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)

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	
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: I**ntroduction 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

SN	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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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

SN	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		

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**

Chairperson	Dean (Acad. Matters)	July, 2023	1.00
		Date of Release	Version

Applicable for AY 2023-24 Onwards

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							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**				

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

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

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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	
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	**YCAP4 :** YCCE Communication Aptitude Preparation	**A**	3	0	0	3	**0**				

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

		July, 2023	1.00	Applicable for AY 2023-24 Onwards
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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	
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	NPTEL	23OE3535	OE-III : Designated approved online NPTEL Course	NPTEL

Chairperson	Dean (Acad. Matters)	Date of Release	Version	Applicable for
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							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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Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**	

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

(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	
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: I**ntroduction 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

SN	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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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

SN	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		

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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		Date of Release	Version

Applicable for AY 2023-24 Onwards

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 Betta 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**

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, VolI & 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/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/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, Polypyrole. Contemporary issues related to the topic.

Unit VI: Advanced Materials **(7 Hrs.)**

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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/Suported%20file/Supprted%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=JfJ7MlP9Dco
4	https://www.youtube.com/watch?v=L2VSOccUrSk
5	https://www.youtube.com/watch?v=p5pk4Um6lsk
6	https://www.youtube.com/watch?v=zVDMgoffmC0

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 a**nd 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.

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

(Department of Mathematics & Humanities)

B.Tech First Year

SoE No. 23FY-101

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**-Etiquettes, 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

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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

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**

Textbooks:	
1.	Technical Communication, 3rd Edition, Raman & Sharma, Oxford University Press
2.	Textbook of English Phonetics for Indian Students,3rd 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)

B.Tech First Year

SoE No. 23FY-101

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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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

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**

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/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/HTML.._the_complete_reference.pdf
2	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/JavaScript%20Programmer's%20Refe rence.pdf

MOOCs Links and additional reading, learning, video material	
1.	https://onlinecourses.swayam2.ac.in/nou20_cs05/preview

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

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

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]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/Programming%20with%20C.pdf
2	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/C-in-depth-2nd-ed.pdf
3	http://103.152.199.179/YCCE/Suported%20file/Supprted%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	
1.	https://archive.nptel.ac.in/courses/106/104/106104128/

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

<table>
<tr><th>Sr. No.</th><th>Problem Statements</th></tr>
<tr><td>1</td><td>Introduction to Linux Operating system & its different commands.</td></tr>
<tr><td>2</td><td>Introduction to editor, Compilation and Execution of a program in Linux</td></tr>
<tr><td>3</td><td>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.</td></tr>
<tr><td>4</td><td>Write program using conditional operators to evaluate the following function and print the value of y. y = 2.4x + 3, for x <= 2 y = 3x –5, for x > 2</td></tr>
<tr><td>5</td><td>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.
<table>
<tr><th>Age</th><th>Gender</th><th>City</th><th>Will Buy?</th></tr>
<tr><td>25-30</td><td>M</td><td>Chennai</td><td>Yes</td></tr>
<tr><td>33-45</td><td>F</td><td>Bangalore</td><td>Yes</td></tr>
<tr><td>57-80</td><td>F</td><td>Chennai</td><td>No</td></tr>
<tr><td>25-30</td><td>F</td><td>Hyderabad</td><td>No</td></tr>
<tr><td>13-19</td><td>M</td><td>Bangalore</td><td>Yes</td></tr>
<tr><td>16-20</td><td>M</td><td>Chennai</td><td>No</td></tr>
</table></td></tr>
</table>

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! + x2 / 2! + x3 / 3! +…….
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.

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 Civil Engineering)

B.Tech in FYC

SoE No. 23FY-101

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**

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

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

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

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

SN	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: I**ntroduction 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

SN	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

Nagar Yuwak Shikshan Sanstha's

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(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	

Liberal Learning Course

SN	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		

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**

Chairperson	Dean (Acad. Matters)	July, 2023	1.00
		Date of Release	Version

Applicable for AY 2023-24 Onwards

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**

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

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 Physics)

B.Tech First Year

SoE No. 23FY-101

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)**	

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

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

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.

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**

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. TannenbauPrentice 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/Suported%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/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/Data%20Structures%20Succinctly%20 Part%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/

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

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 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.)**
Kirchhof'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. **(ContemporaryIssues related to Topic)**	
Total Lecture	**40 Hours**

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

Textbooks:	
1.	Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford Higher Education, First Edition2005
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

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, Treeset, 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**

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/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/thinking_in_java_4th_edition.pdf
2	http://103.152.199.179/YCCE/Suported%20file/Supprted%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/

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)

B.Tech First Year

SoE No. 23FY-101

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.

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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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**				

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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Chairperson	Dean (Acad. Matters)	Date of Release	Version	

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.	

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, 9th Edition, John Wiley and Sons, INC.
2	Dr. B. S. Grewal, Higher Engineering Mathematics, 40th edition, Khanna Publisher.
3	H.K. Dass, Advanced Engineering Mathematics, 8th revised edition, S. Chand, Delhi.
4	Hoffman and Kunze, Linear Algebra, prentice Hall of India, New Delhi
5	Glbert 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.

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

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**

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

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

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

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

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 Lame (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]	
1	
MOOCs Links and additional reading, learning, video material	
1	

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**

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 , Willaiam 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

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**

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

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(*eid:* integer, *ename:* string, *age:* integer, *salary:* real) Works(*eid:* integer, *did:* integer, *pcttime:* integer) Dept(*did:* integer, *dname:* string, *budget:* real, *managerid:* 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 *eid* = 101, *age* = 32 and *salary* = 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(sid: integer, sname: string, address: string) Parts(pid: integer, pname: string, color: string) Catalog(sid: integer, pid: integer, cost: 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.

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

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 Matplotli

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**

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

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

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

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

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

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

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/Book%20Fundamentals%20of%20Data%20Structure%20(1982)%20by%20Ellis%20Horowitz%20and%20Sartaj%20Sahni.pdf
2	http://103.152.199.179/YCCE/Suported%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://youtu.be/zWg7U0OEAoE

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/

III SEMESTER

Mandatory Learning Course (MLC)

MLC2123 : YCAP3

			July,2023	1.00	Applicable for AY 2023-24 Onwards
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)

(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)

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	
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	**YCAP4 :** YCCE Communication Aptitude Preparation	**A**	3	0	0	3	**0**				

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

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

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**

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

IV SEMESTER
23GE1405 : Marathi Language

Course Objectives
1. मराठी भाषेच्या समृद्धीची जाणीव करून देणे. 2. विद्यार्थ्यांमध्ये भाषा कौशल्याचा विकास करणे आणि त्यातून रोजगाराच्या संधींचा शोध घेणे.

Course Outcomes
3. भाषेचा जीवन व्यवहारात योग्य पद्धतीने वापर करण्याचा प्रयत्न करणे. 4. संत साहित्याच्या शिकवणुकीमुळे मानवता आणि मानवी व्यवहाराची सांगड घालणे, नैतिक मूल्ये रुजविणे. 5. 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

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

1. पाठ्यपुस्तक **: शब्दसाधना - भाग १**
2. रोजगाराभिमुख मराठी व्यावहारिक कौशल्ये

IV SEMESTER
23GE1406 : Hindi Language

Course Objectives

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

Course Outcomes

1. पौराणिक अथवा ऐतिहासिक घटनाओं को तार्किक आधार पर स्वीकार करेंगे | अपने परिवेश के उचित और अनुचित व्यवहारों के प्रति आकलन शक्ति बढ़ेगी |
2. एकांकी, कहानी, निबंध आदि विधाओं के मध्य का अंतर बताने में सक्षम होंगे |
3. कविता का रसास्वादन करने में समर्थ होंगे |
4. 'अनुवाद' के स्वरूप एवं प्रक्रिया से अवगत होंगे |
5. 'मार्गिक नक़्शे' 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

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"**

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**

Text Books

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

Reference Books

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

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%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

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 Philosohers 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.

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.

Reference Books

1.	Discrete Mathematics by LipschutzSchaums's Outline series,2ndedition,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

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

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**

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/Suported%20file/Supprted%20file/SERIES%20WISE%20BOOKS/COMPUTER%20SCIENCE/COMPUTER%20SCIENCE%20(E%20Series).pdf
2	http://103.152.199.179/YCCE/Suported%20file/Supprted%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.	

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

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.

Reference Books	
1	"Free and Open Source Software: Policy, Law, and Practice" by Noam Shemtov and Ian Walden
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://www.coursera.org/learn/open-source-software-development-methods

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(), strops(),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**

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

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

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**

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/

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/

III SEMESTER

Mandatory Learning Course (MLC)

MLC2124 : YCAP4

			July,2023	1.00	Applicable for AY 2023-24 Onwards
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)

(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

(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	
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	NPTEL	23OE3535	OE-III : Designated approved online NPTEL Course	NPTEL

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

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**

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**

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**

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**

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**

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

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,3rd Edition, Hopcroft J.E., Rajeev Motwani, Jeffrey D. Ullman, Pearson Education
2.	Introduction to languages and the Theory of Computation, 3rd Edition, John C. Martin, Mc Graw Hill
Reference Books	
1.	Introduction to the Theory of Computation,2nd Edition, Michael Sipser, GALE CENGAGE Learning
2.	Theory of Computation, 1st Edition, Dr. O. G. Kakde , Laxmi Publication
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	Introduction to Languages and the Theory of Computation
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/

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 Σ = {0,1} using JFLAP.	CO1
4	Using JFLAP, construct NFA for a string ending with 'b' over the alphabet Σ = {a, b}.	CO1
5	Construct a DFA for a string containing '00' over the alphabet Σ = {0,1} using any tool.	CO1
6	Construct a DFA for a string having second last symbol as 'a' over the alphabet Σ = {a, b} using JFLAP.	CO1
7	Build a PDA for a palindrome of even length over the alphabet Σ = {0,1}.	CO3
8	Build a PDA for a palindrome of odd length over the alphabet Σ = {a,b}.	CO3
9	Enter the following CFG into JFLAP S → T T S → U T → 0T T → T0 T →# U → 0U00 U → #	CO3
10	Design a Turing Machine that concatenates the given strings on the input tape.	CO4

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**

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

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 Dijikstra 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.

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.

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.

Unit :6	Reasoning in Uncertain Domain	7 Hours
Uncertainty, Handing 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

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 Cryptarithmetic
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.

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. Understant 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.

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
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

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.

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.

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, TinkuAcharya&Ajoy K. Ray, Willey Inter-Science
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
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

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 *https://cse19-iiith.vlabs.ac.in/objective.php?exp=histo*
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 *https://cse19-iiith.vlabs.ac.in/objective.php?exp=segment*
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.

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 profiing 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

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
Predictive modeling: Linear regression, Logistic regression, Time series analysis for forecasting ,Evaluating model performance: Accuracy, Precision, Recall		
	Total Lectures	39 hrs

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

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
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/Supprted%20file/book%20details/CSD.aspx	
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc21_mg65/preview
2	h https://nptel.ac.in/courses/110107092

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

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**

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

Textbooks	
1.	Internet of Things: A Hands-On Approach, Arsheep Bahga, Vijay Madisetti
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.
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
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/noc21_cs17/preview
2	https://onlinecourses.nptel.ac.in/noc21_ee85/preview

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.

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**

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 AluSrinivasanProbability 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

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/

V SEMESTER

Mandatory Learning Course (MLC)

MLC2125 : YCAP5

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

6th 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	
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

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

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 , Evaluationmetrics 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-Validationand 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**

Textbooks	
1.	'Introduction to Machine Learning', Ethem Alpaydin, The MIT Press, secondedition
2.	'Applied MachineLearning', M.Gopal, McGraw-Hill
Reference Books	
1.	'Machine Learning ', Tom Mitchell, McGraw-Hill
2.	'Introduction to Machine Learning with Python, AGuide for Data Scientists Andreas C ',Müller and Sarah Guido, O'RIELLY
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

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.

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:**	7
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.		
2	**Application Layer:**	6
Basics of Socket Programming, Transport Layer Programming Interface(TCP, UDP) , Protocols: HTTP (Overview, Persistent and Non-Persistent, Message Format, Cookies, Cachess) , SMTP (Overview, Message Formats) , IMAP, POP, DNS; FTP; Telnet, SSH; Peer-to-Peer Applications, BitTorrent Protocol; Conte Distribution Networks;		
3	**Transport Layer:**	7
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		
4	**Network Layer, Subnets:**	7
Concept of IP Address, Netmask, Subnet; CIDR; Design of a LAN and WAN,r, 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		
5	**Link Layer:**	6
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	**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	
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	

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 Moveme 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.

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	

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).

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

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

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

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

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

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.	*Human-Centered AI* by Ben Shneiderman
3.	C.R. Kothari – *Research Methodology: Methods and Techniques*, New Age International
4.	Ranjit Kumar – *Research Methodology: A Step-by-Step Guide for Beginners*, 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 – *Research Methodology*, PHI Learning
4.	Dawson, C. – *Practical Research Methods*, UBS Publishers.
5.	Trochim, W.M.K. – *Research Methods: The Concise Knowledge Base*.
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
MOOCs Links and additional reading, learning, video material	
1	www.nptelvideos.in
2	www.coursera.com
3	www.udemy.com
4	swayam.gov.in

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	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: 2. Write a shell script that delete all lines containing a specified word
2	1. Write a shell script that displays a list of all the files in the current directory 2. 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	1. Write a shell script that accept a list of file names as arguments count and report the occurrence of each word. 2. Write a shell script to find the factorial of given integer 3. Write a shell script that list the all files in a directory.
4	1. Write an awk script to find the number of characters, words and lines in a file? Linked list respectively. 2. Write a C Program that makes a copy of a file using standard I/O and system calls? 3. Implement in C the following Unix commands using system calls A) cat B)mv
5	1. Write a C program to emulate the Unix ls-l command? 2. Write a C program to list for every file in a directory, its inode number and file name.? 3. Write a C Program that demonstrates redirection of standard output to a file .EX:ls>f1.?

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?

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**

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**

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**

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

Unit:4	**Non-cooperative Game Theory**	**6 Hours**

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 twoplayer, general-sum games - Identifying dominated strategies

Unit:5	**Game Theory and Collective Decision-Making**	**7 Hours**

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

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

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**

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**

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**

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**

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.

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

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, Artifical 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.		

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

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**

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**

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**

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**

Marker-based approach- Introduction to marker-based tracking, types of markers, marker camerapose and identification, visual tracking, mathematical representation of matrix multiplicationMarker 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.

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

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

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	
1	**"Robotics and Control",** R.K. Mittal and I.J. Nagrath,1st Edition, Tata McGraw Hill Education (2003)
2	**Introduction to Robotics: Mechanics and Control",** John J. Craig, 4th Edition (2021), Pearson
Reference Books	
1	**"Robot Modeling and Control",** Mark W. Spong, Seth Hutchinson, M. Vidyasagar, 1st Edition (2005)Wiley
2	**"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]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Technology/26-2018_Book_Robotics_and_its_Application.pdf
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc21_ge20/preview
2	https://onlinecourses.nptel.ac.in/noc22_cs67/preview

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

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, Applicatons 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 Niranjan 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/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Technology/45 Operating%20System%20Concepts%20(%20PDFDrive%20).pdf
2	http://103.152.199.179/YCCE/Suported%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

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

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

Network Operating System (NOS). SDN Architecture. Planes - data, management and control. Interfaces - northbound and southbound.

Unit:3	PROTOCOLS	6 Hours

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

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

Network Virtualization, Network Topology and Topological Information Abstraction, Data Centric Traffic Management, Wide Area Traffic Management, Wireless networks

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

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 Frame works, 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 ,Dockers, Kubernetes Managing the Cloud-Administrating 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**

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

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

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

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**
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**
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**
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**
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.		

Unit :6	Reasoning in Uncertain Domain	7 Hours
Uncertainty, Handing 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

VI SEMESTER

Mandatory Learning Course (MLC)

MLC2126 : YCAP6 - YCCE Communication Aptitude Preparation