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 Technology)

B. Tech in Artificial Intelligence and Data Science (AIDS)

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 Technology)

B.Tech. in Artificial Intelligence and Data Science

SoE No. 23ADS-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	CT/ADS	23ADS1103	Foundations of Data Science	T	3	0	0	3	3	30	20	50	3
8	1	BES	CT/ADS	23ADS1104	**Lab:** Foundations of Data Science	P	0	0	2	2	1		60	40	
9	1	BES	CT/ADS	23ADS1101	C Programming	T	2	0	0	2	2	30	20	50	2
10	1	BES	CT/ADS	23ADS1102	**Lab:** C 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		**15**	**0**	**8**	**23**	**23**				
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	CT/ADS	23ADS1205	Computer Architecture and Organization	T	3	0	0	3	3	30	20	50	3
5	2	BES	EL	23EL1201	Basic Electrical and Electronics Engineering	T	3	0	0	3	3	30	20	50	3
6	2	PC	CT/ADS	23ADS1206	Introduction to Object Oriented Concepts	T	3	0	0	3	3	30	20	50	3
7	2	PC	CT/ADS	23ADS1207	**Lab :** Introduction to Object Oriented Concepts	P	0	0	2	2	1		60	40	
8	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**	**4**	**19**	**21**				

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 Technology)

B.Tech. in Artificial Intelligence and Data Science

SoE No. 23ADS-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

SoE No. 23ADS-101

Yeshwantrao Chavan College of Engineering
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B.TECH SCHEME OF EXAMINATION 2023
(Scheme of Examination w.e.f. 2023-24 onward)
(Department of Computer Technology)
B.Tech. in Artificial Intelligence and Data Science

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	AIDS	23ADS1301	Statistics for Data Science	T	3	0	0	3	3	30	20	50	3
5	3	PC	AIDS	23ADS1302	**Lab :** Statistics for Data Science	P	0	0	2	2	1		60	40	
6	3	PC	AIDS	23ADS1303	Data Structures	T	3	0	0	3	3	30	20	50	3
7	3	PC	AIDS	23ADS1304	**Lab** : Data Structures	P	0	0	2	2	1		60	40	
8	3	CEP	AIDS	23ADS1305	Community Engagement Project	P	0	0	4	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	CT		**MD Minor Course-I**	T	2	0	0	2	2	30	20	50	3
					TOTAL		**17**	**0**	**8**	**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 and 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 and 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 and 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	

SoE No.
23ADS-101

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 Technology)
B.Tech. in Artificial Intelligence and Data Science

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	AIDS	23ADS1401	Operating Systems	T	3	0	0	3	3	30	20	50	3
4	4	PC	AIDS	23ADS1402	**Lab :** Operating Systems	P	0	0	2	2	1		60	40	
5	4	PC	AIDS	23ADS1403	Advanced Data Structures	T	3	0	0	3	3	30	20	50	3
6	4	PC	AIDS	23ADS1404	**Lab :** Advanced Data Structures	P	0	0	2	2	1		60	40	
7	4	PC	AIDS	23ADS1405	Database Management Systems	T	3	0	0	3	3	30	20	50	3
8	4	PC	AIDS	23ADS1406	**Lab :** Database Management Systems	P	0	0	2	2	1		60	40	
9	4	PC	AIDS	23ADS1407	**Lab :** Java Full Stack	P	0	0	2	2	1		60	40	
10	4	VSEC-3	AIDS	23ADS1408	**Lab :** Python for Data Science	P	0	0	4	4	2		60	40	
11	4	VEC-2	AIDS	23ADS1409	Cyber Laws	T	2	0	0	2	2	30	20	50	3
12	4	OE-2	OE		**Open Elective - II**	T	2	0	0	2	2	30	20	50	3
13	4	MDM	AIDS		**MD Minor Course - II**	T	2	0	0	2	2	30	20	50	3
					TOTAL		**19**	**0**	**12**	**31**	**25**				

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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(Scheme of Examination w.e.f. 2023-24 onward)
(Department of Computer Technology)
B.Tech. in Artificial Intelligence and Data Science

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	AIDS	23ADS1501	Artificial Intelligence	T	3	0	0	3	3	30	20	50	3
2	5	PC	AIDS	23ADS1502	**Lab :** Artificial Intelligence	P	0	0	2	2	1		60	40	
3	5	PC	AIDS	23ADS1503	Design and Analysis of Algorithms	T	3	0	0	3	3	30	20	50	3
4	5	PC	AIDS	23ADS1504	**Lab :** Design and Analysis of Algorithms	P	0	0	2	2	1		60	40	
5	5	PC	AIDS	23ADS1505	Therotical Foundation of Computer Science	T	3	0	0	3	3	30	20	50	3
6	5	PC	AIDS	23ADS1506	Fundamentals of Machine Learning	T	2	0	0	2	2	30	20	50	3
7	5	PE	AIDS		**Professional Elective-I**	T	3	0	0	3	3	30	20	50	3
8	5	PE	AIDS		**Lab :** Professional Elective-I	P	0	0	2	2	1		60	40	
9	5	**OE-3**	OE-3		**Open Elective -III**	T	3	0	0	3	3	30	20	50	3
10	5	MDM	AIDS		**MD Minor Course-III**	T	3	0	0	3	3	30	20	50	3
11	5	STR	AIDS	23ADS1507	Internship, Seminar and Report	P	0	0	2	2	1		60	40	
					TOTAL		**20**	**0**	**8**	**28**	**24**				
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	AIDS	23ADS1521	PE-I : Computer Networks										
2	5	PE-I	AIDS	23ADS1522	**PE-I : Lab :** Computer Networks										
3	5	PE-I	AIDS	23ADS1523	PE-I : High Performance Computer Architecture										
4	5	PE-I	AIDS	23ADS1524	**PE-I : Lab :** High Performance Computer Architecture										
5	5	PE-I	AIDS	23ADS1525	PE-I : Financial Data Analytics										
6	5	PE-I	AIDS	23ADS1526	**PE-I : Lab :** Financial Data Analytics										
7	5	PE-I	AIDS	23ADS1527	PE-I : UI/UX Design										
8	5	PE-I	AIDS	23ADS1528	**PE-I : Lab :** UI/UX Design										
9	5	PE-I	AIDS	23ADS1529	PE-I : Advanced Probability and Statistics										
10	5	PE-I	AIDS	23ADS1530	**PE-I : Lab :** Advanced Probability and Statistics										

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

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B.Tech. in Artificial Intelligence and Data Science

SoE No. 23ADS-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	AIDS	23ADS1601	Computer Vision	T	2	0	0	2	2	30	20	50	3
2	6	PC	AIDS	23ADS1602	**Lab :** Computer Vision	P	0	0	2	2	1		60	40	
3	6	PC	AIDS	23ADS1603	Natural Language Processing	T	2	0	0	2	2	30	20	50	3
4	6	PC	AIDS	23ADS1604	**Lab :** Natural Language Processing	P	0	0	2	2	1		60	40	
5	6	PC	AIDS	23ADS1605	Design Thinking and Research Methodology	T	2	0	0	2	2	30	20	50	3
6		PE	AIDS		**Professional Elective-II**	T	3	0	0	3	3	30	20	50	3
7	6	PE	AIDS		**Lab :** Professional Elective-II	P	0	0	2	2	1		60	40	
8	6	PE	AIDS		**Professional Elective-III**	T	2	0	0	2	2	30	20	50	3
9	6	PE	AIDS		**Lab :** Professional Elective-III	P	0	0	2	2	1		60	40	
10	6	MDM	AIDS		**MD Minor Course-IV**	T	3	0	0	3	3	30	20	50	3
11	6	**VSEC-4**	AIDS	23ADS1606	**Lab :** Competitive Coding	P	0	0	4	4	2		60	40	
12	6	STR	AIDS	23ADS1607	Project Phase-I	P	0	0	4	4	2		60	40	
						TOTAL	**14**	**0**	**16**	**30**	**22**				
List of Mandatory Learning Course (MLC)															
1	6	HS		MLC126	**YCAP6 :**	**A**	3	0	0	3	**0**				

Professional Elective - II					
1	6	PE-II	AIDS	23ADS1621	PE-II : Business Intelligence
2	6	PE-II	AIDS	23ADS1622	**PE-II : Lab :** Business Intelligence
3	6	PE-II	AIDS	23ADS1623	PE-II : Web Analytics
4	6	PE-II	AIDS	23ADS1624	**PE-II : Lab :** Web Analytics
5	6	PE-II	AIDS	23ADS1625	PE-II : Sensor Data Analytics
6	6	PE-II	AIDS	23ADS1626	**PE-II : Lab :** Sensor Data Analytics
7	6	PE-II	AIDS	23ADS1627	PE-II : GeoSpatial Data Intelligence
8	6	PE-II	AIDS	23ADS1628	**PE-II : Lab :** GeoSpatial Data Intelligence
9	6	PE-II	AIDS	23ADS1629	PE-II : Visual Analytics
10	6	PE-II	AIDS	23ADS1630	**PE-II : Lab :** Visual Analytics
11	6	PE-II	AIDS	23ADS1631	PE-II : Dot Net Full Stack Development
12	6	PE-II	AIDS	23ADS1632	**PE-II : Lab :** Dot Net Full Stack Development

Professional Elective - III					
1	6	PE-III	AIDS	23ADS1641	PE-III : Internet of Things
2	6	PE-III	AIDS	23ADS1642	**PE-III : Lab :** Internet of Things
3	6	PE-III	AIDS	23ADS1643	PE-III : Reinforcement Learning
4	6	PE-III	AIDS	23ADS1644	**PE-III : Lab :** Reinforcement Learning
5	6	PE-III	AIDS	23ADS1645	PE-III : Advance Unix Programmin
6	6	PE-III	AIDS	23ADS1646	**PE-III : Lab :** Lab Advance Unix Programmin
7	7	PE-III	AIDS	23ADS1647	PE-III : Introduction to Salesforce
8	8	PE-III	AIDS	23ADS1648	**PE-III : Lab :** Introduction to Salesforce

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Applicable for AY 2023-24 Onwards

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 Technology)

B. Tech in Artificial Intelligence and Data Science (AIDS)

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 Technology)

B.Tech. in Artificial Intelligence and Data Science

SoE No. 23ADS-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	CT/ADS	23ADS1103	Foundations of Data Science	T	3	0	0	3	3	30	20	50	3
8	1	BES	CT/ADS	23ADS1104	**Lab:** Foundations of Data Science	P	0	0	2	2	1		60	40	
9	1	BES	CT/ADS	23ADS1101	C Programming	T	2	0	0	2	2	30	20	50	2
10	1	BES	CT/ADS	23ADS1102	**Lab:** C 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		**15**	**0**	**8**	**23**	**23**				
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	CT/ADS	23ADS1205	Computer Architecture and Organization	T	3	0	0	3	3	30	20	50	3
5	2	BES	EL	23EL1201	Basic Electrical and Electronics Engineering	T	3	0	0	3	3	30	20	50	3
6	2	PC	CT/ADS	23ADS1206	Introduction to Object Oriented Concepts	T	3	0	0	3	3	30	20	50	3
7	2	PC	CT/ADS	23ADS1207	**Lab :** Introduction to Object Oriented Concepts	P	0	0	2	2	1		60	40	
8	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**	**4**	**19**	**21**				

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

Yeshwantrao Chavan College of Engineering

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B.TECH SCHEME OF EXAMINATION 2023

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

(Department of Computer Technology)

B.Tech. in Artificial Intelligence and Data Science

SoE No. 23ADS-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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B. Tech SoE and Syllabus 2023

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

(Department of Mathematics & Humanities)

SoE No. 23FY-101

B.Tech First Year

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.)**
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. **(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**

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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

23ADS1103 : Foundations of Data Science

Course Outcomes :
Upon successful completion of the course the students will be able to 1. To interpret the data analysis task 2. To use the statistical techniques to prepare and present the data for analysis 3. To use the probability theory to handle uncertainty in the applications 4. To interpret the applications of data analysis.

Unit I:	**(7 Hrs.)**
Introduction to Data Science; role of data scientist, Types of Data, tool boxes for data scientists, introduction to R studio **(Contemporary issues related to topic)**	
Unit II:	**(7 Hrs.)**
Understanding different data sets Introduction to Data analysis, Types of Data analysis, Applications. Technologies involved in the data analysis **(Contemporary issues related to topic)**	
Unit III:	**(7 Hrs.)**
Preparing data for analysis: reading data from files, web, databases, Grouping and Displaying Data to Convey Meaning. Measure of central tendency, dispersion **(Contemporary issues related to topic)**	
Unit IV:	**(7 Hrs.)**
Probability theory: basic concepts, applications, types. Bayes theorem **(Contemporary issues related to topic)**	
Unit V:	**(7 Hrs.)**
Probability distribution, Binomial distribution, Poisson distribution, Normal distribution. random variable. **(Contemporary issues related to topic)**	
Unit VI:	**(7 Hrs.)**
Application domains of data analysis. Case studies in various application domains. **(Contemporary issues related to topic)**	
Total Lecture	**42 Hours**

Textbooks:	
1.	Statistics for Management", Richard I. Levin & David S. Rubin, 7th Edition, Pearson Education.

Reference Books:	
1.	"Practical Statistics for Data Scientists, 50 Essential Concepts", Peter Bruce & Andrew Bruce, O'Reilly Media
2.	"An Introduction to Statistical Learning with Applications in R", Gareth James, Daniela Witten, Trevor Hastie & Robert Tibshirani, Springer Press

MOOCs Links and additional reading, learning, video material	
1.	https://nptel.ac.in/courses/106106179
2.	https://www.youtube.com/watch?v=wrIvuzi56oQ

I SEMESTER

23ADS1104: Lab. Foundations of Data Science

Course Outcomes
Upon successful completion of the course the students will be able to 1. To interpret the data analysis task 2. To use the statistical techniques to prepare and present the data for analysis 3. To use the probability theory to handle uncertainty in the applications 4. To interpret the applications of data analysis

Minimum Eight Practical's to be performed from the list as below

SN	**Program based on**
1	Introduction to R and excel
2	Extraction of data using R
3	Handling and understanding data using R
4	Implementations of conditional statements in R
5	Implementation of Loops in R
6	Introduction to data visualization in R
7	Implementing probability functions
8	Data Handling using Excel
9	Project activity on standard data set

I SEMESTER

23ADS1101 : C Programming

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Describe the basics of computer system components and operation, write algorithms and draw flowcharts. 2. Write programs using flow control statements. 3. Use functions to write modular programs. 4. Use linear data structures such as arrays and structures in programs.

Unit I:	**8 Hrs.**
Computer System Basics: Introduction to components of a computer system (disks, memory, processor), how program is executed, understanding of concepts such as compilers, source and object programs, etc. Introduction to algorithms and flowcharts, types of programming errors. Basic building blocks of C: Character set, variables, identifiers & keywords, Data types, Operators: arithmetic, logical and relational operators, precedence of operators	
Unit II:	**8 Hrs.**
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. Decision control statements: if, if - else and nested if-else statements, else-if ladder statement, switch-case control statement.	
Unit III:	**7 Hrs.**
Loop Structures: While, do while and for loops, break and continue statement, "goto" statement, bitwise operators	
Unit IV:	**8 Hrs.**
Modular programming: Concept of functions, user defined functions, function prototypes, formal parameters, actual parameters, return types, call by value, Recursive functions, comparing recursion against iteration, Concepts of a pointer, call by reference.	
Unit V:	**7 Hrs.**
Arrays: One dimensional array, array manipulation, insertion, deletion of an element, searching techniques- Linear and binary search, sorting techniques – Bubble sort , and selection sort. Two-dimensional arrays: matrix representation, basic matrix operations such as addition, multiplication and transpose, Array as function arguments. Strings: string representation and string handling functions	

Unit VI:		**7 Hrs.**
Structure: Introduction, defining a structure, declaring structure variables, accessing structure members, structure initialization, array of structures.		
	Total Lecture	**45 Hours**

Textbooks:	
1.	Computer Science: A Structured Programming Approach Using C, 3rd , B.A.Forouzan and R.F. Gilberg, Cengage Learning
2.	The C Programming Language, 2nd, Brian Kernighan and Dennis Ritchie, Prentice Hall

Reference Books:	
1.	Let Us C, 15th , Yashavant Kanetkar , BPB
2.	Computer Programming and Data Structures, 4th , E Balagurusamy, Tata McGraw Hill

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	

MOOCs Links and additional reading, learning, video material	
1.	https://onlinecourses.nptel.ac.in/noc22_cs40/preview

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2023

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

(Department of Computer Technology)

SoE No. 23ADS-101

B.Tech in Artificial Intelligence and Data Science

I SEMESTER

23ADS1102 : Lab. C Programming

Course Outcomes :

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

1. Describe the basics of computer system components and operation, write algorithms and draw flowcharts.
2. Write programs using flow control statements.
3. Use functions to write modular programs.
4. Use linear data structures such as arrays and structures in programs.

Minimum Eight Practical's to be performed from the list as below

<table>
<tr><th>Sr.</th><th>Problem Statements</th></tr>
<tr><td>1 A</td><td>Introduction to Linux Operating system & it's different commands.</td></tr>
<tr><td>1 B</td><td>Introduction to Vi editor, Compilation and Execution of a program in Linux</td></tr>
<tr><td>2 A</td><td>1) Write a C program to display Your Name, Address and City in different lines.
2) Write a C program to convert centigrade into Fahrenheit. Formula: C= (F-32)/1.8.</td></tr>
<tr><td>2 B</td><td>1) 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>3</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><td>Age</td><td>Gender</td><td>City</td><td>Will Buy?</td></tr>
<tr><td>25-30</td><td>M</td><td>Chenaai</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>Chenaai</td><td>No</td></tr>
</table></td></tr>
<tr><td>4</td><td>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 number is entered by the user.
4) Exit.</td></tr>
<tr><td>5</td><td>Write a program print weather entered number is Prime or not</td></tr>
<tr><td>6</td><td>Write a program to print the sum of exponential series e(x) =1 + x/1! + x^2 / 2! + x^3 / 3! +…….</td></tr>
</table>

7	Write a program to print following pyramid **1** **1 2 3** **1 2 3 4 5** **1** 2 3 4 5 6 7
8	i) 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] Use power function to calculate the power of number. ii) Write a recursive function to print Factorial of a entered number.
9	Write a program to sort an elements using bubble Sort.
10	Produce a multiplication table. Top left hand corner will show 1x1 and bottom right shows 12x12, as below. 1 2 3 4 5 6 7 8 9 10 11 12 2 4 6 8 10 12 14 16 18 20 22 24 3 6 9 12 15 18 21 24 27 30 33 36 4 8 12 16 20 24 28 32 36 40 44 48 5 10 15 20 25 30 35 40 45 50 55 60 6 12 18 24 30 36 42 48 54 60 66 72 7 14 21 28 35 42 49 56 63 70 77 84 8 16 24 32 40 48 56 64 72 80 88 96 9 18 27 36 45 54 63 72 81 90 99 108 10 20 30 40 50 60 70 80 90 100 110 120 11 22 33 44 55 66 77 88 99 110 121 132 12 24 36 48 60 72 84 96 108 120 132 144
11	Write a program To copy one string to another string without using library function
12	Define a structure for a student having name, roll number and marks obtained in six, subjects. Write a program to input the details for 20 students and print the same.
13	Write a program that copies a file to another file. The names of two files should be sent as command line arguments.

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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B. Tech SoE and Syllabus 2023

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

(Department of 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 Technology)

B. Tech in Artificial Intelligence and Data Science (AIDS)

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 Technology)

B.Tech. in Artificial Intelligence and Data Science

SoE No. 23ADS-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	CT/ADS	23ADS1103	Foundations of Data Science	T	3	0	0	3	3	30	20	50	3
8	1	BES	CT/ADS	23ADS1104	**Lab:** Foundations of Data Science	P	0	0	2	2	1		60	40	
9	1	BES	CT/ADS	23ADS1101	C Programming	T	2	0	0	2	2	30	20	50	2
10	1	BES	CT/ADS	23ADS1102	**Lab:** C 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		**15**	**0**	**8**	**23**	**23**				
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	CT/ADS	23ADS1205	Computer Architecture and Organization	T	3	0	0	3	3	30	20	50	3
5	2	BES	EL	23EL1201	Basic Electrical and Electronics Engineering	T	3	0	0	3	3	30	20	50	3
6	2	PC	CT/ADS	23ADS1206	Introduction to Object Oriented Concepts	T	3	0	0	3	3	30	20	50	3
7	2	PC	CT/ADS	23ADS1207	**Lab :** Introduction to Object Oriented Concepts	P	0	0	2	2	1		60	40	
8	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**	**4**	**19**	**21**				

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

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**

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
23ADS1301 : Statistics for Data Science

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Apply different visualization and summarizing technique to given data for its interpretation. 2. Solve given problem using the probability theory and linear algebra 3. Perform sampling distribution to estimate the given data and predict the solution using regression 4. Analyse the data using hypotheses and other testing methods 5. Implement various statistics methods on a given dataset using modern tool and write a report

Unit I:	**8 Hrs.**
Probability and Probability distribution: Basic terminology in probability and rules, Probabilities under conditions of statistical independence and dependence, Bayes Theorem. Random variables, expected values, variance, probability distributions, model given data.	
Unit II:	**8 Hrs.**
Sampling and Sampling Distributions and: Sampling Distributions: Introduction to sampling, random sampling, non-random sampling, Introduction to sampling distributions, design of experiments	
Unit III:	**8 Hrs.**
Estimation and Testing Hypotheses: Introduction, point estimates, interval estimates and confidence interval, determining the sample size in estimations Introduction, Basic to the Hypotheses-testing Procedure, Testing Hypotheses, One sample test: Hypotheses Testing of Means when the population standard deviation is Known, Hypotheses Testing of Means when the population standard deviation is not known, Hypotheses Testing of proportions, Limitations of the tests of hypotheses	
Unit IV:	**8 Hrs.**
Testing Hypothesis II, Quality and quality control: Testing Hypotheses, Two sample test, Statistical process control, Control charts for process mean, Process variability, Charts for attribute, Total quality management.	
Unit V:	**(6 Hrs.)**
Simple Regression and Correlation: Introduction, Estimation Using the Regression Line, Correlation Analysis Making Inferences about Population Parameters Using Regression and Correlation Analyses.	
Unit VI:	**(7 Hrs.)**
Parametric and Non-Parametric Testing: Introduction to parametric and non-parametric tests, ANNOVA, Chi-square test, sign test, rank sum test. Circuits, Applications of Hamilton Circuits; Planar Graphs: Euler's Formula, Kuratowski's Theorem; Graph Coloring: Introduction, Applications of Graph Colorings.	
Total Lecture	**45 Hours**

Textbooks:				
1.	Statistics for Management	Richard I. Levin & David S. Rubin	7 th Edition	Pearson Education
2.	Introduction to Linear Algebra	Gilbert Strang	5 th Edition	Wellesley - Cambridge Press
3.	Introduction to probability and statistics for engineers and scientist, Sheldon M. Ross, 3 rd Edi Elsevier			

Reference Books:				
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		
3.	Mathematical foundations for data analysis	Jeff m. Phillips		

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/

MOOCs Links and additional reading, learning, video material	
1.	https://www.youtube.com/watch?v=V5fqShLVpoI

III SEMESTER
23ADS1302 : Lab. Statistics for Data Science.

Course Outcomes
Upon successful completion of the course the students will be able to
1. Able to analyze and find the hidden meaning from the given data and visualize the results
2. Able to solve the real-life problem using the probability theory and use it for decision making
3. Able to analyze the samples from the population and solve the problem to get predictive solution using the estimation theory
4. Able to analyze the sample data and use it to test the assumptions made for the population parameter

Minimum Eight Practical's to be performed from the list as below

SN	**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 basic visualization techniques in R to understand data
5	Apply some advanced visualization techniques in R to analyze the data
6	Solve the problems using probability distributions in R
7	Using a case study compare various probability distributions
8	Analyze the data using sampling technique
9	Analyze the data to find out estimated value

III SEMESTER
23ADS1303 : Data Structures

Course Outcomes :
Upon successful completion of the course the students will be able to
1. Implement applications of stacks and queues.
2. Develop applications using linked list.
3. Demonstrate various operations of tree data structure.
4. Apply the knowledge of graph data structure for solving real life problems.

Unit I:	**8 Hrs.**
Introduction to Data structures, classification, dynamic memory allocation, array-based implementation of stacks, queues, applications of stacks: expression conversion, applications of queue, implementation stack using queue and queue using stack, Hashing	
Unit II:	**8 Hrs.**
Linked list, self-referential data structure, types: singly, doubly, circular, application for polynomial evaluation, implementation of stacks and queue using linked list.	
Unit III:	**8 Hrs.**
Binary trees, binary search trees, terminologies, AVL, Red-Black	
Unit IV:	**8 Hrs.**
Splay trees, B and B+ trees, Multidimensional trees, Tries	
Unit V	**7 Hrs.**
Directed and Undirected Graphs, Terminologies, Graph traversals, connected and bi-connected components, Topological sort, Applications of BFS and DFS	
Unit VI:	**6 Hrs.**
Minimum Spanning Trees, Shortest Path Algorithms and Applications, All pair shortest paths, Introduction to Network flow Problems	
Total Lecture	**40 Hours**

Textbooks:	
1.	Data Structures using C ,Latest , Reema Thareja ,Oxford publications.
2.	Data Structures, Algorithms and Applications in C++, 2nd, S. Sahani, University Press Orient Longman (India) Pvt. Ltd.
3.	Data Structures and Algorithms in C++ ,Student, Michael T. Goodrich, R. Tamassiaand, Mount Willy, JonhWilly and sons.

Reference Books:	
1.	Data Structures a Pseudocode approach with C ,Latest , Richard Gilberg, B. Forouzan ,Thompsons Course Technology
2.	Data Structures and Program Design in C, Latest ,Tondo Kruse, Leung and Tondo, Pearson Publications

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
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2.	

MOOCs Links and additional reading, learning, video material	
1.	https://nptel.ac.in/courses/106102064
2.	https://www.youtube.com/watch?v=I_314LpT6X8
3.	https://nptel.ac.in/courses/106106133

III SEMESTER
23ADS1304 : Lab. Data Structures

Course Outcomes
Upon successful completion of the course the students will be able to 1. Implement applications of stacks and queues. 2. Develop applications using linked list. 3. Demonstrate various operations of tree data structure. 4. Apply the knowledge of graph data structure for solving real life problems

Minimum Eight Practical's to be performed from the list as below

SN	**Experiments based on**
1	Program based on Stacks and its application
2	Program based on Queue and its application
3	Implementation of one data structures using another
4	Program based on linked list
5	Program on Skip list
6	Program based on Binary tree
7	Program based on Binary Search tree
8	Program based on application of Graph in networking
9	Program based on finding shortest path using Graph
10	Mini project covering all data structures

III SEMESTER
23ADS1305 : Community Engagement Project

III SEMESTER

Code : Sub. Name: Basics of Data Science

Course Outcomes :
Upon successful completion of the course the students will be able to
1. To interpret the data analysis task 2. To use the statistical techniques to prepare and present the data for analysis 3. To use the probability theory to handle uncertainty in the applications 4. To interpret the applications of data analysis

Unit I:	**7 Hrs.**
Introduction to Data Science; role of data scientist, Types of Data, tool boxes for data scientists, introduction to R studio	
Unit II:	**7 Hrs.**
Understanding different data sets Introduction to Data analysis, Types of Data analysis, Applications. Technologies involved in the data analysis	
Unit III:	**8 Hrs.**
Preparing data for analysis: Grouping and Displaying Data to Convey Meaning. Measure of central tendency, dispersion	
Unit IV:	**(8 Hrs.)**
Probability and Probability distribution: Basic terminology in probability and rules, Probabilities under conditions of statistical independence and dependence, Bayes Theorem. Random variables, expected values, variance, probability distributions, model given data.	
Total Lecture	**30 Hours**

Textbooks:	
1.	Statistics for Management Richard I. Levin & David S. Rubin 7 th Edition Pearson Education
2.	Introduction to Linear Algebra Gilbert Strang 5 th Edition Wellesley - Cambridge Press
3.	Introduction to probability and statistics for engineers and scientist, Sheldon M. Ross, 3 rd Edi Elsevier

Reference Books:	
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

3.	Mathematical foundations for data analysis Jeff m. Phillips

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MOOCs Links and additional reading, learning, video material	
1.	https://www.youtube.com/watch?v=V5fqShLVpoI

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

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 Technology)

B.Tech. in Artificial Intelligence and Data Science

SoE No. 23ADS-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.

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

MOOCs Links and additional reading, learning, video material	
1.	https://nptel.ac.in/courses/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

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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)**	

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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

23ADS1205 : Computer Architecture and Organization

Course Outcomes :

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

1. Relate & Identify the function and design of the various units of computers that process data and store the information.
2. Analyze and write control signal for executing machine instructions for different processors.
3. Explain & Design the organization of memory, memory hierarchy, other peripheral devices, and estimate the cost of computation.
4. Compare among different types of I/O operation

Unit I:	**(7 Hrs.)**
Binary Systems: Digital Systems, Binary Numbers, Binary Codes, Computer Arithmetic Number Base Conversions, Octal and Hexadecimal – conversions. Basic Logic Gates, Universal gates (NAND and NOR gates), other gates (XOR, XNOR gates). Boolean identities, De Morgan's Laws. k-map	
Unit II:	**(7 Hrs.)**
Combinational and sequential circuits: (Simple block diagrams, truth tables and IC packages only required). Flip-flops: RS, clocked RS, JK, D and T flip flops, Master slave flip flops, Registers, latches and Tristate buffers. Basic Memory Organization	
Unit III:	**(7 Hrs.)**
Von-Neuman architecture, Functional units, addressing methods, addresing modes, Execution of complete instructions, Bus organizations, sequencing of Control signals, Processor Design, hard wired control, Microprogrammed Control: Microinstructions, Grouping of control signals, Microprogram sequencing, Micro Instructions with next Address field, perfecting microinstruction.	
Unit IV:	**(7 Hrs.)**
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, fast Multiplication, Booth's Algorithm	
Unit V:	**(7 Hrs.)**
Integer Division, Floating point numbers and operations. The Main Memory: Basic concepts, Memory Hierarchy, Speed Size and Cost, Cache Memory, Performance Considerations.	
Unit VI:	**(7 Hrs.)**
Pipelining: Basic Concepts, Data Hazards, Instruction Hazards Computer Peripherals: I/O Devices, I/O transfers – program controlled, interrupt driven and DMA, Interrupt handling.	
Total Lecture	**42 Hours**

Textbooks:	
1.	Computer Organization , 5th edition, V.Carl Hamacher, Zvonko Vranesic, McGraw Hill Publications.
2	Computer Architecture & Organization , 3rd edition , J.P. Hayes , McGraw Hill Publications
3	Modern Digital Electronics,,3rd Edition, R. P. Jain, McGraw Hill

Reference Books:	
1.	Computer Organization and Architecture , 6th edition , William Staling , Pearson Education
2.	Computer Architecture: A Quantitative approach , 6th edition, John L. Hennessy, David A. Patterson , MK series in computer architecture and design

MOOCs Links and additional reading, learning, video material	
1.	https://onlinecourses.nptel.ac.in/noc23_cs67/preview

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B. Tech SoE and Syllabus 2023

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

(Department of Electrical Engineering)

B.Tech in Electrical Engineering

SoE No. 23EL-101

II SEMESTER

23EL1201 : Basic Electrical and Electronics Engineering

Course Outcomes:

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

Unit I: Circuit Elements and Energy Sources	**(7 Hrs.)**
Circuit Elements, Series and Parallel Combination of Resistances, Inductance and Capacitances, Energy Sources, Source Transformation, Sources with Periodic Waveforms, A.C. in Inductance and Capacitance, Star-Delta Connection. **(Contemporary Issues related to Topic)**	
Unit II: Analysis of Network	**(7 Hrs.)**
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

23ADS1206 : Introduction to Object Oriented Concepts

Course Outcomes :

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

1. Understand the concept of object-oriented programming and modelling
2. Apply the knowledge of object-oriented programming to solve the given problem
3. Analyze the problem to provide the objectoriented solution using advanced programming concepts

Unit I: Introduction to C++	**(6 Hrs.)**
Difference between C and C++- Evolution of C++- The Object-Oriented Technology-Disadvantage of Conventional Programming- Key Concepts of Object-Oriented Programming, Advantage of OOP-Object Oriented Language.	
Unit II: Classes and Objects & Constructors and Destructor	**(7 Hrs.)**
Classes in C++-Declaring Objects- Access Specifiers and their Scope- Defining Member Function-Overloading Member Function- Nested class, Constructors and Destructors, Introduction- Constructors and Destructor-Characteristics of Constructor and Destructor- Application with Constructor- Constructor with Arguments (parameterized Constructor-Destructors- Anonymous Objects	
Unit III: Operator Overloading and Type Conversion & Inheritance	**(7 Hrs.)**
The Keyword Operator- Overloading Unary Operator- Operator Return Type- Overloading Assignment Operator (=)- Rules for Overloading Operators, Inheritance, Reusability- Types of Inheritance- Virtual Base Classes-Object as a Class Member- Abstract Classes- Advantages of Inheritance-Disadvantages of Inheritance.	
Unit IV: Pointers & Binding Polymorphisms and Virtual Functions	**(7 Hrs.)**
Pointer, Features of Pointers- Pointer Declaration- Pointer to Class- Pointer Object- The this Pointer- Pointer to Derived Classes and Base Class, Binding Polymorphisms and Virtual Functions, Introduction- Binding in C++-Virtual Functions- Rules for Virtual Function- Virtual Destructor.	
Unit V: Generic Programming with Templates & Exception Handling	**(7 Hrs.)**
Generic Programming with Templates, Need for Templates- Definition of class Templates- Normal Function Templates- Over Loading of Template Function-Bubble Sort Using Function Templates- Difference Between Templates and Macros- Linked Lists with Templates, Exception Handling- Principles of Exception Handling- The Keywords try to throw and catch- Multiple Catch Statements –Specifying Exceptions.	
Unit VI: Overview of Standard Template Library	**(6 Hrs.)**
Overview of Standard Template Library- STL Programming Model- Containers- Sequence Containers-Associative Containers- Algorithms- Iterators- Vectors- Lists- Maps.	
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.	Object Oriented Programming with C++, 5th edition , Bal Gurusamy, McGraw Hill Publications.
2	Object Oriented Programming in C++ , 3rd edition , Lafore,R , Sams Publication

Reference Books:	
1.	The C++ Programming Language, 6th edition , Stroustrup.B , Pearson Education
2.	C++ The Complete Reference , 6th edition , Schildt, H , McGraw Hill Publications

MOOCs Links and additional reading, learning, video material	
1.	https://nptel.ac.in/courses/106105153

II SEMESTER

23ADS1207: Lab. Introduction to Object Oriented Concepts

Course Outcomes
Upon successful completion of the course the students will be able to
1. Understand the concept of object-oriented programming and modelling
2. Apply the knowledge of object-oriented programming to solve the given problem
1. Analyze the problem to provide the object oriented solution using advanced programming concepts

Minimum Eight Practical's to be performed from the list as below

SN	Program based on
1	Implement the concept of Class and its data members and member functions
2	Implement the concept of function overloading
3	Implement the concept of passing object as a function argument
4	Implement the concept of friend function
5	Implement the concept of constructor and its type.
6	Implement the concept of operator overloading
7	Implement the concept of single inheritance.
8	Implement the concept of multilevel Inheritance
9	Implement the concept of each access specifiers (Private, Public and Protected).
10	Implement the concept of run time polymorphism
11	Implement the concept of Files
12	Implement the concept of command line arguments
13	Implement the concept of function templates
14	Implement the concept of Class templates.
15	Implement the concept of exception.

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 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

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

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

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Technology

SoE & Syllabus 2023

3rd Semester

(Department of Computer Technology)

B. Tech in Artificial Intelligence and Data Science (AIDS)

SoE No. 23ADS-101

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 Technology)
B.Tech. in Artificial Intelligence and Data Science

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	AIDS	23ADS1301	Statistics for Data Science	T	3	0	0	3	3	30	20	50	3
5	3	PC	AIDS	23ADS1302	**Lab :** Statistics for Data Science	P	0	0	2	2	1		60	40	
6	3	PC	AIDS	23ADS1303	Data Structures	T	3	0	0	3	3	30	20	50	3
7	3	PC	AIDS	23ADS1304	**Lab** : Data Structures	P	0	0	2	2	1		60	40	
8	3	CEP	AIDS	23ADS1305	Community Engagement Project	P	0	0	4	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	CT		**MD Minor Course-I**	T	2	0	0	2	2	30	20	50	3
					TOTAL		**17**	**0**	**8**	**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 and 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 and 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 and 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	

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
23ADS1301: Statistics for Data Science

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Apply different visualization and summarizing technique to given data for its interpretation. 2. Solve given problem using the probability theory and linear algebra 3. Perform sampling distribution to estimate the given data and predict the solution using regression 4. Analyse the data using hypotheses and other testing methods 5. Implement various statistics methods on a given dataset using modern tool and write a report

Unit I:	**8 Hrs.**
Probability and Probability distribution: Basic terminology in probability and rules, Probabilities under conditions of statistical independence and dependence, Bayes Theorem. Random variables, expected values, variance, probability distributions, model given data.	
Unit II:	**8 Hrs.**
Sampling and Sampling Distributions and: Sampling Distributions: Introduction to sampling, random sampling, non-random sampling, Introduction to sampling distributions, design of experiments	
Unit III:	**8 Hrs.**
Estimation and Testing Hypotheses: Introduction, point estimates, interval estimates and confidence interval, determining the sample size in estimations Introduction, Basic to the Hypotheses-testing Procedure, Testing Hypotheses, One sample test: Hypotheses Testing of Means when the population standard deviation is Known, Hypotheses Testing of Means when the population standard deviation is not known, Hypotheses Testing of proportions, Limitations of the tests of hypotheses	
Unit IV:	**7 Hrs.**
Testing Hypothesis II, Quality and quality control: Testing Hypotheses, Two sample test, Statistical process control, Control charts for process mean, Process variability, Charts for attribute, Total quality management.	
Unit V:	**7 Hrs.**
Simple Regression and Correlation: Introduction, Estimation Using the Regression Line, Correlation Analysis Making Inferences about Population Parameters Using Regression and Correlation Analyses.	
Unit VI:	**7 Hrs.**
Parametric and Non-Parametric Testing: Introduction to parametric and non-parametric tests, ANNOVA, Chi-square test, sign test, rank sum test.	
Total Lecture	**45 Hours**

Textbooks:				
1.	Statistics for Management	Richard I. Levin & David S. Rubin	7 th Edition	Pearson Education
2.	Introduction to Linear Algebra	Gilbert Strang	5 th Edition	Wellesley - Cambridge Press
3.	Introduction to probability and statistics for engineers and scientist, Sheldon M. Ross, 3 rd Edi Elsevier			

Reference Books:				
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		
3.	Mathematical foundations for data analysis	Jeff m. Phillips		

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/

MOOCs Links and additional reading, learning, video material	
1.	https://www.youtube.com/watch?v=V5fqShLVpoI

III SEMESTER
23ADS1302 : Lab: Statistics for Data Science

Course Outcomes
Upon successful completion of the course the students will be able to
1. Able to analyze and find the hidden meaning from the given data and visualize the results
2. Able to solve the real-life problem using the probability theory and use it for decision making
3. Able to analyze the samples from the population and solve the problem to get predictive solution using the estimation theory
4. Able to analyze the sample data and use it to test the assumptions made for the population parameter

Minimum Eight Practical's to be performed from the list as below

SN	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 basic visualization techniques in R to understand data
5	Apply some advanced visualization techniques in R to analyze the data
6	Solve the problems using probability distributions in R
7	Using a case study compare various probability distributions
8	Analyze the data using sampling technique
9	Analyze the data to find out estimated value

III SEMESTER

23ADS1303 : Data Structures

Course Outcomes:

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

1. Apply the concepts of structures, unions, enums, pointers, and file handling in designing data-centric applications.
2. Analyze and implement various hashing techniques and collision handling strategies for efficient data retrieval.
3. Use dynamic memory allocation to implement stacks and queues, and apply them in expression evaluation and conversion problems.
4. Implement linked list-based data structures and apply them in solving real-life

Unit I:	**8 Hrs.**
Introduction to Structures, Array of Structures, Pointer to Structures, Union, Enum, File Handling	
Unit II:	**8 Hrs.**
Hashing – General Idea, Hash Function, Separate Chaining, Hash Tables without linked lists: Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Hash Tables in the Standard Library, Universal Hashing, Extendible Hashing.	
Unit III:	**8 Hrs.**
Arrays, Dynamic Memory Allocation for Arrays, Stacks, Multiple Stack using Same Array, Stack using STL, Applications of Stacks: Expression Conversion, Expression Evaluation, Parenthesis Matching etc.	
Unit IV:	**7 Hrs.**
Queue types: Priority Queue, De-Queue, Circular Queue, Applications of Queue, Implementation of Stack using Queue, Implementation of Queue using Stack, Queue using STL	
Unit V:	**7 Hrs.**
Linked List, Self-Referential Structure, Types of Linked Lists: Singly Linked List, Doubly Linked List, Operations on Singly and Doubly Linked List, Applications of Linked List: Polynomial Evaluation etc.	
Unit VI:	**7 Hrs.**
Stack Implementation using Linked List, Queue implementation using linked list, Skip List. Circular Linked List	
Total Lecture	**45 Hours**

Textbooks:	
1.	Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, 4 th Edition, 2014, Pearson.
2.	Introduction to Algorithms, Thomas H Cormen, Charles E. Leiserson, Ronald L. Rivest, CliffordStein, 3rd Edition, 2009, The MIT Press.

Reference Books:	
1.	Fundamentals of Computer Algorithms, Ellis Horowitz, SatrajSahani and Rajasekharam,2ndEdition, 2009, University Press Pvt. Ltd.
2.	Advanced Data Structures, Reema Thareja, S. Rama Sree, Oxford University Press, 2018

MOOCs Links and additional reading, learning, video material	
1.	https://nptel.ac.in/courses/106102064
2.	https://www.youtube.com/watch?v=I_314LpT6X8
3.	https://nptel.ac.in/courses/106106133

III SEMESTER
23ADS1304 : Lab: Data Structures

Course Outcomes
Upon successful completion of the course the students will be able to 1. Apply concepts of structures, arrays, pointers, unions, and enums. 2. Implement and analyze different types of queues and stacks, including their applications. 3. Utilize dynamic memory allocation and stack-based approaches to solve algorithmic problems. 4. Design, implement, and apply various types of linked lists and skip lists for complex data processing and problem-solving scenarios.

Minimum Eight Practical's to be performed from the list as below

SN	Experiments based on
1	program using structure arrays
2	program that demonstrates file handling operations
3	Program to implement a stack
4	Program to implement a queue
5	Program to implement one data structures using another
6	Program to implement stack and use it for infix to postfix conversion
7	Program to implement a singly linked list
8	Program to implement a doubly linked lists
9	Program to implement stack using singly linked lists
10	Program to implement queue using singly linked lists
11	program to implement a circular linked list
12	Program on Skip list

III SEMESTER

23ADS1305 : Community Engagement Project

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
MDM1ADS101 : Basics of Data Science

Course Outcomes :
Upon successful completion of the course the students will be able to 1. To interpret the data analysis task 2. To use the statistical techniques to prepare and present the data for analysis 3. To use the probability theory to handle uncertainty in the applications 4. To interpret the applications of data analysis

Unit I:	**7Hrs.**
Introduction to Data Science; role of data scientist, Types of Data, tool boxes for data scientists, introduction to R studio	
Unit II:	**7Hrs.**
Understanding different data sets Introduction to Data analysis, Types of Data analysis, Applications. Technologies involved in the data analysis	
Unit III:	**8 Hrs.**
Preparing data for analysis: Grouping and Displaying Data to Convey Meaning. Measure of central tendency, dispersion	
Unit IV:	**8 Hrs.**
Probability and Probability distribution: Basic terminology in probability and rules, Probabilities under conditions of statistical independence and dependence, Bayes Theorem. Random variables, expected values, variance, probability distributions, model given data.	
	Total Lecture **30 Hours**

Textbooks:				
1.	Statistics for Management	Richard I. Levin & David S. Rubin	7 th Edition	Pearson Education
2.	Introduction to Linear Algebra	Gilbert Strang	5 th Edition	Wellesley - Cambridge Press
3	Introduction to probability and statistics for engineers and scientist, Sheldon M. Ross, 3 rd Edi Elsevier			

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

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/

MOOCs Links and additional reading, learning, video material	
1.	https://www.youtube.com/watch?v=V5fqShLVpoI

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2023

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

(Department of Computer Technology)

SoE No. 23ADS-101

B.Tech in Artificial Intelligence and Data Science

III SEMESTER

MDM1ADS201 : Front-End Web Development

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Apply foundational web technologies including HTML5 and CSS3 to create responsive and structured web pages using modern layout techniques like Flexbox and Grid. 2. Implement interactivity on web pages using JavaScript ES6+ features, DOM manipulation, event handling, and browser local storage. 3. Develop dynamic and modular front-end applications using React, including state management, component lifecycle, and routing. 4. Integrate front-end applications with deployment tools, apply UI best practices, manage forms with validation, and utilize version control systems for project management.

Unit I:	**6 Hrs.**
Web Foundations – HTML, CSS & Layouts: Role of front-end in web development, HTML5: tags, semantic structure, forms, media, CSS basics: selectors, colors, fonts, box model, CSS Layouts: Flexbox, Grid, responsiveness, DevTools, structure validation	
Unit II:	**6 Hrs.**
JavaScript Essentials + DOM Manipulation : JavaScript Syntax & ES6+ (let, const, arrow functions), Data types, conditionals, loops, arrays, objects, Functions, events, and DOM manipulation, Event listeners, querySelector, innerHTML, Introduction to local storage and basic debugging	
Unit III:	**7 Hrs.**
React Basics + State & Routing: Introduction to React, JSX, component structure, Props and state, useState, useEffect, component lifecycle, React Router for navigation, Handling forms and controlled components	
Unit IV:	**7 Hrs.**
Front-End Integration & Deployment: UI Enhancement & Best Practices, Styling in Modern React, Forms and Validation, Hosting & Deployment, Version Control Basics	
Total Lecture	**26 Hours**

Textbooks:	
1.	HTML and CSS: Design and Build Websites by Jon Duckett, Publisher: Wiley UNIT-1
2.	Learning JavaScript: JavaScript Essentials for Modern Application Development by Ethan Brown, Publisher: O'Reilly Media UNIT-2
3.	Learning React: Modern Patterns for Developing React Apps by Alex Banks & Eve Porcello, Publisher: O'Reilly Media UNIT-3&4

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

III SEMESTER

Mandatory Learning Course (MLC)

MLC2123 : YCAP3

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 Technology)

B. Tech in Artificial Intelligence and Data Science (AIDS)

SoE No.
23ADS-101

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 Technology)
B.Tech. in Artificial Intelligence and Data Science

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	AIDS	23ADS1401	Operating Systems	T	3	0	0	3	3	30	20	50	3
4	4	PC	AIDS	23ADS1402	**Lab :** Operating Systems	P	0	0	2	2	1		60	40	
5	4	PC	AIDS	23ADS1403	Advanced Data Structures	T	3	0	0	3	3	30	20	50	3
6	4	PC	AIDS	23ADS1404	**Lab :** Advanced Data Structures	P	0	0	2	2	1		60	40	
7	4	PC	AIDS	23ADS1405	Database Management Systems	T	3	0	0	3	3	30	20	50	3
8	4	PC	AIDS	23ADS1406	**Lab :** Database Management Systems	P	0	0	2	2	1		60	40	
9	4	PC	AIDS	23ADS1407	**Lab :** Java Full Stack	P	0	0	2	2	1		60	40	
10	4	VSEC-3	AIDS	23ADS1408	**Lab :** Python for Data Science	P	0	0	4	4	2		60	40	
11	4	VEC-2	AIDS	23ADS1409	Cyber Laws	T	2	0	0	2	2	30	20	50	3
12	4	OE-2	OE		**Open Elective - II**	T	2	0	0	2	2	30	20	50	3
13	4	MDM	AIDS		**MD Minor Course - II**	T	2	0	0	2	2	30	20	50	3
					TOTAL		**19**	**0**	**12**	**31**	**25**				

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
23ADS1401: Operating Systems

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Describe the different services provided by Operating System at different level. 2. Apply knowledge of different operating system algorithms to solve a given problem. 3. Analyze various approaches used to improve system performance. 4. Differentiate various disk scheduling algorithms based on their performances..

Unit I:	**(8 Hrs.)**
Introduction, services provided by OS, functions of OS, system calls. Process management-introduction, process control block, process states, process context switch, threads: user level and kernel level.	
Unit II:	**(8 Hrs.)**
CPU scheduling, goals of scheduling, CPU scheduling algorithms: FCFS, SJF, SRTF, RR, Priority based.	
Unit III:	**(7 Hrs.)**
Inter-process communication: process cooperation and synchronization, race condition, critical section, mutual exclusion and implementation, semaphores, classical inter-process communication problems.	
Unit IV:	**(8 Hrs.)**
Deadlocks: System Model, deadlock characterization-necessary conditions, resource allocation graph (RAG), methods for handling deadlock-deadlock avoidance, deadlock detection, deadlock prevention, recovery from deadlock.	
Unit V:	**(7 Hrs.)**
Memory management techniques-contiguous and non-contiguous, paging and segmentation, translation look aside buffer (TLB) and overheads. Virtual memory and demand paging, page faults, page replacement algorithms, thrashing and working set model	
Unit VI:	**(7 Hrs.)**
File systems-introduction, disk space management and space allocation strategies, directory structures, disk caching, disk arm scheduling strategies: FCFS, SSTF, SCAN, CSACN, LOOK, CLOOK, File Organization: Sequential, Index, Index Sequential	
Total Lecture	**45 Hours**

Textbooks:
Operating system concepts, A. Silberchatz and P.Galvin , Addison Wesley Longman Inc

Reference Books:	
1.	Modern operating systems, 1st , A.S. Tanenbaum , Prentice Hall of India publication
2.	Operating Systems, Crowley , 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/

MOOCs Links and additional reading, learning, video material	
1.	https://nptel.ac.in/courses/106102132
2.	https://www.youtube.com/watch?v=kqGhEJlRdu8
3.	https://www.youtube.com/watch?v=ucVm_arB-fw

IV SEMESTER
23ADS1402: Lab. Operating Systems

Course Outcomes
Upon successful completion of the course the students will be able to 1. Describe the different services provided by Operating System at different level. 2. Apply knowledge of different operating system algorithms to solve a given problem. 3. Analyze various approaches used to improve system performance. 4. Differentiate various disk scheduling algorithms based on their performances.

Minimum Eight Practical's to be performed from the list as below

SN	Program based on
1	Basics of Linux commands and its use.
2	Write a shell script using control structure (i) Write a shell script to find maximum of 3 numbers. (ii)Write a shell script to check whether entered number even or odd
3	Write a shell script using loops (i) Write a shell script to find factorial of a number (ii)Write a shell script to reverse of a number
4	Write a program to create a process using fork( ) system call.
5	Write a program to implement Shortest Job First CPU scheduling algorithm.
6	Write a program to implement Non-Preemptive Priority CPU scheduling algorithm .
7	Write a program to implement FIFO page replacement algorithm.
8	Write a program to implement Best-Fit/Worst-Fit strategies
9	Program based on threads
10	Case study on Android Operating System

IV Semester
23ADS1403: Advanced Data Structures

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Acquire the basic concepts of data structures and select appropriate data structures for solving real life problems 2. Demonstrate various operations on linked list, skip list, hashing based on the requirements of real life problems 3. Implement different types of trees and graph data structures and use them to solve problems dealing with non-linear data

Unit I:	**(8 Hrs.)**
Trees, terminologies, binary, binary search tree, complete, full, threaded, operations, traversals, BFS, DFS	
Unit II:	**(8 Hrs.)**
Heap Sort, Balanced trees: Height-balanced (AVL) trees, Red-black trees, implementation	
Unit III:	**(9 Hrs.)**
Multi-way trees-B and B+ and applications, Splay tree, Multidimensional tree: Tries and Pattern matching algorithms	
Unit IV:	**(8 Hrs.)**
Graphs: Representation, terminologies, & traversals. Spanning trees, topological sort and its implementation, articulation point, shortest path algorithm, all-pairs shortest paths	
Unit V:	**(8 Hrs.)**
Disjoint sets, hash table, Equivalence relation, Basic Data Structure, Simple Union and Find algorithms, Smart Union and Path compression algorithm	
Unit VI:	**(8 Hrs.)**
String Matching – The naive string-matching algorithm, The Rabin-Karp algorithm, The Knuth-Morris-Pratt algorithm.	
Total Lecture	**45 Hours**

Textbooks:	
1.	Data Structures with C Seymour Lipschutz Latest TMH
2.	Data structures using C Reema Thareja Latest Oxford

Reference Books:	
1.	Introduction to Algorithms Thomas Cormen, Charles Leiserson, Ronal Rivest, Clifford Stein 3rd 2015 PHI
2.	Fundamentals of Data Structures in C++ Ellis Horowitz, Sartaj Sahani, Dinesh Mehta 2nd, 2009 University Press
3.	Data Structures and Program Design in C Robert Kruse, Cl Tondo 2nd, 2009 Pearson Education

IV Semester
23ADS1404: Lab Advanced Data Structures

Course Outcomes
Upon successful completion of the course the students will be able to 1. Implement different types of linked list with various operations on them 2. Implement various operations on skip list, disjoint set and hash table. 3. Identify and Implement various operations on different types of trees 4. Write program for finding shortest path between pair of entities

Minimum Eight Practical's to be performed from the list as below

SN	**Program based on**
1	Program based on Linked list
2	Program based on implementing one data structure using another data structure
3	Program to Print the Alternate Nodes in a Linked List using Recursion
4	Program based on Binary tree
5	Program based on Binary search tree
6	Program for Heap sort
7	Program based on Tries
8	Program based on graph
9	Program for detecting presence of cycle in given graph G
10	Program for printing topological sort of given graph

IV SEMESTER
23ADS1405 : Database Management Systems

Course Outcomes :
Upon successful completion of the course the students will be able to 1. **Understand** database management system, through modeling and designing concepts. 2. **Apply** the knowledge of relational algebra, query language, transaction management to perform the operations on database. 3. **Analyze** database schemas to identify design issues and recommend suitable normalization and transaction management techniques for improved efficiency and integrity 4. **Design** database schema using the entity relation diagrams and relational database aspects.

Unit I:	**8 Hrs.**
Introduction to Database Management System: Database system Concepts and Architecture, Data Models, Schemas and Instances, Abstraction & Different Levels of Data Abstraction, Data Independence: Logical & Physical Independence. **Entity-Relationship Model**: Entities and Entity Sets, Relationships and Relationship Sets, Attributes, Mapping Constraints, Keys, Entity Relationship Diagram, Generalization, Aggregation, Reducing E-R Diagrams to Tables	
Unit II:	**7 Hrs.**
Relational Data Model: Structure of Relational Databases **Relational Algebra:** Structure of relational databases, Fundamental Relational-Algebra Operations, Additional relational algebra operations, extended relational algebra operations, modification of the databases.	
Unit III:	**8 Hrs.**
SQL: Data definition language (DDL), Data Manipulation Language (DML), Basic structure of SQL Queries, Set operations, Null Values, Nested sub-queries, views, modification of database, transaction, Joins. **PLSQL Constructs:** SQL data types & schemas, Integrity Constraints, Domain Constraints, Assertions, triggers, Stored Procedures	
Unit IV:	**8 Hrs.**
Relational Database Design AND Normalization: Pitfalls in Relational Database Design, Functional Dependencies, Inference Rules, Equivalence, and Minimal Cover, Properties of Relational Decomposition, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Other Dependencies and Normal Forms	
Unit V:	**7 Hrs.**

Transaction Management: ACID Properties, Implementation of ACID Properties, Database processes to support ACID Properties, Schedules, and Testing of Serializability	
Unit VI:	**7 Hrs.**
Concurrency Control: Lock-based Protocols, Timestamp Based Protocols, Validation Techniques. **Crash Recovery:** Failure Classification, Log Based Recovery, Buffer Management, Checkpoints.	
Total Lecture	**45 Hours**

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

Reference Books:	
1.	Database System Concepts, Henry Korth and Others, McGraw Hill
2.	Database Systems, Connolly, Pearson Publications
3.	Database Systems, S. K. Singh, Pearson Education
4.	Principles of Database Systems Ullman Golgotia Publications 1998

MOOCs Links and additional reading, learning, video material	
1.	https://onlinecourses.nptel.ac.in/noc22_cs40/preview

IV SEMESTER
23ADS1406 : Lab: Database Management Systems

Course Outcomes
Upon successful completion of the course the students will be able to
1. Apply the concepts of database query language to extract, process and manage the data
2. Design the conceptual and physical database schema using database query language

SN	Experiments based on
1	Implementation of DDL commands of SQL with suitable examples
2	Implementation of DML commands of SQL with suitable examples
3	Implementation of different types of function with suitable examples
4	Implementation of different types of operators in SQL
5	Implementation of different types of Joins
6	Study and Implementation of • Group By & having clause • Order by clause • Indexing
7	Study & Implementation of • Sub queries • Views
8	Study & Implementation of different types of constraints
9	Study & Implementation of Database Backup & Recovery commands. Study & Implementation of Rollback, Commit, Savepoint
10	Creating Database /Table Space • Managing Users: Create User, Delete User • Managing roles:-Grant, Revoke.
11	Study & Implementation of PL/SQL
12.	Study & Implementation of SQL Triggers.

IV SEMESTER

23ADS1407 : Lab : Java Full Stack

Course Outcomes :
Upon successful completion of the course the students will be able to
1. Apply the concepts related to advance Java features, database connectivity 2. Apply the techniques to create the user interface for application 3. Understand the process of deployment of application on cloud 4. Apply the different tools to develop the software solution

Unit I:	**(5 Hrs.)**
OOP Concepts, Data Structures, Collection Framework, File handling, JDBC, Introduction to JUnit.	
Unit II:	**(5 Hrs.)**
Introduction to Java 8 Features, Interface Enhancements,Functional Interfaces, Lambda Expression, ForEach, Method References, Streams API, JavaDocs	
Unit III:	**(5 Hrs.)**
Building Responsive Web Pages HTML5, CSS3 and JavaScript, Basic Single Page Applications Using Angular OR React.	
Unit IV:	**(5 Hrs.)**
Working with Spring Core, Dependency Injection, Spring MVC,Spring Boot, Introduction to Hibernate and Spring Microservices	
Unit V:	**(5 Hrs.)**
Virtualization Basics, Introduction to Cloud, RDB Cloud Fundamentals (SaaS, Paas, IaaS), Introduction to AWS (S3 Buckets, RDS), AWS Cloudfront.	
Unit VI:	**(5 Hrs.)**
Introduction to Maven,Jacoco, SonarLint,Jira, Swagger,Moc kito,Docker, Gitrunner.	
Total Lecture	**30 Hours**

IV SEMESTER
22ADS408: Lab: Python for Data Science

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Write a python program to apply various data structures concept 2. Apply the concept of file handling and object-oriented programming in python 3. Select the required framework and appropriate libraries to write a program in python 4. Develop web-based application using functionalities provided under various packages

Minimum Eight Practical's to be performed from the list as below

SN	Program based on
1.	Revision to Python language: Lists, Dictionary, Sets, Tuples, Numpy. write a Python program using: Lists comprehension, Dictionary comprehension
2.	Write a program using: File handling
3.	Write a program using: Exception Handling
4.	Write a program using: Enumeration, Lambda Function
5.	Write program using: Decorators
6.	Write a program using object-oriented concept
7.	Module reference: statistics, Random, Math
8.	Study of Pandas data frames and implement data frames related operations
9.	Program using: Matplotlib
10.	Project work: GUI creation in Python (Flask framework)

IV SEMESTER

23ADS1409 : Cyber Laws

Course Outcomes :
Upon successful completion of the course the students will be able to
1. Identify and explain international and national legal frameworks governing cyberspace. 2. Demonstrate familiarity with legal terminology commonly used in cyber law and technology-related legal discussions. 3. Identify different types of cybercrime and understand relevant laws and regulations for investigating and prosecuting cyber offenses

Unit I: Introduction	**7 Hrs.**
Introduction: Cyber Crime: Meaning and Definition, Classification of Cyber Crimes, Causes of Cyber Crime, Impact and Effects of Cyber Crimes,	
Unit II: Information Technology Law:	**6 Hrs.**
Information Technology Law: Need of Legal Protection in Cyber World, Information Technology Act 2000 – Objectives, Scope, Applicability, Information Technology (Amendment) Act 2008, Recompense of Information Technology Law, Limitation of Information Technology Law	
Unit III: Legal Protection against Cyber Crimes	**7 Hrs.**
Legal Protection against Cyber Crimes: Criminal Liabilities under Information Technology Act 2000, Common Cyber Crimes and Applicable Legal Provisions, Civil Liabilities under Information Technology Act 2000, Civil Liability for Corporate, Cyber Crimes under IPC and Special Laws	
Unit IV: Case studies	**6 Hrs.**
Case studies: Cyber Crime-Some Landmark Occurrence, Recent Trends in Cyber Laws	
Total Lecture	**26 Hours**

Textbooks:	
1.	Cyber Crim Elaw and Practice, The Institute of Company Secretaries of India - New Delhi
2.	Information Security & Cyber Laws, by Gaurav Gupta, Sarika Gupta, Khanna Publishing House

Reference Books:	
1.	Understanding Cybersecurity Law and Digital Privacy, Melissa Lukings, Arash Habibi Lashkari, Springer Cham

IV SEMESTER
MDM2ADS102 : Predictive Data Science

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Apply different visualization and summarizing technique to given data for its interpretation. 2. Solve given problem using the probability theory and linear algebra 3. Perform sampling distribution to estimate the given data and predict the solution using regression 4. Analyse the data using hypotheses and other testing methods Implement various statistics methods on a given dataset using modern tool and write a report

Unit I:	**7Hrs.**
Sampling and Sampling Distributions and: Sampling Distributions: Introduction to sampling, random sampling, non-random sampling, Introduction to sampling distributions	
Unit II:	**7Hrs.**
Estimation and Testing Hypotheses: Introduction, point estimates, interval estimates and confidence interval, determining the sample size in estimations Introduction, Basic to the Hypotheses-testing Procedure, Testing Hypotheses, One sample test: Hypotheses Testing of Means when the population standard deviation is Known, Hypotheses Testing of Means when the population standard deviation is not known	
Unit III:	**8 Hrs.**
Testing Hypothesis II, Quality and quality control: Testing Hypotheses, Two sample test, Statistical process control, Control charts for process mean, Process variability, Charts for attribute, Total quality management.	
Unit IV:	**8 Hrs.**
Simple Regression and Correlation: Introduction, Estimation Using the Regression Line, Correlation Analysis Making Inferences about Population Parameters Using Regression and Correlation Analyses.	
Total Lecture	**30 Hours**

Textbooks:		
1.	Statistics for Management	Richard I. Levin & David S. Rubin 7 th Edition Pearson Education
2.	Introduction to Linear Algebra	Gilbert Strang 5 th Edition Wellesley - Cambridge Press
3	Introduction to probability and statistics for engineers and scientist, Sheldon M. Ross, 3 rd Edi Elsevier	

Reference Books:		
1.	Practical Statistics for Data Scientists 50 Essential Concepts	Peter Bruce & Andrew Bruce
2.	An Introduction to Statistical Learning with Applications in R Witten, Trevor Hastie & Robert Tibshirani	Gareth James, Daniela
3.	Mathematical foundations for data analysis	Jeff m. Phillips

IV SEMESTER

MDM2ADS202 : Back-End Web Development

Course Outcomes :

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

1. Develop server-side applications using Node.js and Express.js with an understanding of modular architecture, HTTP handling, middleware, and JSON responses.
2. Design and implement RESTful APIs with secure user authentication using bcrypt and JWT, and apply best practices for error handling and environment configuration.
3. Integrate MongoDB with Express applications using Mongoose for schema modeling, perform CRUD operations, and handle asynchronous database interactions.
4. Apply best practices in structuring backend applications, test APIs using Postman, use version control with Git, and understand deployment workflows for backend services.

Unit I:	**6 Hrs.**
Node.js Fundamentals & Express.js Basics: Introduction to Node.js: event-driven architecture, modules, Setting up Node.js project with npm, Express.js framework basics, Creating HTTP servers & RESTful routing, Middleware usage, Serving static files, JSON response	
Unit II:	**6 Hrs.**
RESTful API Development & Authentication: REST API design principles, Implementing CRUD operations (Create, Read, Update, Delete), Route parameters, error handling, User Authentication: Password hashing using bcrypt, Login with JSON Web Tokens (JWT), Securing routes, Environment variables with dotenv	
Unit III:	**6 Hrs.**
MongoDB & Mongoose Integration: Introduction to NoSQL and MongoDB (Atlas + Compass), MongoDB collections, documents, and CRUD, Mongoose: Schema and Model definitions, Validations, Connecting to MongoDB from Express, Async/await and error handling in DB context	
Unit IV:	**6 Hrs.**
API Integration, Testing & Deployment: Express App Structure & Best Practices, API Testing with Postman, Error Handling & Logging, Version Control with Git, Deployment Overview	
Total Lecture	**24 Hours**

Textbooks:	
1.	Web Development with Node and Express (2nd Edition) by Ethan Brown, Publisher: O'Reilly Media, UNIT- 1, 2 & 4
2.	Node.js, MongoDB, and Angular Web Development by Brad Dayley, Brendan Dayley, Caleb Dayley, Publisher: Addison-Wesley, UNIT- 2 & 3

IV SEMESTER
Open Elective -II: 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/

IV SEMESTER

Mandatory Learning Course (MLC)

MLC2124 : YCAP4

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

5th Semester

(Department of Computer Technology)

B. Tech in Artificial Intelligence and Data Science (AIDS)

SoE No.
23ADS-101

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 Technology)
B.Tech. in Artificial Intelligence and Data Science

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	AIDS	23ADS1501	Artificial Intelligence	T	3	0	0	3	3	30	20	50	3
2	5	PC	AIDS	23ADS1502	**Lab :** Artificial Intelligence	P	0	0	2	2	1		60	40	
3	5	PC	AIDS	23ADS1503	Design and Analysis of Algorithms	T	3	0	0	3	3	30	20	50	3
4	5	PC	AIDS	23ADS1504	**Lab :** Design and Analysis of Algorithms	P	0	0	2	2	1		60	40	
5	5	PC	AIDS	23ADS1505	Therotical Foundation of Computer Science	T	3	0	0	3	3	30	20	50	3
6	5	PC	AIDS	23ADS1506	Fundamentals of Machine Learning	T	2	0	0	2	2	30	20	50	3
7	5	PE	AIDS		**Professional Elective-I**	T	3	0	0	3	3	30	20	50	3
8	5	PE	AIDS		**Lab :** Professional Elective-I	P	0	0	2	2	1		60	40	
9	5	**OE-3**	OE-3		**Open Elective -III**	T	3	0	0	3	3	30	20	50	3
10	5	MDM	AIDS		**MD Minor Course-III**	T	3	0	0	3	3	30	20	50	3
11	5	STR	AIDS	23ADS1507	Internship, Seminar and Report	P	0	0	2	2	1		60	40	
					TOTAL		**20**	**0**	**8**	**28**	**24**				
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	AIDS	23ADS1521	PE-I : Computer Networks										
2	5	PE-I	AIDS	23ADS1522	**PE-I : Lab :** Computer Networks										
3	5	PE-I	AIDS	23ADS1523	PE-I : High Performance Computer Architecture										
4	5	PE-I	AIDS	23ADS1524	**PE-I : Lab :** High Performance Computer Architecture										
5	5	PE-I	AIDS	23ADS1525	PE-I : Financial Data Analytics										
6	5	PE-I	AIDS	23ADS1526	**PE-I : Lab :** Financial Data Analytics										
7	5	PE-I	AIDS	23ADS1527	PE-I : UI/UX Design										
8	5	PE-I	AIDS	23ADS1528	**PE-I : Lab :** UI/UX Design										
9	5	PE-I	AIDS	23ADS1529	PE-I : Advanced Probability and Statistics										
10	5	PE-I	AIDS	23ADS1530	**PE-I : Lab :** Advanced Probability and Statistics										

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

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

V SEMESTER
23ADS1501 : Artificial Intelligence

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Develop an Understanding to identify performance measures for a given intelligent agent. 2. Apply searching techniques for problem-solving and planning 3. Apply different knowledge representation techniques on given facts 4. Solve AI problems using the techniques of uncertainty

Unit I:	**8 Hrs.**
Introduction: AI , History, Overview, Intelligent Agents, Performance Measure, Rationality, Structure of Agents, Problem-solving agents, Problem Formulation, Uninformed Search Strategies	
Unit II:	**8 Hrs.**
Informed (Heuristic) Search and Exploration, Greedy best first search, A* search, Memory bounded heuristic search, Heuristic functions, inventing admissible Heuristic functions, Local Search algorithms, Hill-climbing, Simulated Annealing	
Unit III:	**7 Hrs.**
Constraint Satisfaction Problems, Backtracking Search, variable and value ordering, constraint propagation, intelligent backtracking, local search for CSPs, Adversarial Search, Games, The minimax algorithm, Alpha-Beta pruning, Imperfect Real-Time Decisions	
Unit IV:	**8 Hrs.**
Knowledge Based Agents, Logic, Propositional Logic: Inference, Equivalence, Validity and Satisfiability, Resolution, Forward and Backward Chaining, First Order Logic: Models for first order logic, Symbols and Interpretations, Atomic sentences, complex sentences, Quantifiers, Inference in FOL, Unification, Forward Chaining, Backward Chaining, Resolution	
Unit V:	**7 Hrs.**
Planning, Language of planning problems, planning with state-space search, forward and backward state-space search, Heuristics for state-space search, partial order planning, planning graphs, planning with propositional logic	
Unit VI:	**7 Hrs.**
Uncertainty, Handing uncertain knowledge, rational decisions, basics of probability, axioms of probability, inference using full joint distributions, independence, Baye's Rule and conditional independence, Bayesian networks, Semantics of Bayesian networks, Exact inference in Bayesian Networks.	
	Total Lecture **45 Hours**

Textbooks:	
1.	Artificial Intelligence A Modern Approach, S. Russell and P. Norvig. Pearson Education
2.	First course in AI, Deepak Khemani, McGraw Hill
3.	Artificial Intelligence, E. Rich and K. Knight andShivashankar B. Nair, McGraw Hill

Reference Books:	
1.	Introduction to Artificial Intelligence and Expert System, D. W. Patterson, PHI
2.	Artificial Intelligence, George F. Lugar, Pearson Education

V SEMESTER
23ADS1502: Lab. Artificial Intelligence

Course Outcomes
Upon successful completion of the course the students will be able to 1. Apply different searching techniques to solve the given problem. 2. Apply different knowledge representation techniques on given facts 3. Implement the concept of uncertainty to solve a given problem

SN	Experiments based on
1	Write a program in prolog for implementation of predicate and rule.
2	Write a program using an Uninformed Searching Technique
3	Write a program using Heuristic Searching Technique
4	Write a program using Heuristic Searching Technique
5	Write a program using Adversarial Searching Technique
6	Implement any cryptarithmetic puzzle
7	Implement Rule-Based Agent
8	Implement the Resolution theorem (Negation) using Prolog
9	Implement Bayes rule with probabilistic inference for reasoning under uncertainty.

V SEMESTER

23ADS1503 : Design & Analysis of Algorithm

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Analyze different types of asymptotic notations and find the time complexity in terms of asymptotic notations 2. Solve recurrences using various techniques. 3. Implement divide and conquer strategy, greedy strategy, dynamic programming algorithms and backtracking strategy. 4. Identify and differentiate between various types of complexity classes.

Unit I:	**8 Hrs.**
Mathematical foundations, summation of arithmetic and geometric series, n, n2, bound summations using integration, Analysis of algorithms, analyzing control structures, worst case and average case analysis, Asymptotic notations, Analysis of sorting algorithms such as selection sort, insertion sort, bubble sort, heap sort, external Sorting, lower bound proof.	
Unit II:	**7 Hrs.**
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 III:	**7 Hrs.**
Divide and conquer basic strategy, binary search, quick sort, merge sort, Fast Fourier Transform etc. Greedy method –basic strategy, application to job sequencing with deadlines problem, minimum cost spanning trees, single source shortest path etc.	
Unit IV:	**8 Hrs.**
Dynamic Programming basic strategy, multistage graphs, all pair shortest path, single source shortest paths, optimal binary search trees, traveling salesman problem.	
Unit V:	**8 Hrs.**
Basic Traversal and Search Techniques, breadth first search, connected components, Backtracking basic strategy, 8 – Queen"s problem, graph colouring, Hamiltonian cycles etc	
Unit VI:	**7 Hrs**
NP-hard and NP-complete problems, basic concepts, non-deterministic algorithms, NP-hard and NPcomplete, Cook"s Theorem, decision and optimization problems, polynomial reduction.	
	Total Lecture **45 Hours**

Textbooks:	
1.	Computer Algorithms Third Horowitz, Sahani, Rajsekharan Galgotia Publications Pvt. Ltd.
2.	Introduction to Algorithms Third Thomas H. Cormen Prentice Hall of India

Reference Books:	
1.	Fundamentals of Algorithms Second Brassard and Bratley Prentice Hall

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/E%20-%20books-Wiley-Blackwell-/New%20Microsoft%20Office%20Word%20Document%20(2).htm

MOOCs Links and additional reading, learning, video material	
1.	https://archive.nptel.ac.in/courses/106/101/106101060/
2.	https://www.digimat.in/nptel/courses/video/106101060/L27.html

V SEMESTER
23ADS1504 : Lab: Design & Analysis of Algorithm

Course Outcomes
Upon successful completion of the course the students will be able to
1. Students should be able to design some algorithms
2. Analyze their performance with respect to selected evaluation parameters

SN	Experiments based on
1	Write a program for insertion sort and display its time complexity for different number of inputs.
2	Write a program for heap sort and compare its time complexity with insertion sort for different number of inputs.
3	Write a program for merge sort and display its time complexity for different number of inputs.
4	Write a program for quick sort and compare its time complexity with merge sort for different number of inputs.
5	Write a program for fractional knapsack problem using greedy strategy and analyse its time complexity for different number of inputs.
6	Write a program for job sequencing with deadline problem using greedy strategy and analyse its time complexity for different number of inputs.
7	Write a program for travelling salesman problem using dynamic programming and analyse its time complexity for different number of inputs.
8	Write a program for all pair shortest path using dynamic programming and analyse its time complexity for different number of inputs.
9	Write a program for 8 queen's problem using backtracking
10	Write a program for graph colouring problem using backtracking

V SEMESTER

23ADS1505 : Theoretical Foundation of Computer System

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Construct automata, regular expression for any pattern. 2. Construct context free grammar for various languages.. 3. Construct push down automata and Turing Machine for a language. 4. Evaluate and justify whether a problem is decidable or not.

Unit I	**7 Hrs.**
Alphabet, Symbols, Sets, Strings, Language, Operations, Relations, Finite Automata, 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 II	**8 Hrs.**
Regular sets, Regular expressions, Manipulation of regular expressions, Equivalence between RE and FA. Pumping Lemma, closure properties of regular sets with proofs, Regular grammars, Right linear and left linear regular grammars, inter-conversion, Equivalence between regular grammar and FA, Inter-conversion between RE and RG	
Unit III	**7 Hrs.**
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, CYK algorithm.	
Unit IV	**7 Hrs.**
Push down automata, definition, and model, acceptance of CFL by empty Stack and by final state, equivalence CFL and PDA, Interconversion, Closure of properties of CFL with proofs, DPDA & NDPDA.	
Unit V:	**8 Hrs.**
Turing machine, Definition, Model of TM, Design of Turing Machine, Computable functions, Recursive enumerable language, Recursive Language, Properties of Recursive enumerable language, Church's hypothesis, Chomsky hierarchy of language , Linear bounded automata and context sensitive language, Universal Turing Machine	
Unit VI	**8 Hrs.**
Undecidable Problems related to Recursive enumerable language and Turing Machine, post correspondence problem, Recursive function Theory –Basis functions and operations on them. Bounded minimization preemptive μ recursive function –unbounded minimization and recursive function. Introduction to formal verification.	
Total Lecture	**45 Hours**

Textbooks:	
1.	Introduction to Automata Theory, Languages and Computation, Hopcroft H.E., Ullman and Motwani, Addison Wesley 2nd Edition, 2000
2.	Introduction to Languages and the theory of Automata, John C. Martin, McGraw-Hill 3rd Edition, 2003.

Reference Books:	
1.	Introduction to the Theory of Computation, Michael Sipser, Course Technology, 2nd Edition, 2005
2.	Theory of Computation, O.G.Kakde, USP 2008

V SEMESTER
23ADS1506 : Fundamentals of Machine Learning

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

1. Understand core machine learning concepts, including learning types, challenges, and theoretical foundations that guide model development.
2. Apply similarity-based and parametric classification models effectively to address practical machine learning problems, selecting appropriate methods based on problem context
3. Evaluate model performance using metrics, tuning strategies, and optimization techniques to identify factors influencing accuracy and generalization

Unit I	**Introduction to Machine Learning:**	**7 Hours**
Need for Machine Learning, meaning of learning, Types of Machine Learning, Challenges of Machine Learning, Machine Learning Process, Understanding Data		
Unit II	**Basics of Learning Theory:**	**8 Hours**
Introduction to learning types, Computational Learning Theory, Design of Learning System, Concept Learning, Induction Biases		
Unit III	**Model Generalization and Learning Dynamics:**	**7 Hours**
Model Performance Issues; Underfitting, Overfitting, Bias-Variance Tradeoff, Classification Metrics; Confusion Matrix, Accuracy, Precision, Recall (Sensitivity or True Positive Rate), F1 Score, ROC-AUC, Model Selection Techniques; Cross-Validation, Model Selection Strategies; Cross-Validation, Grid Search / Random Search, Variational Inference, Model Optimization Techniques; Regularization, Early Stopping, Dropout, Hyperparameter Tuning		
Unit IV	**Similarity-Based Learning and Parametric Classifiers:**	**8 Hours**
Introduction to similarity-based learning, Nearest Neighbor Learning, Weighted k-Nearest Neighbor Learning, Nearest Centroid Classifier, Parametric classifiers		
	Total	**30 Hours**

Textbooks:

1. S Sridhar and M Vijayalakshmi, "Machine Learning", Oxford University Press, 2021.
2. Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, Mathematics for Machine Learning, Cambridge University Press (23 April 2020)
3. Tom M. Mitchell- Machine Learning - McGraw Hill Education, International Edition
4. Trevor Hastie, Robert Tibshirani, and Jerome Friedman -The Elements of Statistical Learning
5. Zhi-Hua Zhou -Ensemble Methods: Foundations and Algorithms

V SEMESTER
23ADS1521 : PE-1: Computer Networks

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Understand design issues of layers and network reference model 2. Solve the given problems related to networking domain. 3. Analyze different networking protocol at various layers. 4. Evaluate the performance of network using different tools.

Unit I:	**8 Hrs.**
Introduction: The uses of computer networks, LAN's, MAN's, WAN's., protocol hierarchies, design issues for layers, interfaces and services, connection oriented and connectionless services, service primitives relationship of services to protocols. The OSI reference model. TCP/IP reference model, Comparison of OSI & TCP/IP reference models, Critique of OSI model & protocols, critique of TCP/IP reference mode	
Unit II:	**7 Hrs.**
Transmission Impairments, Transmission Media: Guided, unguided, Architecture of the Internet, , The Public Switched Telephone Network Switching: circuit, packet and message switching, Modems	
Unit III:	**8 Hrs.**
The Data Link Layer: Data link layer design issues- Framing, Error Control, Flow Control, Link Management, Error detection and Correction-Error-Correcting Codes, error-detecting codes, Elementary data link protocols-An Unrestricted simplex Protocol, A simplex stop and wait protocol, A simplex protocol for a noisy channel, Sliding window protocols- A one bit sliding window protocol, Go Back N protocol, Selective Repeat Protocol.	
Unit IV:	**7 Hrs.**
The Medium Access Sublayer: Static and Dynamic Channel allocation in LAN's and MAN's, Access Protocols ALOHA, Persistent and Non Persistent CSMA, CSMA/CD, Collision free protocols, Binary countdown, Limited connection protocol: The adaptive tree walk protocol.	
Unit V:	**8 Hrs.**
The Network Layer: Network Layer design issues-services provided to the transport layer, Logical Addressing: Classbase and classless, Subnetting and Supernetting, Routing and Routing Algorithm, Distance Vector, Link State, Hierarchical. Congestion Control algorithms- Preallocation of buffers, Packet discarding, Choke packets, Load shedding, Jitter control. Leaky bucket algorithm, token bucket algorithm, IP header format (IPv4, IPv6)	
Unit VI:	**7 Hrs.**
The Transport Layer: Transport layer design issues-services provided to the session layer, Quality of service, transport service primitives, Elements of transport protocols-Addressing, Establishing and Releasing a connection, Flow control and Buffering, Multiplexing, Crash Recovery. Transmission Control Protocol (TCP). The Application Layer: HTTP DNS, SMTP, FTP, TFTP.	
	Total Lecture **45 Hours**

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

Textbooks:	
1.	Computer Networks, A.S. Tanenbaum , Pearson Publication
2.	Computer Networking , Behrouz A. Forouzan , McGraw-Hill Publication.

Reference Books:	
1.	Data communications and networking, Behrouz A. Forouzan , McGraw-Hill

MOOCs Links and additional reading, learning, video material
https://archive.nptel.ac.in/courses/106/105/106105183/

V SEMESTER
23ADS1522 : PE-1: Computer Networks

Course Outcomes
Upon successful completion of the course the students will be able to 1 To understand design issues of layers and network reference model 2.To Solve the given problems related to networking domain. 3.To analyze different networking protocol at various layers. 4. To evaluate the performance of network using different tools.

Minimum Eight Practical's to be performed from the list as below

SN	Experiments based on
1	Use Network Utility Command like ping, ipconfig, netstat, tracert to observe the network details.
2	To implement Hamming Code using C and C++.
3	To implement Dijkstra's Routing algorithm using backtracking approach.
4	Use traffic monitoring tool Wireshark to observe network traffic with packet details.
5	To implement Go_back_n sliding window protocol
6	Configure router. Configure network using Cisco Packet Tracer software and show packet transmission from source to destination.
7	Use Openssl command to perform Asymmetric key encryption(RSA) and also implement RSA algorithm.
8	Client server communication using socket programming
9	Simulating IoT environment using Cisco Packet Tracer.

V SEMESTER

23ADS1523 : PE-I: High Performance Computer Architecture

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Identify the dependency in computation. 2. Analyze and decompose the computation into parts for parallel computation. 3. Apply OpenMP, MPI and GPU programming for the development of parallel programs. 1. Simulate on parallel computing architectures and do performance evaluation amongst the parallel algorithms.

Unit I:	**7 Hrs.**
Parallel Computers and architectures, Dependency analysis, loop transformation techniques	
Unit II:	**7 Hrs.**
Programming with Shared Memory: OpenMP and Message-Passing Computing	
Unit III:	**8 Hrs.**
Embarrassingly Parallel Computations, Partitioning and Divide-and-Conquer Strategies, Pipelined Computations	
Unit IV:	**8 Hrs.**
Synchronous Computations, Load Balancing and Termination Detection, Introduction to GPU	
Unit V:	**8 Hrs**
Sorting Algorithms, Numerical Algorithms, Image Processing algorithms, Searching and Optimization	
Unit VI:	**7 Hrs**
Performance metrics: Speedup, efficiency, scalability, Case studies in scientific computing, machine learning, and big data	
Total Lecture	**45Hours**

Textbooks:	
1.	"Introduction to Parallel Computing", Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar, 2nd edition, Addison-Wesley, 2003.
2.	"Parallel Programming in C with MPI and OpenMP", Michael J. Quinn, McGraw Hill, 2003
3.	"CUDA by Example: An Introduction to General-Purpose GPU Programming", Jason Sanders, Edward Kandrot, 1st edition, Addison-Wesley Professional, 2010.

Reference Books:	
1.	"Designing and Building Parallel Programs", Ian Foster, 1st edition, Pearson, 2019.
2.	"An Introduction to Parallel Computing: Design and Analysis of Algorithms", Ananth Grama, 2nd edition, Pearson, 2004.
3.	"Parallel Programming – Techniques and applications Using Networked Workstations and Parallel Computers", Barry Wilkinson and Michael Allen, 2nd edition, Pearson, 2004.
4.	"Multi-Core Programming - Increasing Performance through Software Multi-Threading", Shameem Akhter and Jason Roberts, Intel Press, 2006.

V SEMESTER

23ADS1524 : PE-I: High Performance Computer Architecture

Course Outcomes :

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

1. Apply OpenMP, MPI and GPU programming for the development of parallel programs.
2. Analyze and decompose the computation into parts for parallel computation.

SN	Experiments based on
1	Write OpenMP programs for parallelizing for loops with different scheduling strategies.
2	Write a basic MPI program for point-to-point communication.
3	Implement a parallel divide-and-conquer algorithm
4	Simulate pipelined computation using threads or message queues.
5	Write a basic CUDA program (e.g., vector addition or image thresholding).
6	Implement parallel sorting (Bitonic sort or parallel merge sort) using OpenMP.
7	Implement matrix multiplication in parallel using OpenMP or CUDA.
8	Implement an image filter (e.g., Gaussian blur) using parallel programming.
9	Analyze speedup and efficiency for a parallel matrix operation using different thread counts.
10	Mini-project: Parallelize a real-world problem (e.g., data aggregation, image processing, ML task) and measure performance.

VI SEMESTER
23ADS1527 :PE-1: UI/UX Design

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Understand design thinking concept 2. Apply user requirements and the design tools to design the UI 3. Analyze the various visual designs to select appropriate one

Unit I:	**7 Hrs.**
Design Thinking Fundamentals: Introduction to Design thinking – Concept, Purpose, 5 stages of design thinking – Empathize, Define, Ideate, Prototype, Test, Introduction to User Interface / User Experience (UI/UX) – Definition of Design with respect to digital media, User Interface, User experience, Difference between UI and UX. History of UX. Need of UI and UX	
Unit II:	**7 Hrs.**
User Requirements and its Analysis: Introduction to research and analysis tool (freeware) such as FigJam, User requirements – Definition, Types of user research - Qualitative research, Quantitative research. Tools to collect user requirements – personal observation, interviews, questionnaire, User/ Expert reviews, User requirement analysis - Understanding target audience and client requirements, Competitive analysis, Affinity mapping, Defining User Persona	
Unit III:	**8 Hrs.**
Information Architecture and Wireframing: Site maps and user flows, Content organization and navigation design, Low-fidelity wireframes: sketching interfaces, Layout design principles, Usability heuristics and accessibility basics	
Unit IV:	**8 Hrs.**
User Interface Design: Storyboarding, User journey mapping, Gestalt principles of design - Aesthetics in UI design - Using Light, Color and Contrast Effectively in UI Design, Introduction to any freeware design tool such as Figma, Visual Communication Design - effective visual communication for graphical user interface	
Unit V:	**7 Hrs.**
User Experience Design Tool: Introduction to User Experience design, UX design open source tool such as - Figma features – Navigations, interactions, Buttons Creating library, Gamification, micro-animation, Creating visual identity of the project – design system, design theme	
Unit VI:	**8 Hrs.**
Prototyping and Testing: Introduction to Wireframing - Purpose of wireframing, Types – low fidelity, medium fidelity, high fidelity, Basics of sketching, Creating low fidelity wireframes, medium fidelity and high fidelity in Figma, Basic considerations in wireframing – device, size, behavior, interaction 5.4 Elements used in wireframing – visual design, high fidelity elements, Prototyping and Testing	
	Total Lecture **45 Hours**

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

Textbooks:	
1.	The Elements of User Experience: User-Centered Design for the Web and Beyond, Jesse James Garrett, New Riders Publishing
2.	Design Thinking: The Handbook, Falk Uebernickel, Li Jiang, Walter Brenner, Britta Pukall, Therese Naef, World Scientific Publishing Co Pte Ltd
3.	Designing and Prototyping Interfaces with Figma, Fabio Staiano, Packt Publishing Ltd, Grosvenor House

Reference Books:	
1.	https://aim.gov.in/pdf/Design_Thinking.pdf
2.	https://youtu.be/-wzNTPXVIyM?si=zET5z3GpIPl-cAry
3.	https://youtu.be/XT152i5asdQ?si=jPdLFFExnaZO8NRs
4.	https://usabilitypost.com/2008/08/14/using-light-color-and-c

V SEMESTER
23ADS1528 : PE-1: Lab UI/UX Design

Course Outcomes
Upon successful completion of the course the students will be able to 1. Create interactions using design tool 2. Create innovative design prototype for given applications

SN	Experiments based on
1	Use Design tool for user requirement collection and analysis
2	Recreate a given user interface using any open source design tool
3	Create grid system for the given screen using any design tool
4	Design given user interface using various components such as auto-layouts in the design tool
5	Recreate given website for UI design, color, images, interactions, menu
6	Create any two gamification effects for given user interface in given scenario
7	Design a quiz for given user interface
8	Create navigations for the given website/ App
9	Create gamification for task completion in website such as LMS/ retail website/ banking website
10	Convert created prototype in HTML page

V SEMESTER
23ADS1529 : PE-I: Advanced Probability and Statistics

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Understand the characteristics of financial data and basic time series models used in financial analysis. 2. Apply statistical and econometric methods to address practical problems in financial data analysis. 3. Analyze financial datasets to identify patterns and relationships using advanced regression techniques 4. Design advanced models for financial data to support strategic decision-making.

Unit I:	**8 Hrs.**
Introduction to Random variables: discrete & continuous Random variables Discrete random variables - Uniform, Bernoulli, Binomial, Geometric, Poisson Distributions, Hyper-geometric, Negative Binomial Continuous Random variables: Uniform, Normal, Exponential, Gamma, Cauchy, Beta1 and Beta2	
Unit II:	**7Hrs.**
Multivariate Statistics: Samples and Populations, Orthogonality, Data appropriate for multivariate Statistics, Degree of relationship among variables, Significance of Group differences.	
Unit III:	**8 Hrs.**
Prediction of Group membership, bi-variate statistics: correlation and regression, data screening and Transformation, multiple regressions, multiway frequency analysis, analysis of co-variance.	
Unit IV:	**8 Hrs.**
Discriminant function analysis, limitations, fundamental equations, types of discriminant function analysis, Principal components, factor analysis.	
Unit V:	**7 Hrs.**
Markov Chain, Stochastic processes, Setting up Markov chains, Balance equations, Non-parametric interference, Empirical Distribution Function (or eCDF), Kernel Density Estimation (KDE), Statistical Functionals, Plug-in estimator, confidential interval, Percentiles, quantiles, Normal-based confidence intervals, DKW inequality, Parametric Interference, Consistency, Asymptotic Normality, Basics of parametric inference, Method of Moments Estimator (MME)	
Unit VI:	**7 Hrs.**
Properties of Method of Moments Estimator (MME),, Basics of MLE, Maximum Likelihood Estimator (MLE), Properties of MLE, Basics of hypothesis testing, The Wald test, t-test, Kolmogorov-Smirnov test (KS test), p-values, Permutation test	
Total Lecture	**45 Hours**

Textbooks:	
1.	An Introduction to Probability and Statistics. Vijay K Rohatgi and A.K.Md. Ehsanes Saleh, 2nd edition, Wiley
2.	Using Multivariate Statistics, 7/e by Linda S. Fidell, Barbara G. Tabachnick.
3.	Probability and Statistics for Data Science: Math + R + Data (Chapman & Hall/CRC Data Science Series)

Reference Books:	
1.	"Probability & Statistics", K.V. Iyengar & B. Krishna Gandhi, S.Chand.
2.	"Probability & Statistics", William Mendenhall & Others, Cengage Publications.
3.	"An introduction to probability theory and its applications", W. Feller, John Wiley and Sons

MOOCs Links and additional reading, learning, video material	
1.	https://onlinecourses.nptel.ac.in/noc20_ma18/preview

V SEMESTER
23ADS1530 : Lab Advanced Probability and Statistics

Course Outcomes
Upon successful completion of the course the students will be able to 1. Apply the concepts of probability and advance probability concepts 2. Apply the concept of Bivariate and Multivariate Regression and Correlation Analysis, for prediction and forecasting.

SN	Experiments based on
1	The concept of random variable
2	The concept of continuous random variable
3	The concept of multivariate statistics
4	The concept of bivariate statistics
5	The concept of principal component
6	The concept of factor analysis
7	The concept of Markov Chain
8	The nonparametric methods

V SEMESTER

MDM3ADS103 : Multivariate Statistics

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Explain the structure and types of multivariate data and their measurement scales. 2. Describe the purpose, assumptions, and interpretation of key multivariate techniques. 3. Theoretically evaluate the appropriateness of a multivariate technique for a given research scenario.

Unit I:	**8 Hrs.**
Fundamentals of Multivariate Data: Definition and scope of multivariate data analysis, types of variables: quantitative vs. categorical, levels of measurement: nominal, ordinal, interval, ratio, importance and application areas of multivariate analysis, introduction to multivariate datasets and structure, concept of variates and multivariate measurement error.	
Unit II:	**7 Hrs.**
Descriptive Multivariate Statistics: Measures of central tendency and dispersion in multivariate context, covariance and correlation matrices, statistical distance: Mahalanobis distance, concept of multivariate normal distribution and its properties, outlier detection and assumptions in multivariate data.	
Unit III:	**7 Hrs.**
Core Multivariate Techniques: Concepts and Interpretation: Principal Component Analysis (PCA): objectives, variance explanation, dimensionality reduction; cluster analysis: basic concepts of similarity, dissimilarity, types of clustering (hierarchical, k-means)	
Unit IV:	**8 Hrs.**
Discriminant analysis: Definition, Importance and applications, Comparison with regression and classification methods, concepts of classification: Binary classification, Multi-class classification linear discriminants: Fisher's Linear Discriminant,Linear combination of predictor variables, assumptions, goals, and basic steps of each technique.	
Unit V:	**(8 Hrs.)**
Overview of Advanced Methods and Applications: Factor analysis: objective, concept of latent variables, factor loadings, rotation; multiple linear regression (MLR): objective, assumptions, model structure, interpretation	
Unit VI:	**(8 Hrs.)**
Multivariate Analysis of Variance (MANOVA): Motivation: Limitations of ANOVA for multiple dependent variables, Interrelationship between dependent variables, Controlling Type I Error in multiple comparisons, Multivariate hypothesis testing needs, Understanding group differences on a combination of outcomes, basic idea of comparing multivariate means; case-based discussions on applications in marketing, social sciences, and healthcare	
Total Lecture	**45 Hours**

Textbooks:	
1	Johnson R.A. and Wichern D.W., Applied Multivariate Statistical Analysis, Pearson
2.	Hair J.F. et al., Multivariate Data Analysis, Prentice Hall

Reference Books:	
1.	Anderson T.W., An Introduction to Multivariate Statistical Analysis, Wiley
2.	Mardia K.V. et al., Multivariate Analysis, Academic Press.

MOOCs Links and additional reading, learning, video material	
1.	https://archive.nptel.ac.in/courses/111/104/111104024/

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2023

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

(Department of Computer Technology)

SoE No. 23ADS-101

B.Tech in Artificial Intelligence and Data Science

V SEMESTER

Open Elective -III : Basket

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

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

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

V SEMESTER
Mandatory Learning Course (Audit Course)
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 Technology)

B. Tech in Artificial Intelligence and Data Science (AIDS)

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 Technology)
B.Tech. in Artificial Intelligence and Data Science

SoE No. 23ADS-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	AIDS	23ADS1601	Computer Vision	T	2	0	0	2	2	30	20	50	3
2	6	PC	AIDS	23ADS1602	**Lab :** Computer Vision	P	0	0	2	2	1		60	40	
3	6	PC	AIDS	23ADS1603	Natural Language Processing	T	2	0	0	2	2	30	20	50	3
4	6	PC	AIDS	23ADS1604	**Lab :** Natural Language Processing	P	0	0	2	2	1		60	40	
5	6	PC	AIDS	23ADS1605	Design Thinking and Research Methodology	T	2	0	0	2	2	30	20	50	3
6		PE	AIDS		**Professional Elective-II**	T	3	0	0	3	3	30	20	50	3
7	6	PE	AIDS		**Lab :** Professional Elective-II	P	0	0	2	2	1		60	40	
8	6	PE	AIDS		**Professional Elective-III**	T	2	0	0	2	2	30	20	50	3
9	6	PE	AIDS		**Lab :** Professional Elective-III	P	0	0	2	2	1		60	40	
10	6	MDM	AIDS		**MD Minor Course-IV**	T	3	0	0	3	3	30	20	50	3
11	6	**VSEC-4**	AIDS	23ADS1606	**Lab :** Competitive Coding	P	0	0	4	4	2		60	40	
12	6	STR	AIDS	23ADS1607	Project Phase-I	P	0	0	4	4	2		60	40	
						TOTAL	**14**	**0**	**16**	**30**	**22**				
List of Mandatory Learning Course (MLC)															
1	6	HS		MLC126	**YCAP6 :**	**A**	3	0	0	3	**0**				

Professional Elective - II					
1	6	PE-II	AIDS	23ADS1621	PE-II : Business Intelligence
2	6	PE-II	AIDS	23ADS1622	**PE-II : Lab :** Business Intelligence
3	6	PE-II	AIDS	23ADS1623	PE-II : Web Analytics
4	6	PE-II	AIDS	23ADS1624	**PE-II : Lab :** Web Analytics
5	6	PE-II	AIDS	23ADS1625	PE-II : Sensor Data Analytics
6	6	PE-II	AIDS	23ADS1626	**PE-II : Lab :** Sensor Data Analytics
7	6	PE-II	AIDS	23ADS1627	PE-II : GeoSpatial Data Intelligence
8	6	PE-II	AIDS	23ADS1628	**PE-II : Lab :** GeoSpatial Data Intelligence
9	6	PE-II	AIDS	23ADS1629	PE-II : Visual Analytics
10	6	PE-II	AIDS	23ADS1630	**PE-II : Lab :** Visual Analytics
11	6	PE-II	AIDS	23ADS1631	PE-II : Dot Net Full Stack Development
12	6	PE-II	AIDS	23ADS1632	**PE-II : Lab :** Dot Net Full Stack Development

Professional Elective - III					
1	6	PE-III	AIDS	23ADS1641	PE-III : Internet of Things
2	6	PE-III	AIDS	23ADS1642	**PE-III : Lab :** Internet of Things
3	6	PE-III	AIDS	23ADS1643	PE-III : Reinforcement Learning
4	6	PE-III	AIDS	23ADS1644	**PE-III : Lab :** Reinforcement Learning
5	6	PE-III	AIDS	23ADS1645	PE-III : Advance Unix Programmin
6	6	PE-III	AIDS	23ADS1646	**PE-III : Lab :** Lab Advance Unix Programmin
7	7	PE-III	AIDS	23ADS1647	PE-III : Introduction to Salesforce
8	8	PE-III	AIDS	23ADS1648	**PE-III : Lab :** Introduction to Salesforce

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

Applicable for AY 2023-24 Onwards

VI SEMESTER

23ADS1601 : Computer Vision

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Understand the basic concepts of image formation, camera geometry, and image representation in computer vision. 2. Apply fundamental image processing techniques like filtering, edge detection, and feature extraction. 3. Analyze 3D vision methods such as stereo vision and optical flow for motion and depth understanding. 4. Implement basic machine learning techniques for tasks like face detection and object classification in vision applications.

Unit I:	**(7 Hrs.)**
Introduction and applications of computer vision: Image formation, Image transformations, Basics of camera geometry and calibration, Understanding pixel values and image types (grayscale, color)	
Unit II:	**(7 Hrs.)**
Image Processing and Feature detection: Image filters, Edge detection, Corner detection, Feature Detection and Matching, Image Stitching/Mosaicing.	
Unit III:	**(8 Hrs.)**
3D Vision and Object Tracking: Stereo Vision, Optical Flow, Basic object tracking and recognition, Introduction to simple segmentation techniques.	
Unit IV:	**(8 Hrs.)**
Learning-Based Vision and Applications: Basics of machine learning in vision, Face detection using Adaboost, Object classification using SVMs and Neural Networks, Real-life applications: face recognition, motion detection	
Total Lecture	**30 Hours**

Textbooks:	
1.	Computer Vision: A Modern Approach, Forsyth and PonceH, 4th edition, Pearson Education.
2.	Introductory Techniques for 3D Computer Vision", Emanuele Trucco and Alessandro Verr, Prentice Hall
3.	Computer Vision Algorithms and Applications, Richard Szeliski
4.	OpenCV Documentation & Tutorials (online)

Reference Books:	
1.	Robot Vision, B. K. P. Horn, MIT Press (Cambridge)
2.	Trucco and Verri, Introductory Techniques for 3D Computer Vision, 1998

VI SEMESTER
23ADS1602 : Lab Computer Vision

Course Outcomes
Upon successful completion of the course the students will be able to 1. Apply image enhancement and smoothing techniques to improve image quality for further analysis. 2. Extract meaningful features from images using descriptors such as HOG and SIFT. 3. Implement and evaluate modern object detection methods including YOLO and R-CNN. 4. Analyze and develop solutions for motion estimation, object recognition, and facial expression recognition using classical and learning-based methods.

Sr. No	Aim of Practical
1	Implement various grey level transformations for Image Enhancement
2	Write a Program to apply convolution processes on an input image for image smoothing.
3	Implement Histogram of Oriented Gradient (HOG) for Feature extraction
4	Write a Program to apply Scale Invariant Feature Transform on input image.
5	Implement object detection algorithm YOLO
6	Implement R-CNN algorithms for object detection
7	Implement motion estimation using optical flow technique.
8	Implement Object recognition.
9	Implement Facial Expression Recognition.

VI SEMESTER

23ADS1603: Natural Language Processing

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Model linguistic phenomena with formal grammars. 2. Design, implement and test algorithms for NLP problems 3. Apply NLP techniques to design real world NLP applications

Unit I: Foundations of NLP	**7 Hrs.**
Introduction to NLP: History, levels, ambiguity, knowledge in language processing, stages, challenges, Applications of NLP,Morphology Fundamentals:Morphological diversity, morphology paradigms (English & Indian languages) ,Lexicon-free approaches ,Regular expressions, finite automata, FSTs, morphological parsing.	
Unit II: Language Modelling & Parsing Techniques	**8 Hrs.**
N-gram models: Language modeling, spelling correction, Parsing:Theories and algorithms of parsing,Robust & scalable parsing (e.g., web text),Rule-based and probabilistic parsing,Scope and attachment ambiguity resolution	
Unit III: Semantics and Word Sense Disambiguation	**8 Hrs.**
Lexical semantics: WordNet, Indian language WordNets, semantic roles, Multilingual dictionaries.Word Sense Disambiguation (WSD):Homonymy, Polysemy, Synonymy, Hyponymy,Dictionary-based and robust WSD techniques, Semantic analysis of sentence structures (noun, verb, and repositional phrases).	
Unit IV:	**7 Hrs.**
Pragmatics and discourse:Co-reference and reference resolution, Syntactic & semantic constraints on references NLP Applications (focus on Indian languages): Sentiment analysis ,Text entailment,Machine translation ,Question answering in multilingual setting, Cross-lingual Information Retrieval (CLIR)	
Total Lecture	**30 Hours**

Textbooks:	
1.	Speech and Language Processing:An Introduction to Natural Language Processing, Speech Recognition, and Computational Linguistics, Jurafsky, Daniel, and James, H. Martin, PrenticeHall, 2000
2.	Foundations of Statistical Natural Language Processing 1999 Christopher D. Manning and Hinrich Schütze, Cambridge, MIT Press,.

Reference Books:	
1.	Natural Language Understanding 2nd, 1995. James Allen Benjamin/Cummings
2.	Statistical Language Learning 1996 Eugene Charniak MIT Press
3.	Harald Clahsen, Andrew Redford, Linguistics 1999 Martin Atkinson, David Britain, Cambridge University Press

VI SEMESTER

23ADS1604: Lab Natural Language Processing

VI SEMESTER

23ADS1605 : Design Thinking in Artificial Intelligence and Data Science and Research Methodology

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Comprehend the foundational concepts of research methodology 2. Identify and formulate research problems and conduct effective literature reviews and adhere to ethical research practices 3. Collect and analyze data using appropriate methods. 4. Interpret research findings and write scientific reports.

Unit:1	**Foundations of Design Thinking in AI and Data Science**	**8 Hours**
Introduction to Design Thinking: Definition, Evolution & Relevance in AI and Data Science, Key Principles: Empathy, Ideation, Prototyping, Testing; The Five Stages of Design Thinking (Stanford d.school Model): Empathize, Define, Ideate, Prototype, Test – contextualized to AI/DS; Empathy in AI Design: Understanding the user and the dataset, Bias, fairness, and inclusivity in AI models; Problem Framing in Data Science: Moving from data availability to real problem statements, "How Might We…" questions for AI use-cases; Case Study Workshop: Example: Reframing a biased loan prediction algorithm, Activity: Empathy mapping for AI users (e.g., patients, customers)		
Unit:2	**Applying Design Thinking to AI & Data Science Projects**	**7 Hours**
Ideation for AI & Data Science Solutions: Brainstorming AI applications that solve real-world problems, Tools: SCAMPER, mind maps, etc.; Rapid Prototyping for Data Science: Designing user flows and interface mockups for AI-powered tools, Low-code/No-code AI prototypes (e.g., using tools like Teachable Machine); Testing and Feedback Loops: Interpretable AI: Making models explainable for non-tech users, Gathering feedback from users and stakeholders; Ethical & Human-Centric AI Design: Privacy, consent, transparency, Data biases and mitigation strategies; Capstone Mini Project: Group activity: Choose a domain (healthcare, retail, education, etc.), Apply all 5 stages of design thinking to an AI/DS problem, Present a concept prototype or solution proposal.		
Unit:3	**Research Fundamentals, Research Problem and Design, Literature Review**	**8 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. Contemporary Issues related to Topic		

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

Contemporary Issues related to Topic

Total Lecture Hours	**30 Hours**

Textbooks	
1	Idris Mootee - Design Thinking for Strategic Innovation
2	Ben Shneiderman- Human-Centered AI
3	Foster Provost and Tom Fawcett- Data Science for Business
4	Don Norman - *The Design of Everyday Things*
5	Jake Knapp- Sprint: *How to Solve Big Problems and Test New Ideas in Just Five Days*
6	C.R. Kothari – *Research Methodology: Methods and Techniques*, New Age International
7	Ranjit Kumar – *Research Methodology: A Step-by-Step Guide for Beginners*, Sage Publications.
Reference Books	
1	R. Panneerselvam – *Research Methodology*, PHI Learning.
2	Dawson, C. – *Practical Research Methods*, UBS Publishers.
3	Trochim, W.M.K. – *Research Methods: The Concise Knowledge Base*.
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	
MOOCs Links and additional reading, learning, video material	
1	**Stanford d.school resources** (free) https://dschool.stanford.edu/resources
2	**IDEO Design Thinking Toolkit (free): https://designkit.org/**

VI SEMESTER
23ADS1606: Lab : Competitive Coding

VI SEMESTER

23ADS1607: Project Phase-I

VI SEMESTER
23ADS1621 : PE-II: Business Intelligence

Course Outcomes :
Upon successful completion of the course the students will be able to • Understand the basic concepts of Business Intelligence, digital data types, multidimensional modelling and its applications in different technology domain. • Apply the ETL process to absorb the data in MDDM and statistical technique to understand data. • Analyze the data to identify digital data types, multidimensional schema and hidden pattern from data. • Design the MDDM and reports using the business concepts.

Unit I:	**7 Hrs.**
Introduction to Business Intelligence: Introduction to digital data and its types – structured, semi-structured and unstructured, BI Definitions & Concepts, BI Framework, BI Infrastructure Components – BI Process, BI Technology, BI Roles & Responsibilities, Business Applications of BI, BI best practices.	
Unit II:	**7 Hrs.**
Introduction to OLTP and OLAP (MOLAP, ROLAP, HOLAP) Introduction to Multi Dimensional Data Modeling: Introduction to data and dimension modeling, multidimensional data model, ER Modeling vs. multi-dimensional modeling, cubes, Identifying Dimension tables and fact table, attribute, hierarchies, star and snowflake schema, Data Warehousing concepts and its role in BI	
Unit III:	**8 Hrs.**
Basics of Data Integration (Extraction Transformation Loading): Concepts of data integration, needs and advantages of using data integration, introduction to common data integration approaches, Meta data – types and sources, Introduction to data quality, data profiling concepts and applications	
Unit IV:	**8 Hrs.**
Decision Making and Analytics: An Overview of Business Intelligence, Analytics, and Decision Support **Descriptive Analytics:** Introduction to Business Reporting, Visual Analytics, and Business Performance Management, **Predictive Analytics:** Introduction to Techniques for Predictive Modeling **Prescriptive Analytics:** Automated Decision Systems and Expert Systems, case study .	
Unit V:	**8 Hrs.**
Introduction to business metrics and KPIs, creating cubes using Microsoft Excel, Basics of Enterprise Reporting: A typical enterprise, Malcolm Baldrige - quality performance framework, balanced scorecard, enterprise dashboard, balanced scorecard vs. enterprise dashboard.	
Unit VI	**7 Hrs.**
Case study: Overview and use of products from open software. BI road Ahead: BI and mobility, BI and cloud computing, BI for ERP systems, Social CRM and BI.	
Total	**45 Hrs.**

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Textbooks:	
1.	R. N. Prasad, Seema Acharya, Fundamentals of Business Analytics, Wiley India
2.	Sam Anahory, Dennis Murray, Data Warehousing in the real world A practical guide for building Decision Support System, PEARSON

Reference Books:	
1.	Business Intelligence by David Loshin, Business Intelligence by David Loshin, Business Intelligence by David Loshin.
2.	Business intelligence for the enterprise by Mike Biere, Business intelligence for the enterprise by Mike Biere, Business intelligence for the enterprise by Mike Biere.

VI SEMESTER

23ADS1622 : PE-II: Lab: Business Intelligence

Course Outcomes
Upon successful completion of the course the students will be able to 1. Apply the ETL process to absorb the data in MDDM and statistical technique to understand data. 2. Design the MDDM and reports using the business concepts.

Minimum Eight Practical's to be performed from the list as below

SN	Experiments based on
1	By using excel, create a chart report, by considering module names on the X-axis, Various Modules on Y-axis. (Bar chart, pivot chart, pie chart, line chart, combo chart) Perform the Slice, Roll-up, Drill Down operations.
2	Perform Extract Transform Load (ETL) extracts data from data-sources, transforms it, cleans it in preparation for reports and analysis and loads it into a data warehouse.
3	Integration of SQL and Tableau.
4	To develop a dashboard that helps understand the factors impacting profit and loss, focusing on **sales trends over the past five years** and **regional variations**, you can structure the dashboard to include the following key elements:(Use Marketing and sales data, build insights from which decisions can be acted upon)
5	Develop Tableau Dashboard to analyze Netflix with OLAP system.
6	Identification of Dimension and Fact table and build star/snowflake model in Power BI by addressing the correct relationship 1:1,1:* , * : 1 and * :* etc.
7	Develop Power BI Dashboard : To provide real-time data on customer behavior and actions.

VI SEMESTER

23ADS1623 : PE-II Web Analytics

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Understand how website visitors view and interact with website pages and features. 2. Analyze data on customer purchasing patterns and demographics leading to business intelligence. 3. Understand demanding trends to make effective strategic decisions. 4. Perform web and text analytics.

Unit I:	**8 Hrs.**
An Overview of Business Intelligence, Analytics, and Decision Support, Changing Business Environments and Computerized Decision Support, Information Systems Support for Decision Making, The Concept of Decision Support Systems (DSS), Business Analytics Overview, Brief Introduction to Big Data Analytics.	
Unit II:	**7 Hrs.**
Text Analytics and Text Mining: Watson, Concepts and Definitions, Introduction to Natural Language Processing, Text Mining Applications, Text Mining Process, Text Mining Tools.	
Unit III:	**7 Hrs.**
Web Analytic fundamentals: Capturing data: Web logs or JavaScripts tags, Separate data serving and data capture, Type and size of data, Innovation, Integration, Selecting optimal web analytic tool, Understanding clickstream data quality, Identifying unique page definition, Using cookies, Link coding issues.	
Unit IV:	**8 Hrs.**
Web Metrics: Common metrics: Hits, Page views, Visits, Unique visitors, Unique page views, Bounce, Bounce rate, Page/visit, Average time on site, New visits; Optimization (e-commerce, non-e-commerce sites): Improving bounce rates, Optimizing adwords campaigns; Real time report, Audience report, Traffic source report, Custom campaigns, Content report, Introduction to Google analytics, Introduction to KPI, characteristics, Need for KPI, Perspective of KPI, Uses of KPI.	
Unit V:	**7 Hrs.**
Web analytics 2.0: Web analytics 1.0, Limitations of web analytics 1.0, Introduction to analytic 2.0, Competitive intelligence analysis : CI data sources, Toolbar data, Panel data ,ISP data, Search engine data, Hybrid data, Website traffic analysis: Comparing long term traffic trends, Analyzing competitive site overlap and opportunities.	
Unit VI:	**8 Hrs.**
Google Analytics: Brief introduction and working, Adwords, Benchmarking, Categories of traffic: Organic traffic, Paid traffic; Google website optimizer, Implementation technology, Limitations, Performance concerns, Privacy issues.	
	Total Lecture **45 Hours**

Textbooks:	
1.	Clifton B., Advanced Web Metrics with Google Analytics, Wiley Publishing, Inc. (2010), 2nd ed.
2.	Ramesh Sharda, Dursun Delen, Efraim Turban, Business Intelligence and Analytics: Systems for decision support, Pearson Education.

Reference Books:	
1.	Rajiv Sabherwal, Irma Becerra-Fernandez," Business Intelligence – Practice, Technologies and Management", John Wiley 2011.
2.	Lariss T. Moss, ShakuAtre, "Business Intelligence Roadmap", Addison-Wesley It Service.
3.	Kaushik A., Web Analytics 2.0 The Art of Online Accountability and Science of Customer Centricity, Wiley Publishing, Inc. (2010),1st ed.

MOOCs Links and additional reading, learning, video material	
1.	https://onlinecourses.nptel.ac.in/noc22_cs40/preview

VI SEMESTER
23ADS1624: PE-II Lab Web Analytics

Course Outcomes
Upon successful completion of the course the students will be able to 1. Understand the fundamentals of Business Intelligence, Decision Support Systems, and Big Data Analytics. 2. Apply text mining techniques and tools to extract insights from unstructured data. 3. Analyze website traffic data and evaluate web metrics for performance optimization. 4. Evaluate web analytics tools and competitive intelligence data to support digital strategy decisions.

Minimum Eight Practical's to be performed from the list as below

SN	Experiments based on
1	Create a Business Intelligence Dashboard using Excel/Power BI **Objective:** Understand how BI dashboards help in decision-making. **Tasks:** Import sample business data (e.g., sales, customer data), create visual reports using charts and slicers. **Tools:** Microsoft Power BI / Excel
2	Case Study Analysis of Decision Support System (DSS) Objective: Explore how organizations use DSS in real scenarios. Tasks: Select a company (e.g., Amazon, Uber), research their DSS implementation, and prepare a report. Tools: Internet research + documentation tools (Word/PPT)
3	Perform Basic Text Mining with Python (NLTK or spaCy) Objective: Extract insights from textual data. Tasks: Use Python to analyze sentiment, frequency of words from product reviews or tweets. Tools: Python, Jupyter Notebook, NLTK/spaCy
4	Use IBM Watson Natural Language Understanding (NLU) Objective: Analyze text using Watson's API. Tasks: Input a paragraph of news or blog content and extract keywords, sentiment, and emotion. Tools: IBM Cloud, Watson NLU
5	Capture and Analyze Web Log Data Objective: Understand how raw server logs track user behavior. Tasks: Use sample Apache or Nginx web logs, parse and visualize hit counts, IPs, pages accessed. Tools: Excel / Python (Pandas), WebLog Expert (optional)
6	Create a JavaScript Tag for Data Capture Objective: Learn how tracking scripts work on websites. Tasks: Insert a basic JavaScript snippet on a webpage to log page views and clicks. Tools: HTML, JavaScript, browser console

7	Analyze Website Metrics using Google Analytics Objective: Explore GA interface and key reports. Tasks: Use a Google Analytics demo account or personal website to analyze metrics like bounce rate, time on site, pageviews. Tools: Google Analytics
8	Define KPIs for a Website Objective: Design key performance indicators based on website goals. Tasks: Choose a website (e-commerce or blog), define 5 KPIs (e.g., conversion rate, bounce rate), and explain their significance. Tools: Documentation (Google Docs/Word), GA demo account
9	Perform Competitive Analysis using SimilarWeb or SEMrush Objective: Compare two websites based on traffic sources and user behavior. Tasks: Use SimilarWeb/SEMrush to compare analytics of two competitors (e.g., Flipkart vs. Amazon). Tools: SimilarWeb, SEMrush (free version or trial)
10	Analyze Long-Term Traffic Trends Objective: Identify patterns in traffic over time. Tasks: Use Google Trends or GA to compare seasonal/annual traffic for keywords or sites. Tools: Google Trends, Google Analytics
11	Set Up Google Analytics on a Test Website Objective: Understand how to implement and configure GA. Tasks: Create a test website or use Blogger/WordPress, insert GA tracking code, and verify data capture. Tools: Google Analytics, HTML editor
12.	Analyze Traffic Categories (Organic vs Paid) Objective: Understand traffic segmentation in GA. Tasks: Use Google Analytics demo account to view and compare organic, paid, and referral traffic. Tools: Google Analytics

VI SEMESTER
23ADS1627 : PE-II: GeoSpatial Data Intelligence

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Understand the core concepts and foundational principles of GIS analytics. 2. Apply spatial analysis techniques using vector and raster data for geospatial problem-solving. 3. Conduct spatial queries and perform statistical analyses on geographic data. 4. Interpret and visualize spatial patterns, relationships, and trends using geospatial tools. 5. Utilize GIS analytics in practical applications related to urban planning, environmental management, and transportation.

Unit I: Introduction to GIS Analytics	**7 Hrs.**
GIS analytics, Differences between mapping and spatial analysis, Types of spatial data: vector and raster, Applications of GIS analytics in the real world	
Unit II: Data Preparation and Management	**8 Hrs.**
Importing and cleaning spatial data, Attribute tables and data types, Spatial and attribute joins Coordinate systems and projections	
Unit III: Spatial Queries and Selections	**7 Hrs.**
Attribute-based queries: SQL in GIS, Location-based queries, Feature selection and extraction, Using queries for problem-solving	
Unit IV: Vector and Raster Analysis	**8 Hrs.**
Buffering and proximity analysis, Overlay analysis: union, intersect, Raster calculations and map algebra, Suitability analysis using raster layers	
Unit V: Spatial Statistics and Pattern Analysis	**7 Hrs.**
Basic spatial statistics: mean center, standard distance, Hotspot and cluster analysis, Visualizing spatial trends and distributions, Introduction to interpolation techniques: IDW, Kriging	
Unit VI: Applications	**8 Hrs.**
Case studies in urban planning, environment, and public health, Ethics and limitations in GIS analytics, Project: identify a problem, analyze spatial data, and present findings	
	Total Lecture **45 Hours**

Reference Books:	
1.	Geospatial Intelligence: Concepts, Methodologies, Tools, and Applications, IGI Global, First Edition (2019), ISBN: 978-1-5225-8054-6
2.	The Esri Guide to GIS Analysis, Volume 2: Spatial Measurements and Statistics, Esri Press, Second Edition (2021), ISBN: 978-1-58948-608-9
3.	Applied GIS and Spatial Analysis, Wiley, First Edition (2003), ISBN: 978-0-470-84409-0

VI SEMESTER

23ADS1628: PE-II : Lab : GeoSpatial Data Intelligence

Course Outcomes
Upon successful completion of the course the students will be able to
1. Prepare and manage geospatial data for analysis.
2. Extract information using spatial and attribute queries.
3. Perform key analytical operations with vector and raster data.
4. Analyze and interpret spatial patterns statistically.
5. Apply learned techniques in a real-world context through a mini-project.

Minimum Eight Practical's to be performed from the list as below

SN	Experiments based on
1	To become familiar with the GIS software interface and load different types of spatial data.
2	Learn how to view, edit, and clean attribute data.
3	Join external tabular data to spatial features.
4	Perform queries to filter spatial features.
5	Conduct proximity analysis using buffer tools.
6	Learn overlay techniques to analyze spatial relationships.
7	Analyze and visualize spatial patterns using statistical tools.
8	Apply GIS analytics skills in a real-world scenario.

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B. Tech SoE and Syllabus 2023

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

(Department of Computer Technology)

SoE No. 23ADS-101

B.Tech in Artificial Intelligence and Data Science

VI SEMESTER

23ADS1629 : Visual Anaytics

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Identify data and visualization types to derive insight. 2. Correlate data characteristics with appropriate visualization techniques. 3. Design and develop dashboards for informed decision-making.

Unit I:	**7 Hrs.**
Foundations of Data Visualization: Overview of data visualization concepts, history, and types of data. Data Abstraction and Task Abstraction models. Understanding the Four Levels of Validation. Scalar and point visualization: color maps, contouring, height plots. Vector visualization: properties, glyphs, and color coding. Visual variables and perception-based design.	
Unit II:	**8 Hrs.**
Visual Analytics & Geo-Spatial Visualization: Designing and analyzing Networks and Trees. Effective representation using tables and layout design. Color and channel manipulations in maps. Geospatial visualization techniques: Choropleth, Hexbin, Dot, Cluster, Cartogram maps. Using geospatial tools and interpreting results for location-based insights.	
Unit III:	**7 Hrs.**
Visualization Tools & Techniques: Introduction to R for visualization using ggplot2, plotly with datasets. Python tools: matplotlib, seaborn, altair, bokeh – comparisons and use cases. Introduction to Tableau: loading data, chart types, interactivity. Creating dashboards using Tableau and best practices.	
Unit IV:	**8 Hrs.**
Visualization of Complex Data Types: Time-series visualization techniques, trends, and forecasts. Text data visualizations: word clouds, keyword maps, and sentiment analysis. Matrix visualizations: adjacency and incidence matrices. Heat maps for density and correlation visualization. Multivariate data representation with parallel coordinates and radar charts.	
Unit V:	**7Hrs.**
Streaming Data Visualization: Introduction to streaming data concepts and use-cases. Architecture for streaming: Kafka, Flume, Spark Streaming. Tools and dashboards for real-time data. Challenges of latency and consistency. Visual analysis of dynamic datasets in finance and social media.	
Unit VI:	**8 Hrs.**
Dashboards & Emerging Trends: Principles and components of dashboard design. Use cases across finance, healthcare, insurance, and marketing. KPIs, filters, interactivity, and storytelling. Emerging trends: AR/VR visualizations, AI-assisted analysis, and ethical implications. Hands-on mini project and use of open-source platforms.	
Total Lecture	**45Hours**

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

Textbooks:	
1.	Tamara Munzer, Visualization Analysis and Design, CRC Press 2014.
2.	Aragues, Anthony. Visualizing Streaming Data: Interactive Analysis Beyond Static Limits. O'Reilly Media, Inc., 2018

Reference Books:	
1.	Chun-hauh Chen, W.K.Hardle, A.Unwin, Hand book of Data Visualization, Springer publication, 2016.
2.	Christian Toninski, Heidrun Schumann, Interactive Visual Data Analysis, CRC press publication,2020
3.	Alexandru C. Telea, Data Visualization: Principles and Practice, AK Peters, 2014.

MOOCs Links and additional reading, learning, video material	
1.	https://onlinecourses.nptel.ac.in/noc21_ge21/preview
2.	https://www.my-mooc.com/en/categorie/data-visualization

VI SEMESTER
23ADS1630 : Lab: Visual Analytics

Course Outcomes
Upon successful completion of the course the students will be able to 1. Effectively apply diverse visualization techniques to analyze and interpret various data types. 2. Create interactive dashboards and real-time visualizations to aid decision-making across domains. 3. Execute end-to-end data visualization projects from data cleaning to insightful storytelling using multiple tools.

Minimum Eight Practical's to be performed from the list as below

SN	Experiments based on
1	Visualizing Different Data Types and Basic Charts: **Problem Statement:** Given a mixed dataset containing numerical, categorical, and ordinal variables (e.g., sales data with product categories, quantities, and ratings), create appropriate visualizations (bar charts, histograms, box plots) to summarize and interpret the data distribution and key trends.
2	Scalar and Vector Visualization Techniques **Problem Statement:** You have a dataset containing wind speed and direction measurements at various locations. Use scalar and vector visualization techniques such as contour plots, color maps, and vector glyphs to represent wind patterns and intensity effectively.
3	Visual Analytics with Networks, Trees, and Tables: **Problem Statement:** Analyze a social network dataset representing connections between users. Visualize the network graph, highlight important nodes, and present hierarchical relationships using tree diagrams and summary tables to explore the structure and influence of users.
4	Geo-Spatial Data Visualization using Choropleth and Cluster Maps: **Problem Statement:** Using a dataset of COVID-19 cases by region, create a choropleth map to visualize infection density, a cluster map to identify hotspots, and other geo-spatial visualizations that help in understanding the spatial spread of the disease.
5	Time-Series and Heatmap Visualizations: **Problem Statement :** Given temperature readings collected hourly over a year, generate time-series visualizations (line graphs, area charts) and heatmaps to identify seasonal trends, anomalies, and patterns in the data.

6	Interactive Dashboard Creation: **Problem Statement:** Build an interactive dashboard for a retail company that includes sales, inventory, and customer feedback data. The dashboard should allow filtering by product categories, time periods, and geographic locations to support management's decision-making process.
7	Streaming Data Visualization: **Problem Statement :** Implement a live data visualization dashboard that displays streaming data such as stock prices or sensor readings. The dashboard should update in real-time and provide meaningful visual insights like trend lines and alerts.
8	Case Study: End-to-End Visualization Project: **Problem Statement:** Select a publicly available dataset (e.g., from Kaggle or government portals) related to environment, health, or finance. Perform data cleaning, exploratory analysis, and create multiple visualizations including dashboards to convey insights that support informed decisions.

VI SEMESTER
23ADS1631 : DOT NET Full Stack Development

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Understand the fundamentals of the .NET Framework and develop basic C# console applications using control flow and error handling constructs. 2. Apply Object-Oriented Programming concepts in C# to create modular, reusable, and maintainable applications. 3. Develop dynamic web applications using ASP.NET Core MVC and RESTful APIs with proper routing, views, and controllers. 4. Integrate relational databases using Entity Framework Core to perform CRUD operations, manage data models, and ensure secure data access. 5. Design responsive web interfaces using HTML5, CSS, and JavaScript and integrate them with .NET Core backend applications.

Unit I:	**7 Hrs.**
Introduction to .NET and C#: Understanding the .NET Framework, Overview of C# Programming Language, Installing Visual Studio IDE, Writing Your First C# Program, Variables, Data Types, and Operators, Control Flow (if statements, loops), Methods and Functions, Debugging and Error Handling	
Unit II:	**7 Hrs.**
Object-Oriented Programming (OOP) with C#: Introduction to Object-Oriented Programming (OOP), Classes and Objects, Encapsulation and Access Modifiers, Inheritance and Polymorphism, Interfaces and Abstract Classes, Exception Handling and Custom Exceptions, Working with Collections (Lists, Arrays), Design Patterns in C#	
Unit III:	**8 Hrs.**
.NET Core and ASP.NET Core: Introduction to .NET Core and ASP.NET Core, Setting Up .NET Core Development Environment, Building Web Applications with ASP.NET Core MVC, Routing and Controllers, Views and Razor Syntax, Model Binding and Validation, Middleware and Configuration, Building RESTful APIs with ASP.NET Core	
Unit IV:	**8 Hrs.**
Entity Framework and Database Integration: Introduction to Entity Framework Core, Creating Database Models, CRUD Operations with Entity Framework, Data Annotations and Fluent API, Working with Migrations, Advanced Querying and LINQ, Using Repository Pattern, Securing APIs and Data Access	
Unit V:	**7Hrs.**

Frontend Development with HTML, CSS, and JavaScript: Introduction to Frontend Development, HTML5 Markup and Elements, CSS Styling and Layout, JavaScript Fundamentals, DOM Manipulation and Events, Frontend Libraries (e.g., Bootstrap), Building Responsive Web UIs, Integrating Frontend with .NET Core		
Unit VI:		**8 Hrs.**
Single-Page Applications (SPA) with Angular/React/Vue: Introduction to SPAs and Frontend Frameworks, Setting Up Angular/React/Vue, Components and Routing, State Management, Services and API Integration, Form Handling and Validation, Building SPAs with Authentication, Optimizing SPA Performance		
	Total Lecture	**45 Hours**

Textbooks:	
1.	**"C# 10 and .NET 6 – Modern Cross-Platform Development"** Mark J. Price, Packt Publishing Latest (6th or 7th Edition preferred) *Coverage*: Unit I, II, III (C#, OOP, .NET Core basics)
2.	**"Entity Framework Core in Action"** Jon P Smith, Publisher: Manning Publications Edition: Second Edition, Coverage: Unit IV (EF Core, Database Integration, Migrations, LINQ)
3.	**"Web Design with HTML, CSS, JavaScript and jQuery Set"** Jon Duckett, Publisher: Wiley, Coverage: Unit V (Frontend Development)
4.	**"Pro Angular"** Adam Freeman, *Publisher*: Apress, *Edition*: Latest, *Coverage*: Unit VI (Angular SPA development) **OR "Learning React"***Alex Banks & Eve Porcello, Publisher: O'Reilly Media, Coverage: Unit VI (React SPA development)*

Reference Books:	
1.	**"The C# Programming Yellow Book"** Rob Miles, *Publisher*: Self-published, *Free PDF Available Coverage*: Unit I, II (Beginner to Intermediate C#)
2.	**"ASP.NET Core in Action"** Andrew Lock, *Publisher*: Manning Publications, *Edition*: Second Edition, *Coverage*: Unit III (ASP.NET Core in depth)
3.	**"Front-End Development Projects with HTML, CSS, and JavaScript"** Peter Smith *Publisher*: Packt Publishing, *Coverage*: Unit V (Hands-on frontend projects)
4.	**"Vue.js Up and Running"** Callum Macrae, *Publisher*: O'Reilly Media, *Coverage*: Unit VI (Vue.js for SPA)

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	
MOOCs Links and additional reading, learning, video material	
1.	https://onlinecourses.nptel.ac.in/noc22_cs40/preview

VI SEMESTER

23ADS1632 : LAB DOT NET Full Stack Development

Course Outcomes
Upon successful completion of the course the students will be able to 1. Apply C# programming constructs including data types, control flow, functions, and exception handling to develop console-based applications. 2. Implement Object-Oriented Programming concepts in C# using classes, inheritance, polymorphism, interfaces, and collections. 3. Develop ASP.NET Core MVC applications using routing, controllers, views, and RESTful APIs with model binding and validation. 4. Integrate and manage databases using Entity Framework Core, including data modeling, CRUD operations, LINQ queries, and validation. 5. Design responsive front-end interfaces using HTML, CSS, JavaScript, and Bootstrap, and integrate them with .NET Core backend services.

Minimum Eight Practical's to be performed from the list as below

SN	Experiments based on
1	Implement a program using different data types, variables, and arithmetic operators.
2	Create a C# program demonstrating control flow using **if-else**, **switch**, and loops (**for**, **while**).
3	Write a program using user-defined methods and function overloading.
4	Develop a program to demonstrate exception handling using **try-catch-finally**.
5	Implement a program demonstrating classes, objects, and access modifiers.
6	Create a C# program that demonstrates inheritance and polymorphism.
7	Build a program using interfaces and abstract classes.
8	Write a program that creates and manages a collection using **List<T>** and **Array**.
9	Implement a simple design pattern (e.g., Singleton or Factory) in C#.
10	Create an ASP.NET Core MVC application with routing, controller, and views.
11	Develop a simple RESTful API using ASP.NET Core with GET and POST endpoints.
12	Implement form input with model binding and server-side validation.
13	Use middleware for logging or error handling in an ASP.NET Core project.
14	Create a code-first Entity Framework Core model and generate a database using migrations.

15	Implement CRUD operations using Entity Framework Core in an ASP.NET Core application.
16	Apply data annotations and Fluent API for model validation and relationships.
17	Perform advanced LINQ queries on a sample database.
18	Create a responsive web page using HTML5 and CSS3.
19	Implement JavaScript functions for DOM manipulation and handling events.
20	Use Bootstrap to design a responsive form and integrate it with a .NET Core backend.
21	Develop a simple frontend UI with user input that connects to an ASP.NET Core API.

VI SEMESTER
23ADS1641 : Internet of Things

Course Outcomes :
Upon successful completion of the course the students will be able to Understand IOT architecture and its enabling technologies. 1. Analyze IOT environments using various communication technologies. 2. Apply various IOT enabling technologies for creation of IOT environments.

Unit I:	**8 Hrs.**
Introduction : 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, IOT Protocols. Application layer: MQTT, COAP, XMPP, AMQP, Communication protocols: IEEE802.15.4, ZigBee, Wireless HART, Zwave, Bluetooth, NFC, RFID	
Unit II:	**7 Hrs.**
Wireless Sensor networks: Components of sensor nodes, Node Behavior in WSNs, Applications, WSN Coverage, OGDC algorithm, Stationary and Mobile Wireless Sensor Networks.	
Unit III:	**7 Hrs.**
Cloud Computing: 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 IV:	**8 Hrs.**
Machine to Machine Communication: Node types, IP and Non IP based M2M network, Interoperability in Internet of Things: Current Challenges in IoT, Interoperability, Types of Interoperability,**Software-Defined Networking** SDN Architecture, OpenFlow Protocol, APIs in SDN, Controller Placement.	
	Total Lecture **30 Hours**

Textbooks:	
1.	**Internet of Things (A Hands-on-Approach) by** Vijay Madisetti and Arshdeep Bahga
2.	**Rethinking the Internet of Things: A Scalable Approach to Connecting Everything by** Francis daCosta

Reference Books:	
1.	**From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence by** Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle.

VI SEMESTER
23ADS1642 : Internet of Things Lab

Course Outcomes
Upon successful completion of the course the students will be able to 1. Demonstrate IOT architecture and its enabling technologies. 2. Develop various IOT environments

Minimum Eight Practical's to be performed from the list as below

SN	Experiments based on
1	To study IoT Kit
2	Design a sketch for running of LED's
3	Design a sketch to monitor state of switch by establishing serial communication between Arduino and computer.
4	Design a sketch to read analog value of potentiometer by establishing serial communication between Arduino and computer.
5	Design a sketch for blinking LED's without using delay
6	Design a sketch to develop switch based binary LED counter. Also observe output on serial monitor.
7	Design a sketch to create a simple digital clock using LCD display.
8	Design a sketch to make use of EEPROM to control devices(LED)
9	To log data of temperature sensor over internet and monitor it from anywhere in the world

VI SEMESTER

23ADS1643 : PE-III Reinforcement Learning

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Demonstrate various Components of Reinforcement Learning. 2. Make use of various exploration and exploitation strategies. 3. Apply Model based and Model Free Prediction techniques. 4. Make use of different value based Reinforcement Learning Algorithms. 5. Demonstrate various Policy based Reinforcement Learning Algorithms.

Unit I:	**6 Hrs.**
Introduction: Deep Reinforcement Learning, Suitability of RL, Components of Reinforcement Learning -Agent, Environment, Observations, Actions, Example-The Bandit Walk Environment, Agent-Environment interaction cycle, MDP (Markov Decision Process): The engine of the Environment-States, Actions, Transition Function, Reward Signal.	
Unit II:	**6 Hrs.**
Planning: Objective of a decision making agent-environment, Plan, Optimal policy, Comparison of Policies, Bellman Equation/State-Value Function, Action-Value Function **Exploitation and Exploration of Reinforcement Learning:** Bandits- Single-state decision problem(Multi-Armed Bandit(MAB) problem), Greedy Strategy, Random Strategy, Epsilon-Greedy Strategy, Decaying Epsilon-Greedy Strategy.	
Unit III:	**6 Hrs.**
Model Free Reinforcement Learning: Monte Carlo Prediction (MC), First-Visit MC (FVMC), Every-Visit MC (EVMC), Temporal Difference Learning (TD), Learning to estimate from multiple steps, N-step TD learning,	
Unit IV:	**6 Hrs.**
Monte Carlo control, SARSA: On-Policy TD control, **Q-learning:** Off-Policy TD control, Double Q-learning, **Model Based Reinforcement Learning:** Dyna-Q, Trajectory sampling.	
Unit V:	**6 Hrs.**
Value Based Reinforcement Learning: Deep reinforcement learning agents with sequential feedback, evaluative feedback, sampled feedback, Function Approximation for Reinforcement Learning- high-dimensional state and action spaces, , Neural Fitted Q (NFQ).	
Unit VI:	**6 Hrs.**
Policy Based Reinforcement Learning: Policy Gradient and Actor-Critic Methods—REINFORCE Algorithm and Stochastic Policy Search ,Asynchronous Advantage Actor-Critic (A3C), Generalized Advantage Estimation (GAE), Advantage Actor-Critic(A2C), Deep Deterministic Policy Gradient (DDPG), Twin-Delayed DDPG (TD3).	
Total Lecture	**36 Hours**

Textbooks:	
1.	Miguel Morales, Grokking Deep Reinforcement Learning, Manning Publications, 2020

Reference Books:	
1.	Richard S. Sutton and Andrew G. Barto, Reinforcement learning: An Introduction, Second Edition, MIT Press, 2019.
2.	Marco Wiering, Martijn van Otterlo(Ed),Reinforcement Learning, State-of-the-Art, Adaptation, Learning, and Optimization book series, ALO, volume 12, Springer, 2012
3	. Keng, Wah Loon, Graesser, Laura, Foundations of Deep Reinforcement Learning: Theory and Practice in Python, Addison Wesley Data & Analytics Series, 2020.
4	Francois Chollet, Deep Learning with Python, Manning Publications, 2018.

MOOCs Links and additional reading, learning, video material	
1.	http://cse.iitkgp.ac.in/~adas/courses/rl_aut2021/syllabus.html

VI SEMESTER
23ADS1644 : PE-III- Lab Reinforcement Learning

Course Outcomes
Upon successful completion of the course the students will be able to
CO1: Apply reinforcement learning algorithms to solve control problems in simulated environments. CO2: Evaluate and compare value-based and policy-based learning methods for agent performance

Minimum Eight Practical's to be performed from the list as below

SN	Experiments based on
1	**Multi-Armed Bandit with Epsilon-Greedy Strategy** Implement a simple Multi-Armed Bandit problem and solve it using the epsilon-greedy exploration strategy. Plot the average reward and understand how exploration helps in better decision-making.
2	**Monte Carlo Value Estimation on FrozenLake** Use Monte Carlo First-Visit method to estimate the value function of different states in the FrozenLake environment. Compare it with the Every-Visit method.
3	**Temporal Difference (TD(0)) Learning on FrozenLake** Apply TD(0) to learn the value of states from episodes without waiting for the episode to finish. Compare the value estimates with Monte Carlo methods.
4	**SARSA vs Q-learning on FrozenLake** Implement both SARSA (On-Policy) and Q-learning (Off-Policy) algorithms. Train agents and compare their performance on the FrozenLake environmen
5	**Dyna-Q – Model-Based Learning in GridWorld** Introduce a simple grid environment and apply the Dyna-Q algorithm which combines learning from experience and simulated planning steps.
6	**Deep Q-Learning (DQN) on CartPole** Build a simple DQN using a neural network to play the CartPole game. Use experience replay and target network for stable training.
7	**Policy Gradient using REINFORCE Algorithm** Implement the REINFORCE algorithm on CartPole using a simple neural network policy to learn directly from rewards and gradients.
8	**Advantage Actor-Critic (A2C) on CartPole** Apply & implement A2C to train an agent on the CartPole environment using a separate actor and critic network for better learning performance.

VI SEMESTER

23ADS1647: PE-III: Introduction to Salesforce

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Apply the knowledge of customer-centered organization and implement the integral processes within an organization that are automated and how does the automation create predictability and efficiencies. 2. Analyze business intelligence, cross selling/up selling, customer loyalty, continuous improvement and quality programs that have been the direct and ongoing result of implementing CRM applications. Solve queries based on relational algebra & SQL. 3. Design and customize a CRM application for organization to suit their business needs

Unit I:	**7 Hrs.**
Introduction to Salesforce CRM: Salesforce, Types of Salesforce Clouds and their features, Industry Clouds in salesforce. **CRM Administration and Data Model Design:** Lightning and classic UI and differences, Object Manager, App Manager, Setup, App creation, tabs, Types of Objects, Data Types, Sandboxes, Understanding Relationships and its limitations, Types of Relationship and their differences, Junction Object, formulas, Dependency picklist fields, Validation Rules.	
Unit II:	**8 Hrs.**
Data Management with CRM Tool: Record details, List Views, Filters, Actions Page layouts, Compact Layouts, Introduction to Lightning flows (Auto triggered and Screen flow), email templates, approval processes, Community Creation, Reports and Dashboards. **Security Model:** Introduction to Profiles and Permission Set, Pemission Set Group, Overview of Data Security, Control access to org, object, field, record, OWD, Role and Roles Hierarchy, Sharing Rule, Sharing sObjects, Apex Sharing.	
Unit III:	**7 Hrs.**
CRM Tool Development: Introduction to Apex, Collections, SOQL and SOSL, DML Operations, Controllers In APEX, Email Service Using Apex Class and Triggers, Asynchronous APEX, Batch APEX, Apex Test Classes. Some Important Governor Limits (like SOQL limit, DML limit etc. Introduction to use of AI in Salesforce: Agentforce for developers, Agents, Prompt and Data Cloud.	
Unit IV:	**8 Hrs.**
Lightning Web Component: Introduction to Aura and LWC and difference between them. Decorators in LWC like wire, api and track. Lightning Data Service, Imperative Apex call from LWC, Parent child LWC component communication using custom events. Use of LMS (Lightning Message Service) for communicating between unrelated components, Navigation Mixin	
Total	**30 Hrs.**

VI SEMESTER

23ADS1648: PE-III: Lab Introduction to Salesforce

Course Outcomes
Upon successful completion of the course the students will be able to 1. Explain the value of relationship management strategy. 2. Implement cloud-based solutions for customers using Salesforce CRM tool 3. Help teams articulate their CRM goals and identify key milestone in the relationship management process. 4. Demonstrate the use of Lightning Component Framework.

SN	Experiments based on
1	A] Introduction Cloud Computing and its Services. B] Introduction to Salesforce CRM.
2	A] Creation of Custom Objects in salesforce Lightning and apply validations on different fields. B] To create Look-up and Master Details Relationship with objects.
3	A] To implement formula field. B] To form dependencies among fields.
4	To create a domain specific schema builder.
5	A] To create clone user and assigned permissions B] To perform OWD operations.
6	Create lightning flow in salesforce: A] Auto triggered flow B] Screen flow
7	To create Email templates in salesforce Lightning. Send Email using flows.
8	A] Write an Apex code to perform the DML Operations on Standard or the Custom objects created by the user. B] Write Test class to cover the same C] Use of Agentforce for developers to document, explain and create test classes
9	Write Async Apex (Batch class)
10	A] Create Resource Resource, Connected App and test with workbench/postman B] Write a Apex class to do Basic Http Request Callout and related configuration like Named Credentials or Remote Site Settings
11	A] Create a Hello LWC Component B] Create a Hello Aura Component. Understand difference with respect to syntax
12.	A] LWC Component showing use of LDS. B] LWC Component showing use of wire to fetch the backend data C] LWC Component to do imperative call
13	A] Use of events in LWC to communicate between Parent and Child component B] Use of LMS for communication between unrelated components
14.	Group Mini Project

VI SEMESTER
MDM4ADS104 : Introduction to Big Data Analytics

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Understand the characteristics of big data and concepts of Hadoop ecosystem. 2. Understand the concepts of Scala programming. 3. Apply Mapreduce programming model to process big data.

Unit I:	**6 Hrs.**
Introduction to Big data: Introduction – Big Data- Characteristics of Big Data – Big data management architecture- Examining Big Data Types – Big Data Technology Components -– Big data analytics – Big data analytics examples - Web Data Overview – Web Data in Action.	
Unit II:	**6 Hrs.**
Hadoop : Introduction – History of Hadoop - Hadoop Ecosystem- Analyzing data with Hadoop - Hadoop Distributed File System- Design - HDFS concepts - Hadoop filesystem –Data flow – Hadoop I/ O - Data integrity – Serialization - Setting up a Hadoop cluster - Cluster specification - cluster setup and installation	
Unit III:	**6 Hrs.**
MapReduce: Introduction – Understanding Map, Reduce functions - Scaling out - Anatomy of a MapReduce Job Run - Failures – Shuffle and sort - Mapreduce types and formats - features – counters - sorting - Mapreduce Applications – Configuring and setting the environment - Unit test with MR unitlocal test	
Unit IV:	**6 Hrs.**
Spark: – Installing spark – Spark applications, Jobs, Stages and Tasks –Resilient Distributed databasesAnatomy of a Spark Job Run – Spark on YARN- SCALA: Introduction- Classes and objects- Basic types and operators- built-in control structures- functions and closures- inheritance	
Total Lecture	**36 Hours**

Textbooks:	
1.	"Hadoop: The Definitive Guide "Third Edit on Tom White O'reily Media, 2012
2.	"Big Data Analytics" First Edition Seema Acharya, Subhasini Chellappan " Wiley 2015.

Reference Books:	
1.	"Taming the Big Data Tidal wave "Bill Franks (2012). John Wiley & Sons
2.	"Programming in Scala", Second Edition, Martin Odersky, Lex Spoon, Bill Venners (2010) Artima Press, California.
3	"Professional NoSQL"Shashank Tiwari (2011). John Wiley & Sons

MOOCs Links and additional reading, learning, video material	
1.	https://onlinecourses.nptel.ac.in/noc20_cs92/preview
2	https://onlinecourses.swayam2.ac.in/arp19_ap60/preview

VI SEMESTER

Mandatory Learning Course (Audit Course)

MLC2126 : YCAP6