTELO&mid=780940A801AE71CDD241780940A801AE71CDD241&mcid=2159391F7A2C47D39F9F65FF83FDED8E&FORM=VIRE	

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B.Tech. in Artificial Intelligence and Machine Learning

SoE No.
23AML-101

VI Semester

23AML1644: PE-III : Cloud computing

Course Outcomes:

Upon successful completion of the course the students will be able to

CO1: An ability to understand software and hardware support for enterprise and cloud computing

CO2: An ability to Perform data modeling for enterprise and cloud knowledge bases.

CO3: An ability to Design enterprise and cloud software applications.

CO4: An ability to Implement and run distributed and cloud applications

CO5: An ability to Ensure security and privacy in enterprise and cloud application while implementing cloud applications methodologies.

Unit:1	Introduction	06 Hours
Defining Cloud Computing; Cloud Types and different models-The NIST model, The Cloud Cube Model, Examining the Characteristics of Cloud Computing; Benefits of cloud computing; Disadvantages of cloud computing; Assessing the Role of Open Standards		
Unit:2	Cloud Delivery Models	07 Hours
Exploring the Cloud Computing Stack, Connecting to the Cloud, Infrastructure as a Service, Platform as a Service, SaaS Vs. PaaS, Using PaaS Application Frameworks, Software as a Service, Identity as a Service, Compliance as a Service		
Unit:3	Virtualization	07 Hours
Introduction to Virtualization Technologies, Load Balancing and Virtualization, Understanding Hypervisors, Understanding Machine Imaging, Porting Applications, Virtual Machines Provisioning and Manageability Virtual Machine Migration Services, Virtual Machine Provisioning and Migration in Action, Provisioning in the Cloud Context.		
Unit:4	Cloud native Computing	07 Hours
Introduction of Cloud native Computing, Containers in Cloud Computing and its benefits, Docker, Kubernetes Managing the Cloud-Administering the Clouds, Management responsibilities, Lifecycle management Cloud Management Products, Emerging Cloud Management Standards,		
Unit:5	Cloud Security	06Hours
Securing the Cloud, Securing Data, the security boundary, Security service boundary, Security mapping, Brokered cloud storage access, Establishing Identity and Presence, Understanding Service Oriented Architecture- Introducing Service Oriented Architecture		
Unit :6	Advance Clouds , AWS Architecture and Case Studies	06Hours
Cloud Computing Cost Analysis, basic, Selecting an IaaS Provider, Capacity Planning and Disaster, Recovery in Cloud Computing, AWS Cloud architectural principles, basic/core characteristics of deploying and operating in the AWS Cloud, the key services on the AWS Platform and their common use cases, Define the billing, account management, and pricing models, Introduction to Amazon EC2. Case Studies: Microsoft Azure, Dropbox		
Total Lecture Hours		39 Hours

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B.Tech. in Artificial Intelligence and Machine Learning

Textbooks	
1	Cloud Computing (Principles and Paradigms), John Wiley & Sons, Inc.
2	Cloud and Distributed Computing : Algorithms and Systems by Rajiv Misra, Yeshwant Singh Patel, Wiley Publications ISBN: 9788126520275
3	Cloud Computing Bible by Barrie Sosinsky John Wiley & Sons
Reference Books	
1	Mastering cloud computing, Rajkumar buyya, Christian vecchiola, S Thamarai Selvi, Tata Mc-Graw Hill Education Private Limited
2	Cloud Computing a Practical Approach, Anthony T .Velte, Toby J. Velte, Robert Elsenpeter, Tata McGraw-HILL
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/DTEL%20Material/7.Information%20Technology/DTEL%20PPTs/18.CC%20PPT_ADG.pdf
2	
MOOCs Links and additional reading, learning, video material	
1	https://nptel.ac.in/courses/106105167
2	https://onlinecourses.nptel.ac.in/noc21_cs14/preview

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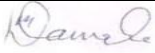
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23AML-101**

B.Tech. in Artificial Intelligence and Machine Learning

VI Semester

23AML1645: PE-III : Product Development (As Per Industry Aligned)

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(Department of Computer Science & Engineering)

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B.Tech. in Artificial Intelligence and Machine Learning

VI Semester

MDM4AML104: Fundamentals of Artificial Intelligence

Course Outcomes:

Upon successful completion of the course the students will be able to

CO1: Understand Agents and Environments of AI domain in order to relate with real world problem

CO2 Compare and contrast the characteristics of traditional and heuristic based searching algorithm in order to implement real world.

CO3 Apply AI techniques to solve problems of game playing

CO4: Demonstrate knowledge representation using the appropriate technique for a given problem

CO5: Apply uncertainty theory based on techniques like probability theory

Unit:1	Introduction to AI	7 Hours
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Introduction to AI, The History of Artificial Intelligence, Strong AI, Weak AI, Intelligent Agents: Agents & environments, Concept of Rationality, Nature of Environments, The Structure of Agents, Application of AI.

Unit:2	Solving Problems by Searching	7Hours
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Problem Solving Agents, Searching for Solutions, Uninformed Search Strategies, Informed Search Strategies, Heuristic Functions, Local Search Algorithms and Optimization Problems, Local Search in Continuous Space, Searching with Non deterministic actions.

Unit:3	Adversarial Search	6 Hours
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Games Theory, Optimal decision in games, The Mini-Max Algorithm, Alpha-Beta pruning, Constraint Satisfaction Problem, Constraint Propagation, Backtracking Search, Local Search for Constraint Satisfaction Problems.

Unit:4	Knowledge representation:	7 Hours
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Issues, representation and mapping approaches, procedural vs. declarative knowledge, Introduction to propositional logic, Forward Reasoning, Backward Chaining, unification and resolution algorithms. frames

Unit:5	First Order Logic	6 Hours
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Syntax, Semantic of first order logic, Symbols of Interpretations, Quantifiers, Equality, Using First Order Logic, Assertions and Queries in first order logic, Knowledge engineering in first order logic, propositional vs. first order logic, Unification and lifting, Forward chaining, Backward Chaining.

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Unit :6	Reasoning in Uncertain Domain	7 Hours
Uncertainty, Handling uncertain knowledge, rational decisions, basics of probability, axioms of probability, inference using full joint distributions, independence, Bayes' Rule and conditional independence, Bayesian networks, Semantics of Bayesian networks, Exact inference in Bayesian Networks.		
Total Lecture Hours		39 Hours
Textbooks		
1	Peter Norvig and Stuart Russel Artificial Intelligence: A Modern Approach Pearson Education, Inc, 2010.	
Reference Books		
1	Elaine Rich, Kevin Knight, Shivasankar B. Nair Artificial Intelligence The McGraw Hill publications, Third Edition, 2014	
2	Introduction to Artificial Intelligence and Expert System, D. W. Patterson, PHI	
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]		
1	http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0 2	
2	https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042	
MOOCs Links and additional reading, learning, video material		
1	https://onlinecourses.nptel.ac.in/noc23_ge40/preview	
2	https://onlinecourses.nptel.ac.in/noc23_cs92/preview	

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(Department of Computer Science & Engineering)

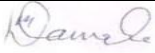
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23AML-101**

VI SEMESTER

Mandatory Learning Course (MLC)

MLC2126 : YCAP6 - YCCE Communication Aptitude Preparation

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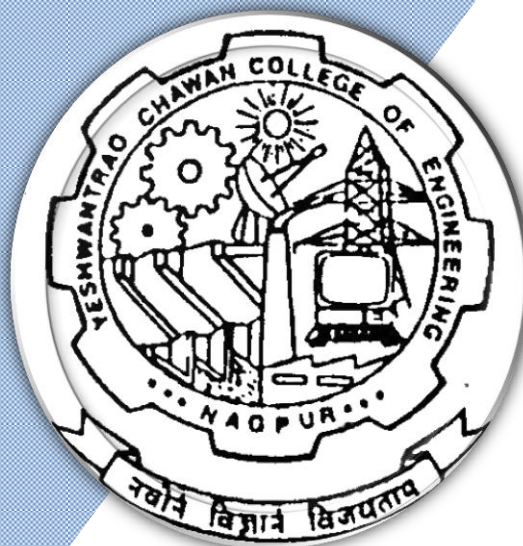
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(Accredited 'A++' Grade by NAAC with a score of 3.6)

Hingna Road, Wanadongri, Nagpur - 441 110



Bachelor of Technology SoE & Syllabus 2023 7th Semester

(Department of Computer Science & Engineering)

B. Tech in Artificial Intelligence and Machine Learning (AIML)



B.TECH SCHEME OF EXAMINATION 2023
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(Department of Computer Science & Engineering)
B. Tech. in Artificial Intelligence and Machine Learning

SoE No.
23AML-101

SN	Sem	Type	BoS/Dep'tt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration in Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
SEVENTH SEMESTER															
1	7	PC	AML	23AML1701	Computer Vision	T	3	0	0	3	3	30	30	40	3
2	7	PC	AML	23AML1702	Deep Learning	T	3	0	0	3	3	30	30	40	3
3	7	PC	AML	23AML1703	Lab : Deep Learning	P	0	0	2	2	1		60	40	
4	7	PC	AML	23AML1704	Software Engineering	T	3	0	0	3	3	30	30	40	3
5	7	PC	AML	23AML1705	Language Processors	T	3	0	0	3	3	30	30	40	3
6	7	PC	AML	23AML1706	Lab : Language Processors	P	0	0	2	2	1		60	40	
7	7	PE	AML		Professional Elective-IV	T	3	0	0	3	3	30	30	40	3
8	7	PE	AML		Lab : Professional Elective-IV	P	0	0	2	2	1		60	40	
9	7	MDM	AML		MD Minor Course-V	T	2	0	0	2	2	30	20	50	3
10	7	STR	AML	23AML1707	Project Phase-II	P	0	0	8	8	4		60	40	
11	7	STR	AML	23AML1708	Campus Recrutment Training (CRT)	P	0	0	0	0	2			100	
12	7	STR	AML	23AML1709	Comprehensive Evaluation of Core Knowledge	P	0	0	2	2	1		60	40	
TOTAL							17	0	16	33	27				

Professional Elective - IV					
1	7	PE-IV	AML	23AML1721	PE-IV : Big data analytics
2	7	PE-IV	AML	23AML1722	PE-IV : Lab : Big data analytics
3	7	PE-IV	AML	23AML1723	PE-IV : MLops
4	7	PE-IV	AML	23AML1724	PE-IV : Lab : MLops
5	7	PE-IV	AML	23AML1725	PE-IV : Edge computing
6	7	PE-IV	AML	23AML1726	PE-IV : Lab : Edge computing
7	7	PE-IV	AML	23AML1727	PE-IV : Java Fullstack Development
8	7	PE-IV	AML	23AML1728	PE-IV : Lab : Java Fullstack Development

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CSE-Artificial Intelligence & Machine Learning**CSE (AIML)****SoE No.
23AML-101****VII Semester****23AML1701: Computer Vision****Course Outcomes:****Upon successful completion of the course the students will be able to**

CO1. Learn fundamentals of computer vision and its applications

CO2. Understand the basic image processing operations to enhance, segment the images.

CO3. Understand the analyzing and extraction of relevant features of the concerned domain problem.

CO4. Understand and apply the motion concepts and its relevance in real time applications.

CO5. Apply the knowledge in solving high level vision problems like object recognition, image classification etc.

Unit:1	Overview of computer vision and its applications	7 Hours
Image Formation and Representation: Imaging geometry, radiometry, digitization, cameras and Projections, rigid and affine transformation		
Unit:2	Image Processing	8 Hours
Pixel transforms, color transforms, histogram processing, histogram equalization, filtering, convolution, Fourier transformation and its applications in sharpening, blurring and noise removal		
Unit:3	Feature detection	7 Hours
edge detection, corner detection, line and curve detection, active contours, SIFT and HOG descriptors, shape context descriptors, Morphological operations.		
Unit:4	Segmentation	8 Hours
Active contours, split & merge, watershed, region splitting, region merging, graph-based segmentation, mean shift and model finding, Normalized cut.		
Unit:5	Object Recognition and it's Applications	8 Hours
Object recognition methods, Template matching, Object detection using Haar cascades, Introduction to deep learning for computer vision. Case studies and real-world applications (e.g., facial recognition, object tracking)		
Unit :6	3D Computer Vision	7 Hours
Camera calibration, Stereo vision, Depth perception and disparity maps, Structure from motion, 3D object recognition and reconstruction		
Total Lecture Hours		45 Hours

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CSE-Artificial Intelligence & Machine Learning**CSE (AIML)****SoE No.
23AML-101****Textbooks**

1	Computer Vision: Algorithms and Applications, R. Szeliski, Springer, 2011.
2	Introductory techniques for 3D computer vision, E. Trucco and A. Verri, Prentice Hall, 1998.

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1	http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/54.NLP_Language_processing_jurafsky_BOOK.pdf
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MOOCs Links and additional reading, learning, video material

1	https://www.youtube.com/live/FbOCV344iLA?si=IQdy1JM1b4z-Evww
2	

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CSE-Artificial Intelligence & Machine Learning**CSE (AIML)****SoE No.
23AML-101****VII Semester****23AML1702: Deep Learning****Course Outcomes:****Upon successful completion of the course the students will be able to :**

CO-1: Understand the basic concepts, underlying mathematics, neural network architectures and learning rules

CO-2: Understand , Design and Apply shallow networks for solving classification and regression problems

CO-3: Select suitable model parameters for different shallow and deep learning models.

CO-4: Understand, Design and Apply deep networks for solving real world problems

Unit:1	Introduction to Biological and Artificial Neural Networks	7Hrs
Necessary mathematics for shallow and deep learning: review of basics of Linear algebra, statistics, and calculus.		
Biological Neurons, General Artificial Neuron Model, MP Neuron, Neuron activation functions, Perceptron and its types, Neural Network learning Rules, types of neural networks, feed forward vs recurrent neural networks.		
Unit:2	Perceptron Training and Machine Learning Basics	8 Hrs
Single Discrete Perceptron training algorithm, linear machine and minimum distance classification, gradient descent and Single Continuous Perceptron training algorithm.		
Machine learning basics: supervised vs unsupervised learning, various Machine learning (ML) tasks like classification, regression, and clustering. Capacity, Overfitting and Underfitting, bias and variance of a ML model.		
Unit:3	Multilayer Perceptrons and Back propagation Algorithm	8Hrs
Multilayer Perceptrons (MLPs), Representation Power of MLPs, Feed forward Neural Networks, Back propagation, algorithm, Momentum Based Gradient Descent (GD), Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMSProp, Adam.		
Unit:4	Regularization and MLP applications	7 Hrs
L1, L2 Regularization, Early stopping, Dropout regularization, Dataset augmentation, Normalization of inputs. Applications of MLPs for classification and regression, performance measures for classification and regression.		

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CSE-Artificial Intelligence & Machine Learning**CSE (AIML)****SoE No.
23AML-101**

Unit:5	CNN and Autoencoders	8 Hrs
History of deep learning, Types of deep networks, Convolutional Neural Networks, Transfer learning using CNNs, Auto encoders, Regularization in auto encoders, Denoising auto encoders, Deep autoencoders.		
Unit :6	Advanced Deep Learning Architectures	7 Hrs
Recurrent Neural Networks(RNN), Long and Short Term Memory Networks(LSTM), Transformer Architecture, Generative Adversarial Networks(GAN), comparison of shallow and deep networks. Deep learning case studies.		
Total Lecture Hours		45 Hours

Text books	
1.	Applied Machine Learning, M. Gopal, Mc Graw Hill (second Edition),2022
2.	Deep Learning, Amit Das, Saptarshi Goswami, Prabir Mitra, Amlan Chakrabarti, Pearson
Reference Books	
1.	Pattern Recognition and Machine Learning, Christopher Bishop, 2007
2.	Deep Learning, Ian Goodfellow, Yoshua Bengio, Aaron Courville, MIT Press, 2016 online eBook at https://www.deeplearning book.org/
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0
2	https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042
MOOCs Links and additional reading, learning, video material	
1	Deep Learning – Prof. Mitesh Khapra (IIT Ropar), Swayam Course https://onlinecourses.nptel.ac.in/noc22_cs124/preview
2.	Neural Networks and Deep Learning, Andrew Ng https://www.coursera.org/learn/neural-networks-deep-learning#syllabus

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CSE-Artificial Intelligence & Machine Learning**CSE (AIML)****SoE No.
23AML-101****VII Semester****23AML1703: Lab: Deep Learning**

Exp. No	Name of Experiment /Problem Statement
1	Building a Linear Regression Model Using a Single Perceptron to Predict Domino's Pizza Size (in Inches) and Price in dollars.
2	Car Price Prediction Using Artificial Neural Networks
3	Building a Logistic Regression Model Using a Single MLP to Predict Whether an Email is Spam or Not for Binary Classification
4	Analyzing Overfitting, Underfitting, and Good Fit in Predicting Student CGPA vs Package
5	Implementing a Multi-Layer Perceptron with Backpropagation for Handwritten Digit Classification Using the MNIST Dataset
6	Implementing Regularization, Early Stopping, and Dropout in a Perceptron Model predict student exam scores based on study hours, class attendance, and previous grades.
7	Implementing a Convolutional Neural Network for Image Classification: Distinguishing Between Dogs vs Cats
8	Implementing an Autoencoder for Image Denoising: Enhancing Image Quality by Removing Noise from Noisy Inputs
9	Implementing a Long Short-Term Memory (LSTM) Network for Predicting House Prices using Size, Location, Age
10	Implementing a Recurrent Neural Network for Sentiment Analysis of Movie Reviews (Internet Movie Database)

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CSE-Artificial Intelligence & Machine Learning**CSE (AIML)****SoE No.
23AML-101****VII Semester****23AML1704: Software Engineering****Course Outcomes:****Upon successful completion of the course the students will be able to**

1. Choose appropriate software engineering process model, requirement engineering principles and software designing fundamentals for a given project.
2. Select appropriate testing strategy and apply testing principles for testing a given application.
3. Apply basics of software configuration management, version control and change control in software development.
4. Evaluate cost estimation, effort and severity of software risk for given application.
5. Perform basic operations on Github for software version control.

Unit:1 Introduction to Software Engineering**7 Hours**

A Generic View of process: Process models: Water fall Model, RAD Model, Evolutionary process models, Prototyping Model, Component Development Model, Agile Model, the **Requirement Engineering:** Requirement Engineering Task Initialization, Eliciting Requirement, Developing Use Case, Analysis Model, Negotiation, Validation.

Unit:2 Building the Analysis model**8 Hours**

Requirement Analysis, Analysis Modeling Approaches, Data Modeling Concept, Object Oriented Analysis, Types of Modeling, **Design Engineering:** Design Concept, Design Model.

Unit:3 Testing Strategies**7 Hours**

Strategic Approach, Strategic issues, Strategies for conventional Software, Strategies for Object Oriented Software, Validation Testing, Testing Tactics: White-Box Testing, Basis Path testing: Flow Graph Notation, Independent Program Paths, Control Structure Testing, Black Box Testing, Introduction to object oriented testing. capability maturity model integration (CMMI)

Unit:4 Configuration Management**8 Hours**

Base lines, Software Configuration items, The SCM Process, Identification of Objects in the Software Configuration, Version Control, Change Control, Configuration Audit, Status Reporting, SCM Standards.

Unit:5 Project Management**7 Hours**

Metrics for Process and Projects, Project Estimation **Risk Management:** Reactive vs. Proactive Risk Strategies, Software Risks, Risk Identification, Risk Projection, risk refinement, RMMM plan.

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23AML-101**

Unit:6	Advanced Topics in Software Engineering	8 Hours
Re engineering, Computer aided software engineering (CASE) tools, Open source SE tools Introduction, Example-Github, Jira. Smart Software Engineering: AI in Software Engineering.		
Total Lecture Hours		45 Hours

Textbooks	
1.	Software Engineering–A Practitioner’s Approach- Roger S. Pressman, 6 th Edition, McGraw Hill Publication.
2.	Software Engineering, Ian Sommerville, 9th Edition, Pearson Publication.
Reference Books	
1.	An Integrated Approach To Software Engineering, Pankaj Jalote ,Narosa, 2005.
2.	Object Oriented Software Engineering, Leth Bridge, 6 th Edition , TATA McGraw Hill Publication.
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS] –	
1	
MOOCs Links and additional reading, learning, video material -	
1	https://onlinecourses.nptel.ac.in/noc24_cs119/preview

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CSE-Artificial Intelligence & Machine Learning**CSE (AIML)****SoE No.
23AML-101****VII Semester****23AML1705: Language Processors****Course Outcomes:****Upon successful completion of the course the students will be able to**

1. Understand the structure, phases, and working of a compiler including lexical and syntax analysis.
2. Apply top-down and bottom-up parsing techniques, and construct parsing tables for LL(1) and LR parsers.
3. Implement syntax-directed translation schemes and generate intermediate code representations.
4. Analyze symbol table organization, and mechanisms for scope representation and error handling.
5. Evaluate and apply code optimization techniques and generate efficient target code.

Unit:1	Introduction to Compilation Process, Compilers & Translators, Phase structure of Compiler, Design of Lexical Analysis.	7 Hours
Unit:2	Specifying Syntactic Structure of Programming Language using Context Free Grammars, The role of Parser, Top-down Parsing, Bottom Up Parsing, Predictive Parsers, and Recursive Decent Parser.	8 Hours
Unit:3	Construction of efficient LR Parsers (SLR, CLR & LALR), Canonical Collection of set of items and construction of Parsing table, Implementation of LR Parsing table.	7 Hours
Unit:4	Syntax Directed Translation: Intermediate Code, Postfix notation, Parse tree and Syntax Trees, Three address codes, quadruples, triples, Translation of Arithmetic Expression, Boolean expressions, Control Statements. Array references, Use of Compiler writing tools (LEX/ FLEX, YACC / BISON).	8 Hours
Unit:5	Symbol Tables: Contents, Representing scope information. Error detection and Recovery: Error handling, Lexical-phase, Syntactic phase and semantic phase.	7 Hours
Unit:6	Introduction to Code Optimization, The principle sources of optimization, Loop optimization, The DAG representation, Introductory Data Flow analysis, Introduction to Code Generation: Object programs, Problems in Code Generation, Register allocation and assignment, Code generation from DAG, Peephole optimization.	8 Hours
Total Lecture Hours		45 Hours

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CSE-Artificial Intelligence & Machine Learning**CSE (AIML)****SoE No.
23AML-101****Textbooks**

1	Alfred V. Aho, Jeffrey D. Ullman & Ravi Sethi , Compilers Principles, Techniques & Tools Pearson Education
2	Alfred V. Aho, Jeffrey D. Ullman, Principles of Compiler Design, Addison Wesley Publication

Reference Books

1	Dr. O.G. Kakde, Compiler Design, Laxmi Publication
2	J. P. Bennett, Introduction to Compiling Techniques: First Course Using ANSI C, LEX and YACC McGraw-Hill Publication

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1	https://www.scribd.com/document/441141979/Compilers-Construction
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MOOCs Links and additional reading, learning, video material -

1	https://onlinecourses.nptel.ac.in/noc21_cs07/preview
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CSE-Artificial Intelligence & Machine Learning**CSE (AIML)****SoE No.
23AML-101****VII Semester****23AML1706: Lab: Language Processors****Course Outcomes:****Upon successful completion of the course the students will be able to**

1. Implement lexical analyzers using LEX/FLEX to tokenize source programs and perform lexical-level transformations.
2. Design and implement syntax analyzers using YACC/Bison to recognize syntactic constructs and validate grammatical rules.
3. Construct and simulate automata and parsing techniques using tools like JFLAP for context-free grammars.
4. Design and implement data structures to represent grammars and compute FIRST and FOLLOW sets for parsing..
5. Develop components of intermediate code generation and symbol table using LEX/YACC to support compiler back-end.

Sr.No.	Experiment based on
1	Implement a Lexical Analyzer using FLEX and develop: A. Program For converting all small case letters to UPPER case letters and Vice-Versa. B. Program to count the words, spaces, and lines in a given input file.
2	Study the LEX/Flex and YACC/Bison tool and Develop: A. LEX program to eliminate comment lines (Single and Multiple) in a text(C program) file and copy the resulting program into a separate file. B. YACC program to recognize valid identifier, operators and keywords in the given text (C program) file.
3	A. Develop a LEX program to recognize valid arithmetic expression. Identifiers in the expression could be only integers and operators could be + and *. Count the identifiers & operators present and print them separately. B. Develop a YACC program to evaluate arithmetic expression involving operators: +, -, *, and /.
4	Develop, Implement and execute a program using YACC/Bison tool to recognize all strings ending with b preceded by n a's using the grammar a n b (note: input n value), also create DFA of

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	given grammar using JFLAP
5	Develop a program to find FIRST and FOLLOW of all variables. Write a suitable data structure to store a context free grammar. Prerequisite is to eliminate left recursion from the grammar before storing
6	Design and Simulate Predictive / LL (1) Parsing Table using JFLAP for the grammar rules: $A \rightarrow aBa$, $B \rightarrow bB$.
7	Design and Simulate SLR(1) parsing using JFLAP for the grammar rules: $E \rightarrow E+T \mid T$, $T \rightarrow T * F \mid F$, $F \rightarrow (E) \mid id$ and parse the sentence: $id + id * id$.
8	Develop a program for intermediate code generator to generate three address code using LEX & YACC.
9	Develop a YACC program Symbol table.
10	Develop a YACC program for code generator.

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CSE-Artificial Intelligence & Machine Learning**CSE (AIML)****SoE No.
23AML-101****VII Semester****23AML1721: PE-IV: Big data analytics****Course Outcomes:****Upon successful completion of the course the students will be able to**

- CO1. Explain fundamentals of big data, issues in big data management, big data analytics and its associated applications in intelligent business and scientific computing
- CO2. Apply machine Learning algorithms for real world data, to provide analytics
- CO3. Make use of the Map Reduce programming model to process the big data along with Hadoop tools
- CO4. Analyze and compare various NoSQL databases based on their data models, consistency, scalability, and use cases, and effectively apply the appropriate NoSQL database solutions to real-world applications."

Unit:1	Introduction to Big Data	7 Hours
	Data, Characteristics of data and Types of digital data: Unstructured, Semi-structured and Structured, Sources of data, working with unstructured data, Evolution and Definition of big data, Characteristics and Need of big data, Challenges of big data, big data environment terminologies, Big Data Analysis Life Cycle. Overview of business intelligence, Characteristics and need of big data analytics, Classification of analytics, Challenges to big data analytics	
Unit:2	Big data analytics and Analytical methods	8 Hours
	. Analytical operations: Associations rules- Apriori algorithm, classifications- decision trees, naïve bayes clustering- K means.	
Unit:3	Hadoop foundation for analytics	8 Hours
	Features, key advantages of Hadoop , key aspects of Hadoop, versions of Hadoop , Hadoop ecosystem ,and Components, HDFS, HBase, Hadoop Technology Stack: Hive, Pig, Zookeeper, Swoop, oozie, flume, etc. Hadoop distributions, Hadoop vs SQL, , Hadoop Vs Spark, Spark architecture, SparkQL	
Unit:4	MapReduce and YARN framework	7 Hours
	Introduction to MapReduce, Processing data with MapReduce, map reduce example, Introduction to YARN, YARN architecture , Data serialization and common serialization formats, Big data serialization formats.	
Unit:5	NoSQL Databases	7 Hours
	Introduction to NoSQL, advantages of NoSQL, SQL vs NoSQL, types of NoSQL databases- Schema-less Models: Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores - Tabular Stores - Object Data Stores - Graph Databases , Hive -- Sharding -- Hbase , Introduction to Cassandra	

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23AML-101**

Unit :6	Introduction to MongoDB key features	8 Hours
Introduction to MongoDB key features, data types in MongoDB, MongoDB Query Language.: update remove, insert methods, MongoDB through the JavaScript’s Shell, Creating and Querying through Indexes, and Document searching, Constructing queries on Databases, documents.		
Total Lecture Hours		45 Hours
Textbooks		
1	Big Data and Analytics ,Seema Acharya, Subhashini Chhellappan , Willey 2nd edition	
2	Professional Hadoop Solutions, Boris lublinsky, Kevin T.Smith, Alexey Yakubovich ,Wiley ISBN: 978-1-118-61193-7 September 2013	
3	Understanding Big data , Chris Eaton,Dirk derooset al. , McGraw Hill 2011	
4	Big Data and Analytics, Seema Acharya Wiley, 2016	
Reference Books		
1	MongoDB in Action , Kyle Banker,Piter Bakkum, Shaun Verch, Dream tech Press	
2	Big Data Analytics with R and Hadoop , Vignesh Prajapati, Packet Publishing	
3	Tom White, HADOOP: The definitive Guide, O Reilly, 2012	
4	Learning Spark: Lightning-Fast Big Data Analysis Paperback , Holden Karau	

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CSE-Artificial Intelligence & Machine Learning**CSE (AIML)****SoE No.
23AML-101****VII Semester****23AML1722: Lab: Big data analytics**

Sr. No.	Name of Practical						
1	Install Apache Hadoop						
2	Develop a MapReduce program to calculate the frequency of a given word in a given file						
3	Develop a MapReduce program to find the frequency of books published each year and find in which year maximum number of books were published using the following data: <table><tr><td>Title</td><td>Author</td><td>Published year</td><td>Author country</td><td>Language</td><td>No of pages</td></tr></table>	Title	Author	Published year	Author country	Language	No of pages
Title	Author	Published year	Author country	Language	No of pages		
4	Develop a Java application to find the maximum temperature using Spark						
5	Installation and study of MongoDB						
6	MongoDB- CRUD operations						
7	MongoDB indexing						
8	Create application that uses MongoDB with Java/ PHP						

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CSE-Artificial Intelligence & Machine Learning**CSE (AIML)****SoE No.
23AML-101****VII Semester****23AML1723: PE-IV : MLOps****Course Outcomes:****Upon successful completion of the course the students will be able to:**

1. To understand the components and stages of the MLOps lifecycle.
2. To identify and compare various MLOps tools and frameworks.
3. To apply containerization and version control practices in ML projects.
4. To develop and deploy basic machine learning models using CI/CD pipelines.
5. To evaluate the performance and stability of deployed models over time.

Unit:1	Introduction to MLOps	7 Hours
What is MLOps? – Need, benefits, lifecycle, Comparison: DevOps vs MLOps, ML System Design: Data, Model, Code pipelines, Tools overview: Git, Docker, Kubernetes, Jenkins, MLFlow, Case studies of MLOps in industry.		
Unit:2	ML Workflow & Data Engineering	8 Hours
Data collection & preprocessing pipelines, Feature engineering & data versioning, Data validation: Great Expectations, TensorFlow Data Validation, Data storage systems: SQL/NoSQL, Data Lakes, DVC, Hands-on: Building a reproducible data pipeline.		
Unit:3	Model Development & Experiment Tracking	7 Hours
Model training, tuning, and evaluation, Experiment tracking using MLflow or Weights & Biases, Reproducibility and managing model metadata, Hyperparameter tuning: Optuna, Ray Tune, Hands-on: Train and track multiple experiments.		
Unit:4	Model Deployment & Serving	8 Hours
Deployment strategies: batch, real-time, A/B testing, Model packaging with Docker, REST API creation with Flask/FastAPI, Model serving frameworks: TensorFlow Serving, TorchServe, KFServing, Hands-on: Deploying a model to a cloud environment (e.g., AWS, GCP).		
Unit:5	Continuous Integration / Continuous Deployment (CI/CD)	7 Hours
CI/CD for ML: GitHub Actions, Jenkins, GitLab CI, Automation in ML pipelines: Testing, validation, approvals, Model registry and versioning, Monitoring and logging: Prometheus, Grafana, Seldon Core,		

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Hands-on: Build a CI/CD pipeline for an ML project.

Unit :6	Monitoring, Governance & Best Practices	8 Hours
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Model monitoring: drift detection, performance metrics, Logging tools and alert systems, ML Governance: Bias, fairness, reproducibility, ethics, Security in ML systems, Real-world MLOps challenges & capstone project planning

Total Lecture Hours	45 Hours
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Textbooks

- | | |
|----------|--|
| 1 | "Introducing MLOps" by Mark Treveil and Alok Shukla, O'Reilly. |
| 2 | "MLOps Engineering at Scale" by Carl Osipov, Manning |

Reference Books

- | | |
|----------|--|
| 1 | "Machine Learning Engineering" by Andriy Burkov, True Positive Incorporated. |
| 2 | "Designing Machine Learning Systems" by Chip Huyen, O'Reilly. |

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MOOCs Links and additional reading, learning, video material -

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|----------|---|
| 1 | https://www.coursera.org/specializations/ml-ops-google-cloud |
| 2 | https://learn.microsoft.com/en-us/training/modules/ml-ops-deployment |

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CSE-Artificial Intelligence & Machine Learning**CSE (AIML)****SoE No.
23AML-101****VII Semester****23AML1724: Lab: MLOps****Course Outcomes:****Upon successful completion of the course the students will be able to:**

1. To understand and implement the components of the MLOps lifecycle.
2. To use the various MLOps tools and frameworks.
3. To apply containerization and version control practices in ML projects.
4. To develop and deploy basic machine learning models using CI/CD pipelines.
5. To evaluate the performance and stability of deployed models over time.

Sr. No	List of Practical's
1	Install and set up essential MLOps tools such as Docker, Git, MLflow, and Kubeflow.
2	Implement version control for machine learning models using Git and DVC.
3	Containerize a simple machine learning model using Docker.
4	Implement a CI pipeline using Jenkins or GitHub Actions for automating model testing and deployment.
5	Deploy a machine learning model using Kubeflow..
6	Implement model performance monitoring and drift detection using Prometheus and Grafana..
7	Automate model retraining using Apache Airflow.
8	Deploy a machine learning model on a cloud platform (AWS, GCP, or Azure).
9	Set up a full CI/CD pipeline for end-to-end model development and deployment.
10	Scale machine learning model deployments using Kubernetes.

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CSE-Artificial Intelligence & Machine Learning**CSE (AIML)****SoE No.
23AML-101****VII Semester****23AML1725: PE-IV: Edge computing****Course Outcomes:****Upon successful completion of the course the students will be able to**

1. Understand the concepts, architecture, and evolution of edge computing.
2. Analyze the communication protocols and platforms used in edge computing environments.
3. Apply machine learning and AI techniques to develop edge-based intelligent.
4. Evaluate edge computing frameworks, tools, and hardware for different Application domain.
5. Identify and mitigate security, privacy, and resource management challenges in edge systems.

Unit No.	Contents	Max. Hrs.
Unit:1	Introduction to Edge Computing	8 Hours
Introduction to Cloud and its limitations to support low latency and RTT, Evolution from Cloud to Edge computing, History of edge computing, Edge, Fog, and Mist Computing, Edge vs. Cloud – Comparison		
Unit:2	Edge Architecture and Communication	8 Hours
Edge Computing Architectures, Edge nodes, Edge gateway, Cloudlet, Communication models: Publish/Subscribe, Request/Response, Protocols: MQTT, CoAP, HTTP/2, WebSockets.		
Unit:3	Distributed Systems Foundations for Edge Computing	8 Hours
Concepts of distributed systems in edge computing such as time ordering and clock synchronization, distributed snapshot, Introduction to Edge Data Center, Lightweight Edge Clouds and its services provided by different service providers.		
Unit:4	Resource Management and Scheduling	7 Hours
Task offloading and scheduling, Load balancing across cloud-fog-edge layers, Bandwidth and energy optimization, Quality of Service (QoS) requirements		
Unit:5	Security, Privacy & Resource Management	7 Hours
Threats and Challenges at the Edge, Lightweight encryption and authentication, Energy and Thermal Management, Task offloading and resource allocation.		

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CSE-Artificial Intelligence & Machine Learning**CSE (AIML)****SoE No.
23AML-101**

Unit :6	Applications and Emerging Trends	7 Hours
Edge AI and TinyML: Deploying ML models on edge, Edge analytics for real-time decision-making, Integration with 5G and IoT, Use cases of machine learning for edge sensor data in predictive maintenance, image classifier and self-driving cars.		
Total Lecture Hours		45 Hours
Textbooks		
1	Edge Computing: A Primer, Jie Cao, Quan Zhang, Weisong Shi, Springer, 2020	
2	Fog and Edge Computing: Principles and Paradigms, Rajkumar Buyya, Satish Narayana Srirama, Wiley, 2019	
Reference Books		
1	Edge Computing: Models, Technologies and Applications, Amir H. Gandomi, S. Hossein Hosseini, Xiaoli Li, Springer,2022	
2	Edge Computing and Computational Intelligence Paradigms for the IoT, Rittwik Jana, Sudeep Tanwar, Neeraj Kumar, CRC Press (Taylor & Francis),2021.	
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]		
1		
MOOCs Links and additional reading, learning, video material		
1	https://onlinecourses.nptel.ac.in/noc24_cs66/preview	
2	https://nptel.ac.in/courses/106104449	

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CSE-Artificial Intelligence & Machine Learning**CSE (AIML)****SoE No.
23AML-101****VII Semester****23AML1726: Lab: PE-IV: Edge computing**

Sr. No.	Practical List
1.	Installation tools to create and manage ECN's
2.	Setup the Communication Parameters
3.	Implement any two Communications protocols
4.	Install and start the IoT Edge for Linux on Windows runtime on your device.
5.	Python based basic programs using Raspberry Pi.
6.	Publishing Data using HTTP.
7.	MicroPython for the Internet of Things A Beginner's Guide to Programming with Python on Microcontroller, Charles Bell, A Press.
8.	Sensor Interfacing and Logging using MQTT.

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CSE-Artificial Intelligence & Machine Learning**CSE (AIML)****SoE No.
23AML-101****VII Semester****23AML1727: PE-IV : Java Full stack Development****Course Outcomes:****Upon successful completion of the course the students will be able to**

CO 1: Understand the core, advance java, cloud and virtualization concepts.

CO 2: Apply the concepts for full stack development.

CO 3: Design different web applications using UI components and Spring framework.

CO 4: Develop fully functional web applications using different frameworks and tools.

CO 5: Implementation of web application using different tools.

Unit:1	Java Basics	7 Hours
OOP Concepts, Data Structures, Collection Framework, File handling, JDBC, Introduction to JUnit		
Unit:2	Advance Java Features	8 Hours
Introduction to Java 8 Features, Interface Enhancements, Functional Interfaces, Lambda Expression, ForEach , Method References, Streams API, JavaDocs		
Unit:3	User Interface Design	7 Hours
Building Responsive Web Pages HTML5, CSS3 and JavaScript, Basic Single Page Applications Using Angular OR React		
Unit:4	Spring Framework	8 Hours
Working with Spring Core, Dependency Injection, Spring MVC, Spring Boot, Introduction to Hibernate and Spring Microservices		
Unit:5	Cloud and Virtualization	8 Hours
Virtualization Basics, Introduction to Cloud, RDB Cloud Fundamentals (SaaS, Paas, IaaS), Introduction to AWS (S3 Buckets, RDS), AWS Cloudfront		
Unit :6	Full Stack Development Tools	7 Hours
Introduction to Maven, Jacoco, SonarLint, Jira, Swagger, Mockito, Docker, Gitrunner		
Total Lecture Hours		45 Hours

Textbooks

1	The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Developer, Chris Northwood, first Edition, Apress Publication First Edition
2	Full Stack Web Development For Beginners: Learn Ecommerce Web Development using HTML5, CSS3, Bootstrap, JavaScript, MySQL and PHP, Riaz Ahmed, Amazon Digital Services ,First Edition

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CSE-Artificial Intelligence & Machine Learning**CSE (AIML)****SoE No.
23AML-101****Reference Books**

1	Full Stack Java Development with Spring MVC, Hibernate, jQuery, and Bootstrap , Mayur Ramgir Wiley Publication, First Edition
2	Java for Web Development: Create Full-Stack Java Applications with Servlets, JSP Pages, MVC Pattern and Database Connectivity, Sarika Agarwal and Vivek Gupta ,BPB Publication, First Edition

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/javabook.pdf
2	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/JavaScript%20Programmer's%20Reference.pdf

MOOCs Links and additional reading, learning, video material

1	https://onlinecourses.nptel.ac.in/noc21_cs14/preview
2	https://nptel.ac.in/courses/106105167

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CSE-Artificial Intelligence & Machine Learning**CSE (AIML)****SoE No.
23AML-101****VII Semester****23AML1728: Lab : Java Full stack Development**

Sr. No.	Experiments based on
1	Develop a Java Program Collection- List, Queue, and Set.
2	Develop a Java Program based on File Handling
3	Develop a Java program using JDBC to Connect with database and fetch employee record and insert records in employee table
4	Develop a Java program to implement a lambda expression- i. To find the sum of two integers ii. To calculate the factorial of a given number
5	Design a class using Stream API to take a Details of Employee like Id, Name, Email, Gender, NewJoining, Salary, Rating. I. Filter the employees list with gender as Female II. Filter the employees list with newJoiner as True III. Sort the employee list by rating asc IV. Sort the employee list by both rating and salary V. Retrieve employee with max salary VI. Retrieve employee with min salary VII. Group all our employees by Gender
6	Build a Responsive Web Pages Using HTML5, CSS3 and JavaScript
7	Design the Basic Single Page Applications Using React
8	Practical based on Spring Microservices
9	To study Virtualization and AWS Cloud.
10	To study Maven, , Jira, Mockito and Docker

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CSE-Artificial Intelligence & Machine Learning**CSE (AIML)****SoE No.
23AML-101****VII Semester****MDM5AML105: Machine Learning and its Applications****Course Outcomes:****Upon successful completion of the course the students will be able to:**

1. To understand the basic principles of supervised and unsupervised machine learning algorithms, and strategies for the design of ML experiments.
2. To apply supervised to the given dataset and predict the model outcome.
3. To apply unsupervised learning algorithms to the given dataset and predict the model outcome.
4. To analyse and find the use cases, domains for the application of Machine Learning.

Unit:1	Introduction to Machine Learning	7 Hours
Overview of Machine Learning, Types of Machine Learning: Supervised, Unsupervised, Reinforcement learning, Classification, Regression, Supervised and Unsupervised Learning, Learning Associations, Machine Learning Workflow, Examples of Machine Learning Applications.		
Unit:2	Supervised Learning	8 Hours
Linear and polynomial regression, classification with k-Nearest Neighbors, Naive Bayes Classifiers, Decision Trees, Generalization, Overfitting, and Underfitting. Random forests, Kernelized Support Vector Machines, evaluation metrics for supervised learning.		
Unit:3	Unsupervised Learning	7 Hours
k-Means Clustering , Choosing the Number of Clusters, Semi-Supervised Learning , Evaluation metrics for unsupervised learning		
Unit:4	Applications of Machine Learning	8 Hours
Importance of ML in various industries, Overview of real-world applications, ML in Healthcare, Finance, Transportation, Customer Service.		
Total Lecture Hours		30 Hours
Textbooks		
1	‘Introduction to Machine Learning’, Ethem Alpaydin, The MIT Press, second edition	
2	‘Applied Machine Learning’, M.Gopal, McGraw-Hill	
Reference Books		

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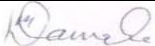
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23AML-101**

1	'Machine Learning ', Tom Mitchell, McGraw-Hill
2	'Introduction to Machine Learning with Python, A Guide for Data Scientists Andreas C 'Müller and Sarah Guido, O'REILLY
3.	'Pattern Recognition and Machine Learning ', Christopher M. Bishop, Springer New York, NY
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc21_cs24/preview
2	https://onlinecourses.nptel.ac.in/noc21_cs85/preview

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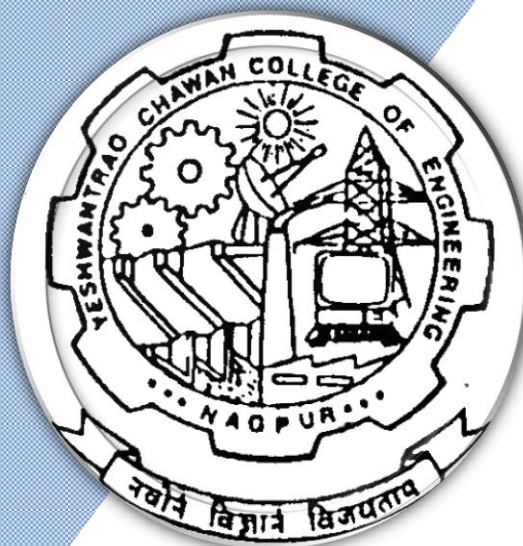
Nagar Yuwak Shikshan Sanstha's

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(Accredited 'A++' Grade by NAAC with a score of 3.6)

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Bachelor of Technology SoE & Syllabus 2023 8th Semester

(Department of Computer Science & Engineering)

B. Tech in Artificial Intelligence and Machine Learning (AIML)



Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
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B.TECH SCHEME OF EXAMINATION 2023
(Scheme of Examination w.e.f. 2023-24 onward)
(Department of Computer Science & Engineering)
B. Tech. in Artificial Intelligence and Machine Learning

SoE No.
23AML-101

SN	Sem	Type	BoS/Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours	
							L	T	P	Hrs		MSEs*	TA**	ESE		
EIGHTH SEMESTER																
1	8	PE	AML		Professional Elective-V	T	3	0	0	0	3	30	20	50	3	
2	8	MDM	AML		MD Minor Course-VI	T	2	0	0	2	2	30	20	50	3	
3	8	STR	AML	23AML1802	Internship / On Job training	P	0	0	14	14	7			100		
							5	0	14	16	12					
GRAND TOTAL							125	0	76	204	176					

Professional Elective -V					
1	8	PE-V	AML	23AML1821	PE-V : Natural Language Understanding and Generation
2	8	PE-V	AML	23AML1822	PE-V : Prompt Engineering
3	8	PE-V	AML	23AML1823	PE-V : Virtual Reality
4	8	PE-V	AML	23AML1824	PE-V : AI for medical domain
5	8	PE-V	AML	23AML1825	PE-V : Cyber Security

Multidisciplinary Minor Courses		
Track 1		
Courses	Sem	Artificial Intelligence and Machine learning
MDM-I	3	(MDM1AML101) Fundamentals of Data Structures
MDM-II	4	(MDM2AML102) Introduction to Analysis of Algorithms
MDM-III	5	(MDM3AML103) Data analysis and Statistics
MDM-IV	6	(MDM4AML104) Fundamentals of Artificial Intelligence
MDM-V	7	(MDM5AML105) Machine Learning and its Applications
MDM-VI	8	(MDM6AML106) Practical Machine Learning for Data analysis

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CSE-Artificial Intelligence & Machine Learning**CSE (AIML)****SoE No.
CSE-201****VIII Semester****23AML1821: PE-V : Natural Language Understanding and Generation****Course Outcomes****After completion of this course, students will be able to****CO1:** Understand the fundamental concepts, components, and real-world applications of Natural Language Processing (NLP).**CO2:** Apply appropriate algorithms and models for analyzing and processing both textual and speech-based data.**CO3:** Analyze linguistic structures and semantic representations at various levels using computational techniques.**CO4:** Design and implement NLP systems using rule-based, statistical, and neural approaches, including Transformer models.**CO5:** Evaluate NLP and speech processing solutions in terms of accuracy, efficiency, and adaptability to modern AI advancements such as LLMs and GenAI

Unit No.	Contents	Max. Hrs.
Unit:1	Introduction	7 Hrs
Origins and challenges of Natural Language Processing (NLP), language modeling: grammar-based and statistical models, regular expressions and finite-state automata (FSA), English morphology and tokenization, text normalization: lowercasing, stopword removal, stemming, lemmatization, spelling correction, and minimum edit distance.		
Unit:2	Word Level Analysis	8 Hrs
N-gram models: unsmoothed models, smoothing techniques, interpolation, backoff strategies. Word classes and Part-of-Speech (POS) tagging: rule-based, stochastic, and transformation-based approaches. Hidden Markov Models (HMMs), Maximum Entropy Models.		
Unit:3	Syntactic Analysis	8 Hrs
Context-Free Grammars (CFGs), grammar rules for English, Treebanks, dependency grammars. Syntactic parsing: ambiguity, dynamic programming, shallow parsing. Probabilistic CFGs, CYK algorithm, and lexicalized CFGs.		
Unit:4	Semantics And Pragmatics	7 Hrs
Semantic representation: First-order logic, syntax-driven analysis, semantic attachments. Word senses and relationships, thematic roles. Word sense disambiguation (WSD): supervised, dictionary-based, and bootstrapping methods. Word similarity using thesaurus-based and distributional methods. Introduction to Generative AI and its role in NLP. Introduction to the Transformer architecture and the attention mechanism. Overview of Large Language Models (LLMs): BERT, RoBERTa, GPT. Role of LLMs in contextual semantics and multilingual understanding.		

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CSE-Artificial Intelligence & Machine Learning**CSE (AIML)****SoE No.
CSE-201**

Unit:5	Basic Concepts of Speech Processing	8 Hrs
Speech fundamentals: articulatory and acoustic phonetics, speech production and classification of sounds. Feature extraction techniques: STFT, filter-bank, LPC.		
Unit :6	Speech-Analysis, Speech Modeling	7 Hrs
Feature extraction and pattern comparison techniques: speech distortion measures – mathematical and perceptual – log-spectral distance, cepstral distances, weighted cepstral distances, and filtering. Likelihood distortions, spectral distortion using a warped frequency scale. LPC, PLP, and MFCC coefficients. Time alignment and normalization: dynamic time warping (DTW), multiple time-alignment paths. Hidden Markov Models: Markov processes, HMMs – evaluation, optimal state sequence (Viterbi search), Baum-Welch parameter re-estimation, and implementation issues.		
Total No. Of Lectures		45

Text books	
1.	Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
2.	Steven Bird, Ewan Klein and Edward Loper, —Natural Language Processing with Python, First Edition, O'Reilly Media, 2009.
3	Lawrence Rabiner And Biing-Hwang Juang, “Fundamentals Of Speech Recognition”, Pearson Education, 2003.
4	Daniel Jurafsky And James H Martin, “Speech And Language Processing – An Introduction To Natural Language Processing, Computational Linguistics, And Speech Recognition”, Pearson Education, 2002
Reference Books	
1.	Frederick Jelinek, “Statistical Methods Of Speech Recognition”, MIT Press, 1997.
2.	Breck Baldwin, —Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015
3	Richard M Reese, —Natural Language Processing with Java, O'Reilly Media, 2015.

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CSE-Artificial Intelligence & Machine Learning**CSE (AIML)****SoE No.
CSE-201****VIII Semester****23AML1822: PE-V : Prompt Engineering****Course Outcomes****After completion of this course, students will be able to****CO-1:** Explain the fundamentals of large language models (LLMs), types of prompting, and associated challenges.**CO-2:** Design effective prompts using optimization techniques and appropriate tools for various NLP tasks.**CO-3:** Demonstrate advanced prompting strategies such as CoT, ReAct, and Tree of Thoughts to enable multi-step reasoning.**CO-4:** Develop prompt-based solutions for specialized applications like creative writing, coding, and data analysis using appropriate tools and techniques.**CO-5:** Evaluate prompt effectiveness and apply ethical considerations to mitigate bias, hallucination, and adversarial risks.

Unit No.	Contents	Max. Hrs.
Unit 1	Introduction to Prompt Engineering (Basics of LLMs)	7 Hrs
	Evolution of Large Language Models (LLMs): GPT, BERT, T5, What is a Prompt? How LLMs Interpret Prompts, Types of Prompting: Zero-shot, One-shot, Few-shot, Basics of Tokenization, Context Windows, Challenges: Bias, Hallucination, Length Constraints, Tools: OpenAI Playground, Hugging Face models	
UNIT 2	Prompt Design and Optimization Techniques	8 Hrs
	Components of a Good Prompt: Clarity, Context, Instructions, Techniques: Instruction-based Prompting, Role Prompting, Context Setting, Methods for prompt refinement and optimization, Prompt Iteration, Evaluation, and Debugging, Case Studies: Crafting prompts for different tasks (Summarization, Translation, QA)	
UNIT 3	Advanced Prompting Strategies	7 Hrs
	Chain-of-Thought (CoT) Prompting, Self-Consistency Prompting, Tree of Thoughts (ToT) prompting, ReAct (Reasoning + Acting) framework, Meta-Prompting and Automatic Prompt Generation, Multi-step Reasoning and Planning	
UNIT 4	Specialized Prompting Applications	8 Hrs

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CSE-Artificial Intelligence & Machine Learning**CSE (AIML)****SoE No.
CSE-201**

Prompting for: Creative Writing (Story generation, Poetry), Coding and Code Generation (Codex, Copilot), Data Extraction and Analysis, Image Generation (using DALL-E, MidJourney prompts), Fine-tuning vs Prompt-tuning: Differences and Practical Considerations, Using Retrieval-Augmented Generation (RAG) with Prompts		
UNIT 5	Evaluation, Bias, and Ethics in Prompt Engineering	7 Hrs
Evaluation Metrics for Prompt Effectiveness: Accuracy, Fluency, Factuality, Coherence, Detecting Bias and Hallucination in LLM outputs, Mitigation strategies for safe prompt design, Adversarial Prompting and Jailbreaking, Ethical Considerations: Plagiarism, Misinformation		
UNIT 6:	Future of Prompt Engineering and Hands-on Project	8 Hrs
Trends: Agents, Tool Use, Plugins (e.g., OpenAI Plugins, LangChain), AutoGPT, BabyAGI: Automating Prompt Chaining, Designing Prompt-based Workflows (Marketing, HR, Legal, etc.)		
Total No.Of Lectures		45 Hr

Text books	
1.	"The Art of Prompt Engineering with ChatGPT" by Nathan Hunter
2.	"Prompt Engineering for Generative AI: Harnessing the Power of LLMs" by Sinan Ozdemir (O'Reilly, 2023)
Reference Books	
1.	Prompt Engineering Guide" (https://www.promptingguide.ai/)
2.	"Chain-of-Thought Prompting Elicits Reasoning in LLMs" (Google Research Paper)
3.	OpenAI Documentation and Best Practices

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CSE-Artificial Intelligence & Machine Learning**CSE (AIML)****SoE No.
CSE-201****VIII Semester****23AML1823: PE-V : Virtual Reality****Course Outcomes:****After completion of this course, students will be able to**

CO1: Describe how VR systems work and list the applications of VR.

CO2: Understand the design and implementation of the hardware that enables VR systems to be built.

CO3: Understand the system of human vision and its implication on perception and rendering.

CO4: Explain the concepts of motion and tracking in VR systems.

CO5: Describe the importance of interaction and audio in VR systems.

Unit:1	Introduction to Virtual Reality	7Hours
Defining Virtual Reality, History of VR, Human Physiology and Perception, Key Elements of Virtual Reality Experience, Virtual Reality System, Interface to the Virtual World-Input & output- Visual, Aural & Haptic Displays, Applications of Virtual Reality.		
Unit:2	Representing the Virtual World	7 Hours
Representation of the Virtual World, Visual Representation in VR, Aural Representation in VR and Haptic Representation in VR.		
Unit:3	The Geometry of Virtual Worlds &The Physiology of Human Vision	8Hours
Geometric Models, Changing Position and Orientation, Axis-Angle Representations of Rotation, Viewing Transformations, Chaining the Transformations, Human Eye, eye movements & implications for VR.		
Unit :4	Visual Perception & Rendering	8Hours
Visual Perception - Perception of Depth, Perception of Motion, Perception of Color, Combining Sources of Information. Visual Rendering -Ray Tracing and Shading Models, Rasterization, Correcting Optical Distortions, Improving Latency and Frame Rates.		
Unit :5	Motion & Tracking	8Hours
Motion in Real and Virtual Worlds- Velocities and Accelerations, The Vestibular System, Physics in the Virtual World, Mismatched Motion and Vection Tracking- Tracking 2D & 3D Orientation, Tracking Position and Orientation, Tracking Attached Bodies		
Unit :6	Beyond A. R. - Mixed Reality	7 Hours
Interaction - Motor Programs and Remapping, Locomotion, Manipulation, Social Interaction. Audio -The Physics of Sound, The Physiology of Human Hearing, Auditory Perception, Auditory Rendering.		
Total Lectures		45

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(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

BTech SoE and Syllabus 2023-24

(Scheme of Examination w.e.f. 2024-245 onward)

(Department of Computer Science and Engineering)

CSE-Artificial Intelligence & Machine Learning**CSE (AIML)****SoE No.
CSE-201****Textbooks**

- | | |
|----|---|
| 1. | Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016 |
| 2. | Understanding Virtual Reality: Interface, Application and Design, William R Sherman and Alan B Craig, (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San Francisco, CA, 2002 |
| 3. | Developing Virtual Reality Applications: Foundations of Effective Design, Alan B Craig, William R Sherman and Jeffrey D Will, Morgan Kaufmann, 2009. |

Reference Books

- | | |
|----|---|
| 1. | Gerard Jounghyun Kim, "Designing Virtual Systems: The Structured Approach", 2005. |
| 2. | Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, "3D User Interfaces, Theory and Practice", Addison Wesley, USA, 2005. |
| 3. | Oliver Bimber and Ramesh Raskar, "Spatial Augmented Reality: Merging Real and Virtual Worlds", 2005 |
| 4. | Burdea, Grigore C and Philippe Coiffet, "Virtual Reality Technology", Wiley Interscience, India, 2003. |

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

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| 1 | http://lavalle.pl/vr/book.html |
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MOOCs Links and additional reading, learning, video material

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| 1 | https://nptel.ac.in/courses/106/106/106106138/ |
| 2 | https://www.coursera.org/learn/introduction-virtual-reality |

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CSE-Artificial Intelligence & Machine Learning**CSE (AIML)****SoE No.
CSE-201****VIII Semester****23AML1823: PE-V : AI for medical domain****Course Outcomes:****Upon successful completion of the course the students will be able****CO1:** Understand the role and scope of AI in solving healthcare and medical problems.**CO2:** Apply machine learning and deep learning techniques to analyze medical data.**CO3:** Develop and evaluate AI models for disease prediction, diagnosis, and prognosis.**CO4:** Analyze and interpret the performance of AI models using real-world medical datasets.**CO5:** Address ethical, legal, and regulatory issues involved in deploying AI in healthcare.

Unit:1	Introduction to AI in Healthcare	7 Hours
Overview of AI in the medical field, Types of medical data: Structured vs. unstructured, EHR, imaging, genomic, etc. Applications: Diagnosis, drug discovery, personalized medicine, robotic surgery, Challenges: Data privacy, data quality, interoperability, Case studies: IBM Watson Health,		
Unit:2	Machine Learning Fundamentals for Medical Applications	8Hours
Supervised vs. unsupervised learning, Feature engineering for medical datasets, Classification and regression in diagnosis, Algorithms: Decision Trees, k-NN, SVM, Random Forests, Model evaluation: Confusion matrix, ROC-AUC, precision-recall, F1 score		
Unit:3	Deep Learning in Medical Imaging and Signal Processing	8 Hours
CNNs for medical image classification (X-ray, MRI, CT), RNNs and LSTMs for biomedical signals (ECG, EEG), Segmentation and localization techniques (U-Net, Mask R-CNN), Transfer learning and pre-trained models (ResNet, VGG, etc.), Hands-on: Using TensorFlow or PyTorch for a medical image dataset		
Unit :4	Natural Language Processing in Healthcare	8 Hours
Clinical NLP applications: symptom extraction, named entity recognition, relation extraction, Working with unstructured clinical notes and reports, Medical ontologies: UMLS, SNOMED CT, ICD codes, NLP techniques: Bag-of-Words, TF-IDF, Word2Vec, BERT in clinical text , Chatbots and virtual health assistants		
Unit :5	AI in Disease Prediction and Personalized Medicine	7 Hours
Predictive modeling for diseases (diabetes, cancer, heart disease), Risk assessment and prognosis models, Recommendation systems for treatments and medications, Precision medicine and AI integration with genomics, Case study: AI in COVID-19 diagnosis and prediction		
Unit:6	Ethical, Legal, and Regulatory Aspects	7 Hours
Data privacy laws (HIPAA, GDPR) in healthcare, Bias and fairness in medical AI, Explainability and interpretability (SHAP, LIME, etc.), Clinical validation and deployment of AI models, Future directions: AI in global health, remote monitoring, and wearables		
Total Lecture Hours		45 Hours

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CSE-Artificial Intelligence & Machine Learning**CSE (AIML)****SoE No.
CSE-201****Textbooks**

1	Artificial Intelligence in Healthcare", Adam Bohr, Kaveh Memarzadeh, Academic Press (Elsevier)
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2	Machine Learning for Healthcare, Kevin Franks, Apress
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Reference Books

1	Artificial Intelligence and Big Data Analytics for Smart Healthcare, Miltiadis Lytras, Abdullah Mohammed, Springer
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2	Deep Medicine: How Artificial Intelligence Can Make Healthcare Human Again, Eric Topol
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3	Biomedical Informatics: Computer Applications in Health Care and Biomedicine, Edward H. Shortliffe, James J. Cimino, Springer
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YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

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MOOCs Links and additional reading, learning, video material

1	https://www.coursera.org/specializations/ai-healthcare
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CSE-Artificial Intelligence & Machine Learning**CSE (AIML)****SoE No.
CSE-201****VIII Semester****MDM6AML106: Practical Machine Learning for Data analysis****Course Outcomes:****Upon successful completion of the course the students will be able to**

CO1: Understand the fundamental concepts and scope of data analysis and machine learning, and explain their interrelation in solving real-world problems.

CO2: Apply appropriate techniques for data cleaning, including handling missing, inconsistent, or duplicate values to ensure data quality.

CO3: Explain the principles and applications of supervised learning algorithms, including linear regression and logistic regression.

CO4: Apply and compare clustering algorithms such as K-Means, Hierarchical Clustering, and DBSCAN for data grouping tasks.

CO5: Design and implement a complete end-to-end machine learning pipeline, from data pre-processing to model deployment.

Unit:1 Introduction to Machine Learning & Data Analysis: 7 Hours

Introduction to Machine Learning & Data Analysis: Overview of Data Analysis and Machine Learning, Types of Machine Learning: Supervised, Unsupervised, Reinforcement Applications in Data Analysis, Steps in a Machine Learning Project, Introduction to Python/R for ML (basic libraries: NumPy, Pandas, Matplotlib). **Data Pre-processing and Exploration:** Data Cleaning and Handling Missing Values, Feature Selection and Feature Engineering, Data Transformation: Normalization and Standardization, Exploratory Data Analysis (EDA), Data Visualization Techniques.

Unit:2 Supervised and Unsupervised Learning Techniques 7 Hours

Supervised Learning Techniques: Linear Regression and Logistic Regression, Decision Trees and Random Forests, Support Vector Machines (SVM), k-Nearest Neighbors (k-NN), Model Evaluation Metrics: Accuracy, Precision, Recall, F1 Score, ROC-AUC.

Unsupervised Learning Techniques: Clustering: K-Means, Hierarchical Clustering, DBSCAN, Dimensionality Reduction: PCA, t-SNE, Association Rule Learning: Apriori, FP-Growth, Applications in Market Segmentation, Anomaly Detection.

Unit:3 Advanced Topics and Model Optimization: 6 Hours

Advanced Topics and Model Optimization: Ensemble Methods: Bagging, Boosting (AdaBoost, XGBoost), Cross-validation and Hyper parameter Tuning (Grid Search, Random Search), Handling Imbalanced Data, Feature Importance and Model Interpretability (e.g., SHAP, LIME)

Unit:4 Case Studies and Applications: 6 Hours

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CSE-Artificial Intelligence & Machine Learning**CSE (AIML)****SoE No.
CSE-201****Case Studies and Applications:**

Real-world Case Studies (e.g., Sales Forecasting, Sentiment Analysis, Customer Churn), End-to-End ML Project Pipeline, Deployment Basics (Intro to Streamlit, Flask, or cloud platforms), Ethics and Fairness in Machine Learning, Capstone Project Presentation / Report

Total Lecture Hours**26 Hours****Textbooks**

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|---|---|
| 1 | Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, O'Reilly Media. |
| 2 | Andreas C. Müller & Sarah Guido, Introduction to Machine Learning with Python, O'Reilly Media |
| 3 | Joel Grus, Data Science from Scratch: First Principles with Python, O'Reilly Media. |

Reference Books

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|---|--|
| 1 | Bishop, C. M , Pattern Recognition and Machine Learning, Springer 2006 |
| 2 | Hastie, T., Tibshirani, R., & Friedman, J. , The Elements of Statistical Learning, Springer, 2009 (2nd Edition) |
| 3 | Géron, A. , Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, O'Reilly Media, 2022 (3rd Edition) |

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]

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|---|---|
| 1 | https://www.microsoft.com/en-us/research/wp-content/uploads/2006/01/Bishop-Pattern-Recognition-and-Machine-Learning-2006.pdf |
| 2 | https://www.cs.huji.ac.il/~shais/UnderstandingMachineLearning/understanding-machine-learning-theory-algorithms.pdf |

MOOCs Links and additional reading, learning, video material

- | | |
|---|---|
| 1 | https://www.coursera.org/learn/machine-learning-data-analysis |
| 2 | https://pll.harvard.edu/course/data-science-machine-learning |

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