Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

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

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Technology

SoE & Syllabus 2023

1st to 6th Semester

(Department of Computer Science & Engineering)

B. Tech in Computer Science and Engineering

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.TECH SCHEME OF EXAMINATION 2023

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

(Department of Computer Science & Engineering)

B. Tech in Computer Science & Engineering

SoE No. 23CSE-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-B)															
1	1	BS	GE	23GE1103	Differential Equations and Complex Analysis	T	3	0	0	3	3	30	20	50	3
2	1	BS	GE	23GE1110	Applied Physics	T	3	0	0	3	3	30	20	50	3
3	1	BS	GE	23GE1111	**Lab:** Applied Physics	P	0	0	2	2	1		60	40	
4	1	BES	ME	23ME1101	Engineering Graphics	T	1	0	0	1	1	30	20	50	3
5	1	BES	ME	23ME1102	**Lab :** Engineering Graphics	P	0	0	4	4	2		60	40	
6	1	BES	EL	23EL1101	Basic Electrical and Electronics Engineering	T	3	0	0	3	3	30	20	50	3
7	1	BES	CT	23CT1103	**Lab :** Computer WorkShop	P	0	0	2	2	1		60	40	
8	1	PC	CSE	23CSE1101	Object Oriented Programming using Python	T	3	0	0	3	3	30	20	50	3
9	1	PC	CSE	23CSE1102	**Lab :** Object Oriented Programming using Python	P	0	0	2	2	1		60	40	
10	1	VSEC	GE	23GE1117	Get Set Go	…	…	…	…	…	2		60	40	
11	1	CC2	GE		**Liberal Learning Course (LLC2)**	…	…	…	…	…	2		60	40	
					TOTAL FIRST SEM		**13**	**0**	**10**	**23**	**22**				
MANDATORY LEARNING COURSES															
1	1	HS		GE2131	Universal Human Values (UHV)	**A**	2	0	0	2	0				
SECOND SEMESTER (GROUP-B)															
1	2	BS	GE	23GE1201	Calculus and Vector	T	3	0	0	3	3	30	20	50	3
2	2	BS	GE	23GE1206	Engineering Chemistry	T	3	0	0	3	3	30	20	50	3
3	2	BS	GE	23GE1207	**Lab:** Engineering Chemistry	P	0	0	2	2	1		60	40	
4	2	HS/AEC1	GE	23GE1212	Professional Communication	T	2	0	0	2	2	30	20	50	2
5	2	HS/IKS	GE	23GE1215	Indian Knowledge System	T	2	0	0	2	2	30	20	50	2
6	2	BES	CV	23CV1201	Engineering Mechanics	T	3	0	0	3	3	30	20	50	3
7	2	BES	CV	23CV1202	**Lab:** Engineering Mechanics	P	0	0	2	2	1		60	40	
8	2	BES	IT	23IT1203	Programming for Problem Solving	T	2	0	0	2	2	30	20	50	2
9	2	BES	IT	23IT1204	**Lab:** Programming for Problem Solving	P	0	0	2	2	1		60	40	
10	2	VSEC	GE	23GE1218	Functional English	…	…	…	…	…	2		60	40	
11	2	CC1	GE		**Liberal Learning Course (LLC1)**	…	…	…	…	…	2		60	40	
					TOTAL SECOND SEM		**15**	**0**	**6**	**21**	**22**				

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

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

(Department of Computer Science & Engineering)

B. Tech in Computer Science & Engineering

SoE No. 23CSE-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	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

MSEs* = Two MSEs of 15 Marks each will conducted and marks of these 2 MSEs will be considered for Continuous Assessment

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

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

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

Applicable for AY 2023-24 Onwards

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							L	T	P	Hrs		MSEs*	TA**	ESE	
THIRD SEMESTER															
1	3	HSSM-1	GE	23GE1301	Fundamentals of Management & Economics	T	2	0	0	2	2	30	20	50	3
2	3	BS	GE	23GE1303	Linear Algebra	T	3	0	0	3	3	30	20	50	3
3	3	PC	CSE	23CSE1301	Computer Architecture & Organization	T	3	0	0	3	3	30	20	50	3
4	3	PC	CSE	23CSE1302	Data structures	T	3	0	0	3	3	30	20	50	3
5	3	PC	CSE	23CSE1303	**Lab :** Data structures	P	0	0	2	2	1		60	40	
6	3	PC	CSE	23CSE1304	**Lab :** Programming with JAVA	P	0	0	2	2	1		60	40	
7	3	VEC-2	CSE	23CSE1305	Digital & Tecnological Solution / Understanding India-**Ethics in IT**	T	2	0	0	2	2	30	20	50	3
8	3	CEP	CSE	23CSE1306	Community Engagement Project	P	0	0	2	4	2		60	40	
9	3	OE-1	OE		**Open Elective - I**	T	2	0	0	2	2	30	20	50	3
10	3	MDM			**MD Minor Course - I**	T	2	0	0	2	2	30	20	50	3
					Total		**17**	**0**	**6**	**25**	**21**				

List of Mandatory Learning Course (MLC)															
1	3	HS	T&P	MLC2123	**YCAP3 :** YCCE Communication Aptitude Preparation	**A**	3	0	0	3	**0**				

Open Elective - I

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

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

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

(Department of Computer Science & Engineering)

B. Tech. in Computer Science & Engineering

SoE No. 23CSE-101

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
FOURTH SEMESTER															
1	4	HSSM-2	GE	23GE1401	Entrepreneurship Development	T	2	0	0	2	2	30	20	50	3
2	4	**AEC-2**	GE	23GE1405 23GE1406	Marathi Language / Hindi Language	T	2	0	0	2	2	30	20	50	3
3	4	VEC-1	CV	23CV1411	Environmental Sustainability, Pollution and Management	T	2	0	0	2	2	30	20	50	3
4	4	PC	CSE	23CSE1401	Discrete Mathematics and Graph Theory	T	3	0	0	3	3	30	20	50	3
5	4	PC	CSE	23CSE1402	Operating system	T	3	0	0	3	3	30	20	50	3
6	4	PC	CSE	23CSE1403	**Lab :** Operating system	P	0	0	2	2	1		60	40	
7	4	PC	CSE	23CSE1404	Introduction to data analysis	T	3	0	0	3	3	30	20	50	3
8	4	PC	CSE	23CSE1405	**Lab :** Introduction to data analysis	T	0	0	2	2	1		60	40	
9	4	VSEC-3	CSE	23CSE1406	**Lab :** Vocational & Skill Enhancement - Web Technology	P	0	0	2	4	2		60	40	
10	4	OE-2	OE		**Open Elective - II**	T	2	0	0	2	2	30	20	50	3
11	4	MDM	CSE		**MD Minor Course - II**	T	2	0	0	2	2	30	20	50	3
					TOTAL		**19**	**0**	**6**	**27**	**23**				

List of Mandatory Learning Course (MLC)															
1	4	HS	T&P	MLC2124	**YCAP4 :** YCCE Communication Aptitude Preparation	**A**	3	0	0	3	**0**				

Open Elective - II

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

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SoE No. 23CSE-101

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
FIFTH SEMESTER															
1	5	PC	CSE	23CSE1501	Theory of computation	T	3	0	0	3	3	30	20	50	3
2	5	PC	CSE	23CSE1502	Database management systems	T	3	0	0	3	3	30	20	50	3
3	5	PC	CSE	23CSE1503	**Lab :** Database management systems	P	0	0	2	2	1		60	40	
4	5	PC	CSE	23CSE1504	Design and Analysis of Algorithms	T	3	0	0	3	3	30	20	50	3
5	5	PC	CSE	23CSE1505	**Lab :** Design and Analysis of Algorithms	P	0	0	2	2	1		60	40	
6	5	PC	CSE	23CSE1506	**Lab :** Open Source Tools	P	0	0	2	2	1		60	40	
7	5	PE	CSE		**Professional Elective I**	T	3	0	0	3	3	30	20	50	3
8	5	PE	CSE		**Lab : Professional Elective I**	P	0	0	2	2	1		60	40	
9	5	OE-3	OE		**Open Elective -III**	T	3	0	0	3	3	30	20	50	3
10	5	MDM	CSE		**MD Minor Course-III**	T	3	0	0	3	3	30	20	50	3
11	5	STR	CSE	23CSE1507	Intership, Seminar and Report	P	0	0	2	2	1		60	40	
					TOTAL		**18**	**0**	**10**	**28**	**23**				
List of Mandatory Learning Course (MLC)															
1	5	HS	T&P	MLC2125	**YCAP5 :** YCCE Communication Aptitude Preparation	**A**	3	0	0	3	**0**				

Professional Elective - I

1	5	PE-I	CSE	23CSE1521	**PE-I :** Digital Image Processing
2	5	PE-I	CSE	23CSE1522	**PE-I : Lab :** Digital Image Processing
3	5	PE-I	CSE	23CSE1523	**PE-I :** Business Intelligence
4	5	PE-I	CSE	23CSE1524	**PE-I : Lab :** Business Intelligence
5	5	PE-I	CSE	23CSE1525	**PE-I :** Mobile Application Development
6	5	PE-I	CSE	23CSE1526	**PE-I : Lab :** Mobile Application Development
7	5	PE-I	CSE	23CSE1527	**PE-I :** Internet of Things
8	5	PE-I	CSE	23CSE1528	**PE-I : Lab :** Internet of Things
9	5	PE-I	CSE	23CSE1529	**PE-I :** Introduction to geographical information system
10	5	PE-I	CSE	23CSE1530	**PE-I : Lab :** Introduction to geographical information system
11	5	PE-I	CSE	23CSE1531	**PE-I :** Neural networks and applications
12	5	PE-I	CSE	23CSE1532	**PE-I : Lab :** Neural networks and applications
13	5	PE-I	CSE	23CSE1533	**PE-I :** Advanced web technology
14	5	PE-I	CSE	23CSE1534	**PE-I : Lab :** Advanced web technology Lab
15	5	PE-I	CSE	23CSE1535	**PE-I :** Customer Relationship Management
16	5	PE-I	CSE	23CSE1536	**PE-I : Lab :** Customer Relationship Management

Coursera Electives

1	5	PE-I	PC	23CSE1537	PE-I : IBM Generative AI Engineering Professional Certificate
2	5	PE-I	PC	23CSE1538	PE I : **Lab.:** IBM Generative AI Engineering Professional Certificate

Open Elective - III

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

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							L	T	P	Hrs		MSEs*	TA**	ESE	
SIXTH SEMESTER															
1	6	PC	CSE	23CSE1601	Machine Learning	T	3	0	0	3	3	30	20	50	3
2	6	PC	CSE	23CSE1602	**Lab :** Machine Learning	P	0	0	2	2	1		60	40	
3	6	PC	CSE	23CSE1603	Language Processors	T	3	0	0	3	3	30	20	50	3
4	6	PC	CSE	23CSE1604	Lab : Language Processors	P	0	0	2	2	1	60	40		
5	6	PC	CSE	23CSE1605	Design Thinking and Research Methodology	T	2	0	0	2	2	30	20	50	3
6	6	PE	CSE		**Professional elective-II**	T	3	0	0	3	3	30	20	50	3
7	6	PE	CSE		**Professional elective-III**	T	3	0	0	3	3	30	20	50	3
8	6	PE	CSE		**Professional elective-IV**	T	3	0	0	3	3	30	20	50	3
9	6	MDM	MDM		**MD Minor Course-IV**	T	3	0	0	3	3	30	20	50	3
10	6	**VSEC-4**	CSE	23CSE1606	**Lab :** Vocational & Skill Enhancement -Linux Administration and shell programming	P	0	0	2	4	2		60	40	
11	6	STR	CSE	23CSE1607	Project Phase-I	P	0	0	4	4	2		60	40	
					TOTAL		**20**	**0**	**10**	**32**	**26**				

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

Professional Elective - II					
1	6	PE-II	CSE	23CSE1621	**PE-II :** Big Data Analytics
2	6	PE-II	CSE	23CSE1622	**PE-II :** Computer Graphics
3	6	PE-II	CSE	23CSE1623	**PE-II :** Parallel computing
4	6	PE-II	CSE	23CSE1624	**PE-II :** Game Theory
5	6	PE-II	CSE	23CSE1625	**PE-II :** Real time system
6	6	PE-II	CSE	23CSE1626	**PE-II :** Cloud Computing
7	6	PE-II	CSE	23CSE1627	**PE-II :** Management Information system
8	6	PE-II	CSE	23CSE1628	**PE-II :** Digital Marketing Analytics

Professional Elective - III					
1	6	PE-III	CSE	23CSE1641	**PE-III :** Financial Data analysis
2	6	PE-III	CSE	23CSE1642	**PE-III :** Augmented Reality
3	6	PE-III	CSE	23CSE1643	**PE-III :** Information Retrieval System
4	6	PE-III	CSE	23CSE1644	**PE-III :** Optimization Techniques
5	6	PE-III	CSE	23CSE1645	**PE-III :** Human Computer interaction
6	6	PE-III	CSE	23CSE1646	**PE-III :** Blockchain Technology
7	6	PE-III	CSE	23CSE1647	**PE-III :** Bioinformatics
8	6	PE-III	CSE	23CSE1648	**PE-III :** Software Defined Network
9	6	PE-III	CSE	23CSE1649	**PE-III :** Soft Computing

Professional Elective - IV					
1	6	PE-IV	CSE	23CSE1661	**PE IV :** GPU architecture and Programming
2	6	PE-IV	CSE	23CSE1662	**PE IV :** Quantum Computing
3	6	PE-IV	CSE	23CSE1663	**PE IV :** Prompt Engineering
4	6	PE-IV	CSE	23CSE1664	**PE IV :** Nature Inspired Computing
5	6	PE-IV	CSE	23CSE1665	**PE IV :** Distributed Computing
6	6	PE-IV	CSE	23CSE1666	**PE IV :** Industry 4.0
7	6	PE-IV	CSE	23CSE1667	**PE IV :** Distributed Database Management System
8	6	PE-IV	CSE	23CSE1668	**PE IV :** Data Mining
9	6	PE-IV	CSE	23CSE1669	**PE-IV** : Product Development

Coursera Electives					
1	6	PE-IV	CSE	23CSE1670	PE-IV: IBM Deep Learning with PyTorch, Keras and Tensorflow Professional Certificate
		PE-IV	CSE	23CSE1671	PE-IV: **Lab.** IBM Deep Learning with PyTorch, Keras and Tensorflow Professional Certificate

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

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

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

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Technology

SoE & Syllabus 2023

1st Semester

(Department of Computer Science & Engineering)

B. Tech in Computer Science and Engineering

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.TECH SCHEME OF EXAMINATION 2023

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

(Department of Computer Science & Engineering)

B. Tech in Computer Science & Engineering

SoE No. 23CSE-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-B)															
1	1	BS	GE	23GE1103	Differential Equations and Complex Analysis	T	3	0	0	3	3	30	20	50	3
2	1	BS	GE	23GE1110	Applied Physics	T	3	0	0	3	3	30	20	50	3
3	1	BS	GE	23GE1111	**Lab:** Applied Physics	P	0	0	2	2	1		60	40	
4	1	BES	ME	23ME1101	Engineering Graphics	T	1	0	0	1	1	30	20	50	3
5	1	BES	ME	23ME1102	**Lab :** Engineering Graphics	P	0	0	4	4	2		60	40	
6	1	BES	EL	23EL1101	Basic Electrical and Electronics Engineering	T	3	0	0	3	3	30	20	50	3
7	1	BES	CT	23CT1103	**Lab :** Computer WorkShop	P	0	0	2	2	1		60	40	
8	1	PC	CSE	23CSE1101	Object Oriented Programming using Python	T	3	0	0	3	3	30	20	50	3
9	1	PC	CSE	23CSE1102	**Lab :** Object Oriented Programming using Python	P	0	0	2	2	1		60	40	
10	1	VSEC	GE	23GE1117	Get Set Go	…	…	…	…	…	2		60	40	
11	1	CC2	GE		**Liberal Learning Course (LLC2)**	…	…	…	…	…	2		60	40	
					TOTAL FIRST SEM		**13**	**0**	**10**	**23**	**22**				
MANDATORY LEARNING COURSES															
1	1	HS		GE2131	Universal Human Values (UHV)	**A**	2	0	0	2	0				
SECOND SEMESTER (GROUP-B)															
1	2	BS	GE	23GE1201	Calculus and Vector	T	3	0	0	3	3	30	20	50	3
2	2	BS	GE	23GE1206	Engineering Chemistry	T	3	0	0	3	3	30	20	50	3
3	2	BS	GE	23GE1207	**Lab:** Engineering Chemistry	P	0	0	2	2	1		60	40	
4	2	HS/AEC1	GE	23GE1212	Professional Communication	T	2	0	0	2	2	30	20	50	2
5	2	HS/IKS	GE	23GE1215	Indian Knowledge System	T	2	0	0	2	2	30	20	50	2
6	2	BES	CV	23CV1201	Engineering Mechanics	T	3	0	0	3	3	30	20	50	3
7	2	BES	CV	23CV1202	**Lab:** Engineering Mechanics	P	0	0	2	2	1		60	40	
8	2	BES	IT	23IT1203	Programming for Problem Solving	T	2	0	0	2	2	30	20	50	2
9	2	BES	IT	23IT1204	**Lab:** Programming for Problem Solving	P	0	0	2	2	1		60	40	
10	2	VSEC	GE	23GE1218	Functional English	…	…	…	…	…	2		60	40	
11	2	CC1	GE		**Liberal Learning Course (LLC1)**	…	…	…	…	…	2		60	40	
					TOTAL SECOND SEM		**15**	**0**	**6**	**21**	**22**				

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

Nagar Yuwak Shikshan Sanstha's

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B.TECH SCHEME OF EXAMINATION 2023

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

(Department of Computer Science & Engineering)

B. Tech in Computer Science & Engineering

SoE No. 23CSE-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	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

MSEs* = Two MSEs of 15 Marks each will conducted and marks of these 2 MSEs will be considered for Continuous Assessment

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

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

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

Applicable for AY 2023-24 Onwards

I SEMESTER

23GE1103: Differential Equations and Complex Analysis

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

Unit I: Differential Equations I	**(7 Hrs.)**
Linear differential equations of first order and first degree, Differential equation reducible to linear form, Exact differential equations (excluding the case of integrating factor) and their applications to various fields. **(Contemporary Issues related to Topic)**	
Unit II: Differential Equations II	**(8 Hrs.)**
Higher order linear differential equations with constant coefficients, Complementary functions and Particular Integral for different cases, Method of variation of parameters, Examples on application to various fields. **(Contemporary Issues related to Topic)**	
Unit III: Differential Equations III	**(7 Hrs.)**
Cauchy's homogeneous linear differential equations, Legendre's linear differential equations, Applications of differential equations to various fields (only up to second order). **(Contemporary Issues related to Topic)**	
Unit IV: Partial Differential Equations	**(8 Hrs.)**
Partial Differential Equations of first order, first degree i.e. Lagrange's form, linear homogeneous equations of higher order with constant coefficient. Application of variable separable method to solve first and second order partial differential equations. **(Contemporary Issues related to Topic)**	
Unit V: Complex Number	**(8 Hrs.)**
Basic concepts of complex numbers and its various forms. Separation of real and imaginary parts, De Moivre's theorem, Application of De Moivre's theorem, Exponential function of complex numbers, Circular function of complex numbers, Hyperbolic function and their inverse, Logarithm of a complex number. **(Contemporary Issues related to Topic)**	
Unit VI: Complex Variables	**(7 Hrs.)**
Analytic function, Cauchy-Riemann conditions, Harmonic functions, Finding Harmonic conjugates, Taylor's and Laurent's Theorem (statement only), Examples on Taylor's and Laurent's Theorem, Evaluation integral by using Residue theorem. **(Contemporary Issues related to Topic)**	
Total Lecture	**45 Hours**

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

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

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Applied%20Sciences%20&%20Humanities/Mathematics%20and%20Humanities/

MOOCs Links and additional reading, learning, video material	
1.	https://nptel.ac.in/courses/111103070
2.	https://onlinecourses.nptel.ac.in/noc19_ma28/preview
3.	https://nptel.ac.in/courses/111/106/111106100/

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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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

I SEMESTER

23GE1110 : Applied Physics

Course Outcomes :

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

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

Unit I: Quantum Physics	**(8 Hrs.)**
Wave particle duality, Davisson and Germer experiment, Wave packet, Heisenberg's uncertainty principle, thought experiment, Significance, Applications. **(Contemporary Issues related to Topic)**	
Unit II: Introduction to Quantum Computing	**(7 Hrs.)**
Introduction of complex numbers, operators, Eigen values, Eigen functions. Wave function and its probability interpretation, Schrodinger Equation, Particle in infinite and finite potential well, quantum tunneling, Introduction to Bits and Qubits. **(Contemporary Issues related to Topic)**	
Unit III: Band Theory of Solids	**(8 Hrs.)**
Formation of energy bands in solids; Classification of solids, Energy band diagram of Si and Ge, Intrinsic and extrinsic semiconductors, Conductivity, Law of mass action, Hall effect, Direct and Indirect band gap semiconductors. **(Contemporary Issues related to Topic)**	
Unit IV: Electron Ballistics and Devices	**(9 Hrs.)**
Motion of a charged particle in uniform electric and magnetic field, Cross field configuration; Electron refraction, Electron lens. Cathode ray oscilloscope and its application. **(Contemporary Issues related to Topic)**	
Unit V: Lasers	**(7 Hrs.)**
Coherence and its types, Interaction of radiation with matter, Population Inversion, Pumping: methods and schemes, Optical resonant cavity, Ruby laser, He-Ne laser, diode laser, Properties and engineering applications of laser. **(Contemporary Issues related to Topic)**	

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

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

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

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

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

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

I SEMESTER

23GE1111 : 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.

I SEMESTER

23ME1101 : Engineering Graphics

Course Outcomes :
Upon successful completion of the course the students will be able to
1. Construct orthographic drawing and isometric drawing of a given object
2. Evaluate Projections of various One Dimensional, Two dimensional, Three dimensional objects
3. Develop the lateral surfaces of various solids, their section and intersection.
4. Practice the use of software tools used for Two dimensional drawings.

Unit I: Theory of Orthographic Projections:	**(3 Hrs.)**
Introduction, Quadrant system, Theory of orthographic projection, Projection method and principal planes, First and Third angle projections,	
Unit II: Theory of Isometric Projections:	**(2 Hrs.)**
Theory of isometric projection, Method for drawing isometric views, Different problems on isometric projections.	
Unit III: Lines:	**(2 Hrs.)**
Projection of points, Projection of lines, True lengths and inclinations, apparent lengths and inclinations, various positions of lines in different quadrants, Traces of lines, projection of line on auxiliary plane.	
Unit IV: Planes and Solids:	**(4 Hrs.)**
Projection planes: (Polygonal Lamina, Circular Lamina), Projection of Perpendicular planes and oblique planes. Auxiliary views (Auxiliary planes) Projection of Solids :(Inclined to One Plane Only) - Polyhedra (Regular and Irregular Polyhedra), Solids of Revolution	
Unit V: Section of Solids and Development of Surfaces:	**(2 Hrs.)**
Types of Section planes, Sectional top view, True shape. Development of different solids using Radial line and parallel line methods.	
Unit VI: Intersection of Surfaces of solids:	**(2 Hrs.)**
Intersection between similar solids, Intersection between dissimilar solids, Lines and Curves of Intersection.	
Total Lecture	**15 Hours**

Textbooks:	
1.	D.M. Kulkarni, A. P. Rastogi and A. K. Sarkar , Engineering Graphics with AutoCAD PHI learning Pvt. Ltd., Revised Edition(2014),
2.	N. D. Bhatt ,Engineering Drawing Charotar Publishing House Pvt. Ltd, 53 rd Edition 2017

Reference Books:	
1.	D. A. Jolhe Engineering Drawing , Tata McGraw Hill Publications , 2008,
2.	K. L. Narayana & P. Kannaiah , Engineering Drawing SciTech Publication , 2010
3.	R. K. Dhawan Engineering Drawing S. Chand Publication Multicolor revised edition 2015

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	Intranet on address 172.16.1.10. data/CCC/software / AutoCAD Software Setup.

MOOCs Links and additional reading, learning, video material	
1.	https://youtube.com/playlist?list=PLLy_2iUCG87Bw9XPfEF3r3EW5UlAOv8iz
2.	Eng https://nptel.ac.in/courses/112105294

I SEMESTER

23ME1102 : Lab. Engineering Graphics

Course Outcomes :
Upon successful completion of the course the students will be able to
1. Construct orthographic drawing and isometric drawing of a given object
2. Evaluate Projections of various One Dimensional, Two dimensional, Three dimensional objects
3. Develop the lateral surfaces of various solids, their section and intersection**.**
4. Practice the use of software tools used for Two dimensional drawings.

Practical's to be performed from the list as below

SN	**Experiments based on**	**No.of Practical's**
1	Introduction of AutoCAD Basic Commands	02
2	Orthographic Projection	03
3	Isometric Projection	03
4	Projection of Straight Line	03
5	Projection of Planar Surface	03
6	Projection of Solid	03
7	Section and Development of Solid	04
8	Intersection of Surfaces	03
9	Drawing Sheet 1: Convention for various lines, Dimensioning and Orthographic Projection	02
10	Drawing Sheet 2: Projection of line, planar surface or solid. (Any one)	02
	Total Practical's	**28 Hours**

I SEMESTER

23EL1101 : 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

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

MOOCs Links and additional reading, learning, video material	
1.	https://onlinecourses.nptel.ac.in/noc22_ee113/preview

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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)

B.Tech in Computer Technology

SoE No. 23CT-101

I SEMESTER

23CT1103 : Lab. Computer WorkShop

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Understand the fundamentals of computer hardware and working of Linux operating system 2. Use Linux commands to manage files and file systems 3. Execute Scripts 4. Debug Programs on various IDEs

Unit I: Computer Hardware	**(4 Hrs.)**
Computer Hardware, RAM, HDD, Levels of Caches, Setting environment variables, Installation of software in Linux, Installing printers	
Unit II: Introduction to Linux/Unix OS	**(4 Hrs.)**
Introduction to Linux/Unix OS - ls, wc, chdir, mkdir, chmod, cd, mv, df, du, netstat, ps, more, set, env, setenv, chgrp, man, rm, rmdir, grep, vi, tar, untar, uuencode, find, cat, history, ping, ifconfig, traceroute	
Unit III: Unix tools	**(4 Hrs.)**
Unix tools - Awk, sed, Emacs	
Unit IV: Scripting	**(4 Hrs.)**
Scripting – variables, conditionals, loops, finding logged in users , Parameter passing to C program from shell (argc / argv)	
Unit V: Installing Linux (or any variant)	**(4 Hrs.)**
Installing Linux (or any variant): Introduction to using different tools for identification of possible errors in C program – gdb, concepts of "core dump", backtracing using "bt", using "info" to dump all registers, creating watch-list / watch variables. DDD (Data Display Debugger) – introduction and usage	
Unit VI: IDE for code development	**(4 Hrs.)**
IDE for code development Using DevCpp and/or VisualStudio, Create a project using multiple .c and .h files with cross-refrences, Setting compiler options and linker options, Understanding different settings	
Total Lecture	**24 Hours**

Textbooks:	
1.	Linux Pocket Guide, Daniel J. Barrett, 3rd edition, O'Reilly Media
2.	The Linux Command Line, William Shotts, 2nd edition, No Starch Press
3.	Linux for Beginners, Jason Cannon, 1st edition, Independently Published

Reference Books:	
1.	Linux Command Line and Shell Scripting Bible, Richard Blum, 3rd edition, Wiley
2.	Command Line Kung Fu, Jason Cannon, 1st edition, Independently Published

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

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/SERIES%20WISE%20BOOKS/COMPUTER%20TECHNOLOGY/COMPUTER%20TECHNOLOGY%20(G%20Series).pdf
2	chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/SERIES%20WISE%20BOOKS/COMPUTER%20TECHNOLOGY/COMPUTER%20TECHNOLOGY%20(I%20Series).pdf
3	chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/SERIES%20WISE%20BOOKS/COMPUTER%20TECHNOLOGY/COMPUTER%20TECHNOLOGY%20(PE%20Series).pdf

MOOCs Links and additional reading, learning, video material	
1.	https://www.youtube.com/watch?v=19O5kFdtKb0
2.	https://www.youtube.com/watch?v=ZtqBQ68cfJc
3.	https://www.youtube.com/watch?v=kfjDWygSvnw
4.	https://www.youtube.com/watch?v=GtovwKDemnI&t=1578s
5.	https://www.youtube.com/watch?v=J7L2x1ATOgk
6.	https://www.youtube.com/watch?v=85FrhrIwBtw

Course Outcomes

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

1. Understand the fundamentals of computer hardware and working of Linux operating system
2. Use Linux commands to manage files and file systems
3. Execute Scripts
4. Debug Programs on various IDEs

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

SN	Experiments based on
1	Installation of various software in Linux environment
2	Basics of Linux commands and its use
3	Programs based on Scripting
4	Execution of C Program through command line argument
5	Debugging in Turbo C and DEVC++
6	Debugging using gdb debugger
7	Create project using multiple C files
8	Exploring various text editors in Linux: AWK, SED, Emacs

I SEMESTER

23CSE1101 : Object Oriented Programming using Python

Course Outcomes :

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

1. Understand the basic data types, built in data structures, control statements and loops and write simple programs in Python.
2. Apply the concepts of functions modules and packages and write programs using them.
3. Design and develop classes in Python.
4. Solve real world problems and develop interesting applications using Python

Unit:1	**Introduction to Python**	**6 Hours**
Build-in Data types & variables, arithmetic operators, Bitwise operators, relational and logical operators, assignment statement, print & input function, Strings, and string operations, mutable versus immutable data types, Standard library functions		
Unit:2	**Decision making and Loops**	**6 Hours**
Decision making: if, if-else & nested if- else statements, loop statements: for, while and continue and break statements, Programs for computing GCD, LCD, Taylor's series expansion, bisection method, etc. Real world problem solving based on decision making and looping statements.		
Unit:3	**Object Oriented Concepts**	**7 Hours**
Features of object oriented programming, Python Objects and Classes: defining classes, member variables, doc strings for classes, private members, dunder methods, Operator Overloading, designing custom classes.		
Unit:4	**Object Oriented Features & Data Structures**	**7 Hours**
Inheritance, Encapsulation, Polymorphism, function overloading versus overriding, Abstract base class, composition. Built in data structures: Lists, Dictionaries, Tuples, Sets, and Arrays, mutability. Usage and Comparison of built in data structures, in Python.		
Unit:5	**Function, Module & Packages**	**6 Hours**
User defined Functions, returning values, keyword arguments and default values, local & global variables, doc strings for functions, developing useful functions, Modules and Packages, import statement.		
Unit :6	**Exception handling & Application Development**	**6 Hours**
Exception handlining, Basics of file handling, developing useful applications using built in and custom modules and packages. Developing real world applications in Python		
	Total Lecture Hours	**38 Hours**

Textbooks:	
1	Python 3 Object Oriented Programming second Edition, Dusty Phillip, Packt Publishing
2	Fundamental of Python: First Programs, Kenneth A. Lambert, Cengage
3	Python Programming, A Modular Approach, Sheetal Taneja and Naveen Kumar, Pearson

Reference Books:	
1	Introduction to Computation and Programming Using Python, John V. Guttag, Second Edition,2016, PHI EEE (MIT Press).
2.	Python for Programmers, Paul Deitel and Harvey Deitel, Pearson
3.	Learn Python Programming, Fabrizio Romano, Heinrich Kruger, Third Edition, 2020, PACKT Publishing

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/python-basics-sample-chapters.pdf
2	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/practical-machine-learning-python-problem-solvers.pdf

MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc20_cs70/preview
2	https://onlinecourses.nptel.ac.in/noc20_cs83/preview

I SEMESTER

23CSE1102 : Lab. Object Oriented Programming using Python

Course Outcomes :
Upon successful completion of the course the students will be able to
1. Implement solution to the real-world problems using various Python features

Sr. No.	Experiments based on
MSPA-1	Writing simple programs using various operators and decision making and loops.
MSPA-2	Writing real world programs using user defined classes, functions and modules
MSPA-3	Writing real world programs using object oriented features and built in data structures.
MSPA-4	Develop an useful real world application using files, modules and packages, and exception handling

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2023

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

(Department of Civil Engineering)

B.Tech in FYC

SoE No. 23FY-101

I SEMESTER

23GE1117-Get Set Go

Course Outcomes:

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

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

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

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

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

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

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

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Technology

SoE & Syllabus 2023

2nd Semester

(Department of Computer Science & Engineering)

B. Tech in Computer Science and Engineering

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.TECH SCHEME OF EXAMINATION 2023

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

(Department of Computer Science & Engineering)

B. Tech in Computer Science & Engineering

SoE No. 23CSE-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-B)															
1	1	BS	GE	23GE1103	Differential Equations and Complex Analysis	T	3	0	0	3	3	30	20	50	3
2	1	BS	GE	23GE1110	Applied Physics	T	3	0	0	3	3	30	20	50	3
3	1	BS	GE	23GE1111	**Lab:** Applied Physics	P	0	0	2	2	1		60	40	
4	1	BES	ME	23ME1101	Engineering Graphics	T	1	0	0	1	1	30	20	50	3
5	1	BES	ME	23ME1102	**Lab :** Engineering Graphics	P	0	0	4	4	2		60	40	
6	1	BES	EL	23EL1101	Basic Electrical and Electronics Engineering	T	3	0	0	3	3	30	20	50	3
7	1	BES	CT	23CT1103	**Lab :** Computer WorkShop	P	0	0	2	2	1		60	40	
8	1	PC	CSE	23CSE1101	Object Oriented Programming using Python	T	3	0	0	3	3	30	20	50	3
9	1	PC	CSE	23CSE1102	**Lab :** Object Oriented Programming using Python	P	0	0	2	2	1		60	40	
10	1	VSEC	GE	23GE1117	Get Set Go	…	…	…	…	…	2		60	40	
11	1	CC2	GE		**Liberal Learning Course (LLC2)**	…	…	…	…	…	2		60	40	
					TOTAL FIRST SEM		**13**	**0**	**10**	**23**	**22**				
MANDATORY LEARNING COURSES															
1	1	HS		GE2131	Universal Human Values (UHV)	**A**	2	0	0	2	0				
SECOND SEMESTER (GROUP-B)															
1	2	BS	GE	23GE1201	Calculus and Vector	T	3	0	0	3	3	30	20	50	3
2	2	BS	GE	23GE1206	Engineering Chemistry	T	3	0	0	3	3	30	20	50	3
3	2	BS	GE	23GE1207	**Lab:** Engineering Chemistry	P	0	0	2	2	1		60	40	
4	2	HS/AEC1	GE	23GE1212	Professional Communication	T	2	0	0	2	2	30	20	50	2
5	2	HS/IKS	GE	23GE1215	Indian Knowledge System	T	2	0	0	2	2	30	20	50	2
6	2	BES	CV	23CV1201	Engineering Mechanics	T	3	0	0	3	3	30	20	50	3
7	2	BES	CV	23CV1202	**Lab:** Engineering Mechanics	P	0	0	2	2	1		60	40	
8	2	BES	IT	23IT1203	Programming for Problem Solving	T	2	0	0	2	2	30	20	50	2
9	2	BES	IT	23IT1204	**Lab:** Programming for Problem Solving	P	0	0	2	2	1		60	40	
10	2	VSEC	GE	23GE1218	Functional English	…	…	…	…	…	2		60	40	
11	2	CC1	GE		**Liberal Learning Course (LLC1)**	…	…	…	…	…	2		60	40	
					TOTAL SECOND SEM		**15**	**0**	**6**	**21**	**22**				

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

Nagar Yuwak Shikshan Sanstha's

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B.TECH SCHEME OF EXAMINATION 2023

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

(Department of Computer Science & Engineering)

B. Tech in Computer Science & Engineering

SoE No. 23CSE-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	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

MSEs* = Two MSEs of 15 Marks each will conducted and marks of these 2 MSEs will be considered for Continuous Assessment

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

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

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

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Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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B. Tech SoE and Syllabus 2023

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

(Department of Mathematics & Humanities)

SoE No. 23FY-101

B.Tech First Year

II SEMESTER

23GE1201: Calculus and Vector

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

Unit I: Differential Calculus	**(7 Hrs.)**
Successive differentiation, n^{th} derivative of rational function, Trigonometrical transformations, n^{th} derivative of the product of two functions (Leibnitz's theorem), Taylor's theorem, Use of Maclaurin's theorem for one variable, standard expansions, Examples on Taylor's Theorem. **(Contemporary Issues related to Topic)**	
Unit II: Partial Differentiation	**(8 Hrs.)**
Derivative of Functions of several variables, First and higher order derivatives, Homogeneous functions, Euler's theorem on homogeneous function, Chain rule and total differential coefficient of composite functions, Jacobians, Properties of Jacobians, Relation between functions **(Contemporary Issues related to Topic)**	
Unit III: Integral Calculus	**(7 Hrs.)**
Gamma function, Transformation of Gamma functions, Beta function, Transformation of Betta functions, Properties of Beta function (without proof), Relation between Beta and Gamma functions, Differentiation under Integral sign (Leibniz rule) **(Contemporary Issues related to Topic)**	
Unit IV: Multiple integrals	**(8 Hrs.)**
Double integral, change of order of integral, change of variables, triple integrals and its applications on Area, Mass,Centre of Gravity, Volume. **(Contemporary Issues related to Topic)**	
Unit V: Vector Calculus	**(7 Hrs.)**
Vector fields, Vector differentiation, Gradient, Divergence and Curl, Directional derivatives with physical interpretation, Solenoidal and irrotational motions. (Contemporary Issues related to Topic) **(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**

			July,2023	1.00	Applicable for AY 2023-24 Onwards
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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

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B. Tech SoE and Syllabus 2023

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

(Department of Applied Chemistry)

B.Tech 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.)**

			July,2025	1.00	Applicable for AY 2025-26 Onwards
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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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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 Mathematics & Humanities)

B.Tech First Year

SoE No. 23FY-101

II SEMESTER

23GE1212 : Professional 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, Classification of Barriers (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 & Interview Skills	**(7 Hrs.)**
Presentation-Nuances of presentation- Kinesics, Proxemics, Chronemics, Vocalics, Modes of Presentation, Interview-Purpose , expectations of employer and preparation for Interview, Types, Types of Questions &Answering Techniques, Telephonic Interviews – preparation and guidelines	
Unit IV: Technical Reports, Memo & E-Mail Etiquettes	**(8 Hrs.)**
Report -Types, Characteristics, prewriting aspects of report and preparing writing of reports 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
3.	

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

Reference Books:	
1.	Dale Carnegie ,How to Develop Self – Confidence & Influence People by Public Speaking
2.	Asha Kaul, Communication Skills
3.	Allen Peas ,Body Language
4.	Gerson's Gerson, Technical Communication

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

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B. Tech SoE and Syllabus 2023

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(Department of Mathematics & Humanities)

B.Tech First Year

SoE No. 23FY-101

II SEMESTER

23GE1215 : 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

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

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

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

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

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

B. Tech SoE and Syllabus 2023

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

(Department of Civil Engineering)

B.Tech in Civil Engineering

SoE No. 23CV-101

II SEMESTER

23CV1201 : Engineering Mechanics

Course Outcomes :

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

1. Describe the fundamental concepts of statics and dynamics.
2. Apply the basic concepts of applied mechanics for solution of problems on planar force system.
3. Determine the properties of surface like centroid, moment of inertia, etc. for planar surfaces and mass moment of inertia for rigid body.
4. Analyze pin jointed truss frame structure and beam structure analytically and graphically.
5. Evaluate the dynamic variables of kinetics of particles and simple lifting machine

Unit I: Resultant of planar force System	**(7 Hrs.)**
Fundamental concepts, system of forces, laws of mechanics, principle of transmissibility of force, Moment of force, Principle of moment, Couple, Resultant of a planar force system, Equivalent force couple system. **(Contemporary Issues related to Topic)**	
Unit II: Equilibrium of planar force System	**(6 Hrs.)**
Free body diagrams, Conditions of equilibrium, types of supports, types of beams, types of loads on beam, Equilibrium of a planar force system **(Contemporary Issues related to Topic)**	
Unit III: Friction and Trusses	**(7 Hrs.)**
Friction: Coulomb's laws of dry friction, plane friction, belt friction. Trusses: Types of trusses, assumptions in analysis of truss, Analysis of truss by method of joint. **(Contemporary Issues related to Topic)**	
Unit IV: Properties of Surfaces	**(6 Hrs.)**
Centroid: Introduction, First Moment of Area, Centroid of composite areas. Moment of Inertia: Introduction, Second Moment of Area, Polar moment of Inertia, Radius of Gyration, Transfer formula for moment of Inertia, Product of Inertia, Moment of Inertia, and product of inertia for composite areas, Principal Moments of Inertia. **(Contemporary Issues related to Topic)**	
Unit V: Virtual Work Method and Kinetics of Particle	**(7 Hrs.)**
Virtual Work Method: Introduction, Principle of virtual work, Application to beam and frame. Kinetics of Particle: Introduction, Newton's law of motion for a Particle, D' Alembert's principle, Translation of particle and connected system. **(Contemporary Issues related to Topic)**	
Unit VI: Work Energy and Impulse Momentum Method	**(6 Hrs.)**
Work Energy Method: Introduction, Work energy equation for translation, Work energy applied to particle motion and connected system. Impulse Momentum Method: Introduction, Linear Impulse momentum, Conservation of linear momentum, coefficient of restitution, elastic impact, Impulse momentum in plane motion. **(Contemporary Issues related to Topic)**	
Total Lecture	**39 Hours**

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

Textbooks:	
1.	Nelson A., Engineering Mechanics (Statics and Dynamics), ed 2009, Tata Mc. Grew Hill Education Pvt. Ltd., New Delhi, 2009.
2.	Dubey N.H., Engineering Mechanics (Statics and Dynamics) first edition 2013, Tata Mc. Graw Hill Education Pvt. Ltd., New Delhi, 2013.
3.	Singer F.L, Engineering Mechanics (Statics and Dynamics), Harper and Rowe publication, New Delhi, 1994.
Reference Books:	
1.	Timoshenko S, Young D.H and Rao J.V, Engineering Mechanics, Mc. Graw Hill Publication, New Delhi, 2007.
2.	Bhattacharyya B., Engineering Mechanics, Oxford University Press, New Delhi, 2008.
3.	Hibbeler R.C, Engineering Mechanics (Statics and Dynamics), Pearson Publication, Singapore, 2000.
4.	Shames I.H. and Rao J.V., Engineering Mechanics (Statics and Dynamics), First Edition, Pearson Publication, New Delhi, 2003.
5.	Beer F.P. and Johnston E.R; Vector Mechanics for Engineers, 9th edition Tata Mc. Graw Hill Publication, New Delhi. 2007.
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Civil%20Engineering/78.%20Engineering-Mechanics-Statics-and-Dinamics-E-W-Nelson-C-L-Best-W-G-McLean-1st-Ed-1997-Schaum-Outline-McGraw-Hill%20(1).pdf
2	chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Civil%20Engineering/79.%20Engineering%20Mechanics.%20Statics-%20MERIAM%20%20AND%20KRAIGE.pdf
3	chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Civil%20Engineering/81.%20Engineering%20Mechanics%201.pdf
MOOCs Links and additional reading, learning, video material	
1.	https://www.youtube.com/watch?v=nGfVTNfNwnk
2.	https://www.youtube.com/watch?v=6nguX-cEsvw
3.	https://nptel.ac.in/courses/112103108

II SEMESTER
23CV1202 : Lab. Engineering Mechanics

Course Outcomes
Upon successful completion of the course the students will be able to 1. Describe the fundamental concepts of statics and dynamics. 2. Apply the basic concepts of applied mechanics for solution of problems on planar force system. 3. Determine the properties of surface like centroid, moment of inertia, etc. for planar surfaces and mass moment of inertia for rigid body. 4. Analyze pin jointed truss frame structure and beam structure analytically and graphically. 5. Evaluate the dynamic variables of kinetics of particles and simple lifting machine

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

SN	Experiments based on
1	To find determine the support reactions of a Simply Supported Beam experimentally and analytically.
2	To determine the forces in the members of a Jib Crane Apparatus experimentally and graphically.
3	To determine the coefficient of friction between two surfaces of different material on Plane Friction Apparatus.
4	To determine the coefficient of friction of Coil Friction Apparatus.
5	To determine the forces in members of a Shear Leg Apparatus experimentally and manually.
6	To determine the mass moment of inertia of a fly wheel using Fly Wheel Apparatus
7	To determine efficiency and law of machine of Differential Axel & Wheel machine.
8	To determine efficiency and Law of machine of Single Purchase Crab machine.
9	To determine efficiency and Law of machine of Double Purchase Crab machine.
10	To verify law of polygonal of forces using Law of Polygon Apparatus.
11	To find support reactions of a simply supported beam using graphical method and hand calculation.
12.	To find the forces in the member of truss using graphical method and hand calculation.
13.	To find (1) Principle moment of inertia and (2) Moment of inertia and product of inertia about any inclined axis for a composite figure using Mohr's circle and hand calculation,

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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 Information Technology)

B.Tech in Information Technology

SoE No. 23IT-101

II SEMESTER

23IT1203 : Programming for Problem Solving

Course Outcomes :
1) Understand the basics of computer system operations and algorithms, flowcharts.
2) Apply the basics of C programming for problem solving.
3) Apply and analyze the different dimensional arrays for problem solving.
4) Understand the basics of string, structure, and union and apply them to problem solving.

Unit I: Computer System Basics:	**(3 Hrs.)**
Basics of programming and problem solving. Introduction to algorithms and flowcharts, Types of programming errors, basic input/output statements and functions (scanf, printf, getch, putch, gets, puts), Introduction to library functions,	
Unit II: Basic of C Programming	**(6 Hrs.)**
Basic building blocks of C: Character set, variables, identifiers & keywords, Data types, Operators: arithmetic, logical and relational operators, , bitwise operators, precedence of operators, Expressions, sizeof() operator, constants, typedef statement, 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: Loop Structures:	**(5 Hrs.)**
While, do while and for loops, break and continue statement, "goto" statement, real life programming examples based on these loop structures, real life programming examples.	
Unit IV: Modular Programming:	**(6 Hrs.)**
Concept of functions, user defined functions, function prototypes, formal parameters, actual parameters, return types, call by value , call by reference, C programs using functions, Recursive functions, comparing recursion against iteration, C programs using recursive functions, real life programming examples	
Unit V: Arrays:	**(6 Hrs.)**
One dimensional array, array manipulation, insertion, deletion of an element, searching techniques- Linear and binary search, sorting technique – Bubble sort. Two-dimensional arrays: matrix representation, programs for basic matrix operations such as addition, multiplication and transpose, Array as function arguments. real life programming examples	
Unit VI: String, Structure and Union:	**(4 Hrs.)**
Strings: string representation and string handling functions, Introduction to pointer, structure and union. real life programming examples	
Total Lecture	**30 Hours**

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

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

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

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books

MOOCs Links and additional reading, learning, video material	
1	https://nptel.ac.in/courses/106104128
2	https://nptel.ac.in/courses/106104128
3	https://www.youtube.com/watch?v=rQoqCP7LX60&list=PLxgZQoSe9cg1drBnejUaDD9GEJBGQ5hMt

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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 Information Technology)

B.Tech in Information Technology

SoE No. 23IT-101

II SEMESTER

23IT1204 : Lab. Programming for Problem Solving

Course Outcomes: Students will be able to
1) Understand the basics of computer system operations and algorithms, flowcharts. 2) Apply the basics of C programming for problem solving. 3) Apply and analyze the different dimensional arrays for problem solving. 4) Understand the basics of string, structure, and union and apply them to problem solving.

Unit I: Computer System Basics:	**(3 Hrs.)**
Basics of programming and problem solving. Introduction to algorithms and flowcharts, Types of programming errors, basic input/output statements and functions (scanf, printf, getch, putch, gets, puts), Introduction to library functions,	
Unit II: Basic of C Programming	**(6 Hrs.)**
Basic building blocks of C: Character set, variables, identifiers & keywords, Data types, Operators: arithmetic, logical and relational operators, , bitwise operators, precedence of operators, Expressions, sizeof() operator, constants, typedef statement, 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: Loop Structures:	**(5 Hrs.)**
While, do while and for loops, break and continue statement, "goto" statement, real life programming examples based on these loop structures, real life programming examples.	
Unit IV: Modular Programming:	**(6 Hrs.)**
Concept of functions, user defined functions, function prototypes, formal parameters, actual parameters, return types, call by value , call by reference, C programs using functions, Recursive functions, comparing recursion against iteration, C programs using recursive functions, real life programming examples	
Unit V: Arrays:	**(6 Hrs.)**
One dimensional array, array manipulation, insertion, deletion of an element, searching techniques- Linear and binary search, sorting technique – Bubble sort. Two-dimensional arrays: matrix representation, programs for basic matrix operations such as addition, multiplication and transpose, Array as function arguments. real life programming examples	
Unit VI: String, Structure and Union:	**(4 Hrs.)**
Strings: string representation and string handling functions, Introduction to pointer, structure and union. real life programming examples	
Total Lecture	30 Hours

			July,2023	1.00	Applicable for AY 2023-24 Onwards
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Text books	
1	The C Programming Language, J.B.W.Kernighan & D.M.Ritchie, Prentice Hall
2	Mastering C, K.R.Venugopal & S.R. Prasad, TMH, 2007.
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Reference Books	
1	Problem Solving And Program Design In C, Jeri. R. Hanly, Elliot B. Koffman, Pearson Education.
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1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books

MOOCs Links and additional reading, learning, video material	
1	https://nptel.ac.in/courses/106104128
2	https://nptel.ac.in/courses/106104128
3	https://www.youtube.com/watch?v=rQoqCP7LX60&list=PLxgZQoSe9cg1drBnejUaDD9GEJBGQ5hMt

List of Practical

SN	Unit	Name Of The Practical	Remark	CO'S Mapped	PO'S Mapped
1(A)		Introduction to Linux Operating system & it's different commands.	**Manual**	**CO 1**	**PO1**
1(B)		Introduction to Vi editor, Compilation and Execution of a program in Linux.	**Manual**	**CO 1**	**PO1**
2	**II**	Practical based on Arithmetic and Conditional operators.	**Operators**	**CO 1**	**PO1**
3	**II**	Practical based on Conditional and Unconditional Statements.	**Conditional Statements**	**CO 1**	**PO1**
4	**III**	Practical based on Entry Controlled Looping Statements.	**For / While Loop**	**CO 2**	**PO 1, PO 2**
5	**III**	Practical based on Exit Controlled Looping Statement	**Do while Loop**	**CO 2**	**PO 1, PO 2**
6	**IV**	Practical based on Functions and Recursion.	**Functions / Recursion**	**CO 3**	**PO2, PO3**
7	**V**	Practical based on 1-D Array.	**1D Array**	**CO 3**	**PO2, PO3**
8	**V**	Practical based on 2-D Array.	**2D Array**	**CO 3**	**PO2, PO3**
9	**VI**	Practical based on Strings.	**Strings & Pointers**	**CO 3**	**PO2, PO3**
10	**VI**	Practical based on Structures.	**Structures**	**CO 4**	**PO1, PO2, PO3**

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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 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 Science & Engineering)

B. Tech in Computer Science and Engineering

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.TECH SCHEME OF EXAMINATION 2023

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

(Department of Computer Science & Engineering)

B. Tech. in Computer Science & Engineering

SoE No. 23CSE-101

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
THIRD SEMESTER															
1	3	HSSM-1	GE	23GE1301	Fundamentals of Management & Economics	T	2	0	0	2	2	30	20	50	3
2	3	BS	GE	23GE1303	Linear Algebra	T	3	0	0	3	3	30	20	50	3
3	3	PC	CSE	23CSE1301	Computer Architecture & Organization	T	3	0	0	3	3	30	20	50	3
4	3	PC	CSE	23CSE1302	Data structures	T	3	0	0	3	3	30	20	50	3
5	3	PC	CSE	23CSE1303	**Lab :** Data structures	P	0	0	2	2	1		60	40	
6	3	PC	CSE	23CSE1304	**Lab :** Programming with JAVA	P	0	0	2	2	1		60	40	
7	3	VEC-2	CSE	23CSE1305	Digital & Tecnological Solution / Understanding India-**Ethics in IT**	T	2	0	0	2	2	30	20	50	3
8	3	CEP	CSE	23CSE1306	Community Engagement Project	P	0	0	2	4	2		60	40	
9	3	OE-1	OE		**Open Elective - I**	T	2	0	0	2	2	30	20	50	3
10	3	MDM			**MD Minor Course - I**	T	2	0	0	2	2	30	20	50	3
					Total		**17**	**0**	**6**	**25**	**21**				

List of Mandatory Learning Course (MLC)															
1	3	HS	T&P	MLC2123	**YCAP3 :** YCCE Communication Aptitude Preparation	**A**	3	0	0	3	**0**				

Open Elective - I

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

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

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
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
23CSE1301 : Computer Architecture And Organization

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

UNIT I: Basic Structure of Computer Hardware and Software	7
Functional Units, Basic Operational Concepts, Bus Structures, Software, processor clock and basic performance evaluation, number systems, and arithmetic operations, Memory Locations, addressing and encoding of information, instruction and instruction sequencing, branching, condition codes, zero, one and two address instructions, RISC vs CISC computers.	
UNIT II: Addressing modes	**7**
Addressing modes, Stacks, and Subroutines, Processing Unit, Some fundamental concepts, Execution of a complete instruction, One, two, and three bus organization, Sequencing of control Signals, Assembly language programming.	
UNIT III: Processor Design, hardwired control, Microprogrammed Control	**8**
Microinstructions, Grouping of control signals, Microprogram sequencing, Micro Instructions with next Address field, prefetching microinstructions.	
UNIT IV: Arithmetic (Fixed and Floating point)	8
Number Representation, Addition of Positive numbers, Logic Design for fast adders, Addition and Subtraction, Arithmetic and Branching conditions, Multiplications of positive numbers, Signed- Operand multiplication, Booth's Algorithm , fast Multiplication, Integer Division algorithms, Floating point numbers and operations, IEEE floating point standards	
UNIT V: The Main Memory & Cache Memory	8
The Main Memory: Basic concepts, Memory Hierarchy, semiconductor RAM memories, Static RAM vs Dynamic RAM, semiconductor ROM memories, DDRAM, Memory system considerations, Speed , Size and Cost. Cache Memory: cache memory mapping techniques, secondary storage devices, HDD vs SSD, Performance Considerations.	
UNIT VI: Computer Peripherals, I/O modules and I/O Devices, I/O transfers	7
Computer Peripherals, I/O modules and I/O Devices, I/O transfers, Program controlled, memory mapped and I/o mapped I/O, Interrupt handling and Interrupt driven I/O, DMA. Pipelining: Basic Concepts, Data Hazards and Instruction Hazards. Introduction to GPU and GPU Computing.	
Total Lectures	**45**

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

Reference Books
1. Computer Organization and Architecture , 6th edition Willaiam Staling, Pearson Education
2. Computer Architecture & Organization , 3rd edition ,J.P. Hayes ,McGraw Hill Publications

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	file://172.16.1.10/cse/Ebooks/COmputer%20Organization%20Zaky%205th%20.pdf
2	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Technology/53-CAO_V.%20Carl%20Hamacher-GKY.pdf

MOOCs Links and additional reading, learning, video material	
1.	https://nptel.ac.in/courses/106105163

III Semester

23CSE1302: Data Structures

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

UNIT I:	7
Introduction to data structures- Need of data structures, Types of data structures, recursion, Arrays, sorting – Bubble sort , Insertion sort, Selection sort, Merge sort, Quick sort and searching techniques- Linear Search and Binary Search, Hashing: Direct-address tables, Hash tables, open addressing, Perfect Hashing	
UNIT II:	7
Stacks and queues: The stack as an ADT, Representation, Stack operation, Application. Queue: The Queue as an ADT, Representation, Queue operation, Circular and Priority queue, Applications of stacks and queues	
UNIT III:	7
Linked Lists: Linked list as an ADT, Singly-linked lists, doubly linked lists and circular linked lists. Operations on linked list etc., Linked stacks and Queues, Applications of lists in polynomial representation, multi-precision arithmetic.	
UNIT IV:	6
Binary Trees: Binary trees, binary trees- basic algorithms and various traversals. Binary Search Trees (BSTs) and insertion, deletion in BSTs. Heaps and heap sort	
UNIT V:	6
Balanced trees: Height-balanced (AVL) trees, Splay tree, Red-black trees, Multi-way trees-B and B+ and applications	
UNIT VI:	**6**
Graphs: Representation & traversals: Spanning trees, topological sort, shortest path algorithm, all-pairs shortest paths	
Total Lectures	**39**

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

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

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/Book%20Fundamentals%20of%20Data%20Structure%20(1982)%20by%20Ellis%20Horowitz%20and%20Sartaj%20Sahni.pdf
2	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/Data%20Structures%20Succinctly%20Part%201.pdf

MOOCs Links and additional reading, learning, video material	
1.	https://nptel.ac.in/courses/106102064
2.	https://archive.nptel.ac.in/courses/106/106/106106127/

III Semester

23CSE1303: Lab-Data Structures

List of Experiment

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

III Semester
23CSE1304: Lab -Programming with JAVA

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

Sr.No.	Experiment based on
1	Implement the concept of Class and its data members and member functions in Java
2	Implement the concept of class constructor and its type in Java
3	Implement the concept of Abstraction in Java
4	Implement the concept of function overloading in Java
5	Implement the concept of run time polymorphism in Java
6	Implement the concept of all types of inheritance in Java
7	Implement the concept of arrays in Java
8	Implement the concept of exception in Java
9	Implement the concept of Collection Vector and Framework in Java
10	Implement the concept of Threads in Java
11	Implement the concept of Files in Java
12	Implement the concept of swing in java

III Semester

23CSE1305: Digital & Technological Solution / Understanding India - Ethics in IT

Course Outcomes
On completion of this course students will be able to. CO1: Adapt the global ethical principles and modern ethical issues. CO2: Apprehend ethics in the business relationships and practices of IT. CO3: Implement trustworthy computing to manage risk and security vulnerabilities. CO4: Analyse concerns of privacy, privacy rights in information-gathering practices in IT.

UNIT I:	6
An overview of Ethics: Brief about ethics, Ethics in the Business World, Ethics in IT. Ethics for IT professionals and IT users: IT professionals: Changing Professional Services, Professional Relationships, Codes of Ethics, awareness of IT malpractices, IT Users: Common Ethical Issues for IT Users, Supporting the Ethical Practices of IT Users.	
UNIT II:	6
Introduction: IT security incidents, Types of Exploits, Types of Perpetrators, Laws for Prosecuting Computer Attacks, Implementing Trustworthy Computing, Risk and Vulnerability Assessment, Educating Employees, Contractors, and Part-Time Workers, Establishing a Security Policy Privacy: The right of Privacy, Privacy Protection and the Law, Key Privacy and Anonymity Issues Identity Theft, Consumer Profiling, Treating Consumer Data Responsibility, Workplace Monitoring Freedom of Expression: Defamation and Hate Speech, Key issues, Controlling Access to Information on the Internet, Anonymity on the Internet, Corporate Blogging, Pornography	
UNIT III:	6
Social Networking: Brief about Social Networking, Social Networking Ethical Issues: Cyber bullying, Cyber stalking, Encounters with Sexual Predators, Uploading of Inappropriate Material, Online Virtual Worlds: Crime in Virtual Worlds, Educational and Business Uses of Virtual Worlds. Ethics of IT Organization: Key Ethical Issues for Organizations, of Workers, Outsourcing, Whistle blowing, Code of Ethics and Professional Conduct.	
UNIT IV:	6
Malware, Medical Implants, Abusive Workplace Behaviour, Automated Active Response Weaponry, Malicious Inputs to Content Filters.	
Total Lectures	**24**

Text Books :	
1.	Ethics in Information Technology, George Reynolds, 5th Edition, Cengage learning
2.	Professional Ethics, R. Subramanian, Second Edition, OXFORD University Press

Reference Book:	
1.	An Introduction to Ethics, William Lillie,Allied Publishers
2.	Engineering Ethics, Charles b. Fleddermann, Prentice Hall
3.	Engineering Ethics &Human Values, M.Govindarajan, S.Natarajan & V.S.Senthilkumar, PHI Learning

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/

MOOCs Links and additional reading, learning, video material	
1.	https://onlinecourses.nptel.ac.in/noc19_hs35/preview

III Semester

23CSE1306: Lab- Field Project- Computer Literacy

Practical's based on syllabus given below:

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

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

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

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

MOOCs Links and additional reading, learning, video material	
1.	https://onlinecourses.swayam2.ac.in/cec21_cs15/preview

III SEMESTER
Multidisciplinary Minor Courses

Track 1

Courses	Sem	MDMT1CSE101 : Image processing and Computer Vision
MDM-I	3	(MDM1CSE101) Algorithms and Data Structure
MDM-II	4	(MDM2CSE102) Programming with Open CV
MDM-III	5	(MDM3CSE103) Fundamentals of Digital Image Processing
MDM-IV	6	(MDM4CSE104) Basics of Artificial Neural Network
MDM-V	7	(MDM5CSE105) Machine Learning fundamentals
MDM-VI	8	(MDM6CSE106) Computer Vision Essentials

Track 2

Courses	Sem	MDMT2CSE201 : Cryptography and Digital Forensics
MDM-I	3	(MDM1CSE201) Internet technologies and Cyber laws
MDM-II	4	(MDM2CSE202) Cryptography
MDM-III	5	(MDM3CSE203) Ethical Hacking
MDM-IV	6	(MDM4CSE204) Digital Forensic
MDM-V	7	(MDM5CSE205) Cyber Audit
MDM-VI	8	(MDM6CSE206) IOT Security

Track 3

Courses	Sem	MDMT3CSE301 : Software Systems
MDM-I	3	(MDM1CSE301) Data Structure Essentials
MDM-II	4	(MDM2CSE302) Object Oriented Concepts using Java
MDM-III	5	(MDM3CSE303) Software Design Patterns
MDM-IV	6	(MDM4CSE304) Software Engineering Concepts
MDM-V	7	(MDM5CSE305) Software Testing Essentials
MDM-VI	8	(MDM6CSE306) Software Project Management in Practice

III Semester

Track1 : MDMT1CSE101 : Image processing and Computer Vision

(MDM1CSE101) Algorithms and Data Structure

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

UNIT I: Introduction	7
Introduction: Function, Recursion, Array, Introduction to data structures- Need of data structures, Types of data structures, recursion, Arrays, sorting – Bubble sort , Insertion sort, Selection sort, Merge sort, Quick sort and searching techniques- Linear Search and Binary Search , Algorithmic analysis, finding complexity of small code .	
UNIT II: Stack and Queue	7
The stack as an ADT, Representation, Stack operation, Application. Queue: The Queue as an ADT, Representation, Queue operation, Circular and Priority queue, Applications of stacks and queues	
UNIT III: Linked List	7
Linked list as an ADT, Singly-linked lists, doubly linked lists and circular linked lists. Operations on linked list etc., Linked stacks and Queues, Applications of lists in polynomial representation,	
UNIT IV: Trees and Graphs	7
Binary trees, binary trees- basic algorithms and various traversals. Binary Search Trees (BSTs) and insertion, deletion in BSTs, Introduction to Graphs: Graph Terminologies, Graph Traversal Methods.	
Total Lectures	**28**

TEXT BOOKS:	
1	Data Structures and Program Design in C, Robert Kruse, G. L. Tondo andB. Leung ,PHI-EEE
2	Fundamentals of Data Structures in C, Ellis Horowitz, Satraj Sahni and Susan, Anderson-Freed, W. H. Freeman and Company.
3	How to Solve it by Computer, R. G. Dromey, Pearson Education

Reference books:	
1	Data Structures with C, Seymour Lipschutz, TMH

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/Book%20Fundamentals%20of%20Data%20Structure%20(1982)%20by%20Ellis%20Horowitz%20and%20Sartaj%20Sahni.pdf
2	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/Data%20Structures%20Succinctly%20Part%201.pdf
3	

MOOCs Links and additional reading, learning, video material	
1.	https://nptel.ac.in/courses/106102064
2.	https://archive.nptel.ac.in/courses/106/106/106106127/
3.	

III Semester

Track2 : MDMT2CSE201 : Cryptography and Digital Forensics
(MDM1CSE201) Internet technologies and Cyber laws

Course Outcome	
1.	Understand the historical development and key components of the internet.
2.	Demonstrate proficiency in understanding Internet Protocol (IP) and its addressing mechanisms, including subnets and routing.
3.	Analyze the functionalities of the User Datagram Protocol (UDP) and Transmission Control Protocol (TCP).
4.	Understand the legal responses to computer hacking and related cybercrimes.

UNIT I	9
Introduction to the Internet: Introduction to Networks, OSI Model, TCP/IP Protocol suite, Comparison of OSI and TCP/IP, Addressing, IPV4, IPV6, Comparisons of IPV4 and IPV6 Headers. Internetworking Protocols: Internet Protocol (IP), IP addressing, IP subnets, IP routing, Methods of delivery: unicast, broadcast, multicast, Internet Control Message Protocol (ICMP), Address Resolution Protocol (ARP), Reverse Address Resolution Protocol (RARP), Dynamic Host Configuration Protocol (DHCP).	
UNIT II	8
Transport layer: User Datagram Protocol (UDP), Transmission Control Protocol (TCP), TCP segment format, Encapsulation and Dencapsulation, TCP connection, Error control, Flow control. Application Layer: Name space, Domain Name Space (DNS), Distribution of Name Space, DNS in the Internet, Resolution DNS Messages, TELNET, SSH, FTP, TFTP, WWW, HTTP, SMTP, POP3, MIME, IMAP.	
UNIT III	**6**
Introduction to Cyber Crime and the Law: The Legal response to Computer hacking, Computer Misuse Act, Concept of Access, Unauthorized Modification of data, Logic Bombs, Computer Viruses, Legal Response, Modification in the Computer Misuse Act, Operation of the Unauthorized modification offence, Hackers sites, Safety on the internet.	
UNIT IV	5
Evolution of the IT Act, Genesis and Necessity Salient features of the IT Act, 2000, various authorities under IT Act and their powers. ; Penalties & Offences, amendments. Introduction to E-Commerce Law	
Total Lectures	**28**

TEXT BOOKS:	
1	Internet Technologies for Fixed and Mobile Networks, By Toni Janevski , Artech House Publishers
2	Law Relating to Computers, Internet and E-Commerce, by Nandan Kamath, Lexis Nexis

Reference books:	
1	TCP/IP Protocol Suite, by Behrouz A. Forouzan, McGraw-Hill Forouzan Networking Series
2	Computer Networking with Internet Protocols and Technology, by William Stallings, Pearson Education

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	
2	

MOOCs Links and additional reading, learning, video material	
1.	
2.	

III Semester

Track3 : MDMT3CSE301 : Software Systems

(MDM1CSE301) Data Structure Essentials

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

UNIT I: Introduction	7
Introduction: Function, Recursion, Array, Introduction to data structures- Need of data structures, Types of data structures, recursion, Arrays, sorting – Bubble sort , Insertion sort, Selection sort, Merge sort, Quick sort and searching techniques- Linear Search and Binary Search, algorithmic analysis, finding time complexity for small code	
UNIT II: Stack and Queue	7
The stack as an ADT, Representation, Stack operation, Application. Queue: The Queue as an ADT, Representation, Queue operation, Circular and Priority queue, Applications of stacks and queues	
UNIT III: Linked List	7
Linked list as an ADT, Singly-linked lists, doubly linked lists and circular linked lists. Operations on linked list etc., Linked stacks and Queues, Applications of lists in polynomial representation,	
UNIT IV: Trees and Graphs	7
Binary trees, binary trees- basic algorithms and various traversals. Binary Search Trees (BSTs) and insertion, deletion in BSTs, Introduction to Graphs: Graph Terminologies, Graph Traversal Methods.	
Total Lectures	**28**

TEXT BOOKS:	
1.	Data Structures and Program Design in C, Robert Kruse, G. L. Tondo and B. Leung ,PHI-EEE
2.	Fundamentals of Data Structures in C, Ellis Horowitz, Satraj Sahni and Susan, Anderson-Freed, W. H. Freeman and Company.
3.	How to Solve it by Computer, R. G. Dromey, Pearson Education

Reference books:	
1.	Data Structures with C, Seymour Lipschutz, TMH
2.	

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/Book%20Fundamentals%20of%20Data%20Structure%20(1982)%20by%20Ellis%20Horowitz%20and%20Sartaj%20Sahni.pdf
2	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/Data%20Structures%20Succinctly%20Part%201.pdf

MOOCs Links and additional reading, learning, video material	
1.	https://nptel.ac.in/courses/106102064
2.	https://archive.nptel.ac.in/courses/106/106/106106127/

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: 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)

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

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Technology

SoE & Syllabus 2023

4th Semester

(Department of Computer Science & Engineering)

B. Tech in Computer Science and Engineering

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.TECH SCHEME OF EXAMINATION 2023

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

(Department of Computer Science & Engineering)

B. Tech. in Computer Science & Engineering

SoE No. 23CSE-101

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
FOURTH SEMESTER															
1	4	HSSM-2	GE	23GE1401	Entrepreneurship Development	T	2	0	0	2	2	30	20	50	3
2	4	**AEC-2**	GE	23GE1405 23GE1406	Marathi Language / Hindi Language	T	2	0	0	2	2	30	20	50	3
3	4	VEC-1	CV	23CV1411	Environmental Sustainability, Pollution and Management	T	2	0	0	2	2	30	20	50	3
4	4	PC	CSE	23CSE1401	Discrete Mathematics and Graph Theory	T	3	0	0	3	3	30	20	50	3
5	4	PC	CSE	23CSE1402	Operating system	T	3	0	0	3	3	30	20	50	3
6	4	PC	CSE	23CSE1403	**Lab :** Operating system	P	0	0	2	2	1		60	40	
7	4	PC	CSE	23CSE1404	Introduction to data analysis	T	3	0	0	3	3	30	20	50	3
8	4	PC	CSE	23CSE1405	**Lab :** Introduction to data analysis	T	0	0	2	2	1		60	40	
9	4	VSEC-3	CSE	23CSE1406	**Lab :** Vocational & Skill Enhancement - Web Technology	P	0	0	2	4	2		60	40	
10	4	OE-2	OE		**Open Elective - II**	T	2	0	0	2	2	30	20	50	3
11	4	MDM	CSE		**MD Minor Course - II**	T	2	0	0	2	2	30	20	50	3
					TOTAL		**19**	**0**	**6**	**27**	**23**				

List of Mandatory Learning Course (MLC)															
1	4	HS	T&P	MLC2124	**YCAP4 :** YCCE Communication Aptitude Preparation	**A**	3	0	0	3	**0**				

Open Elective - II

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

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

IV SEMESTER
23GE1401 : Entrepreneurship Development

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

Unit I:	**7 Hrs.**
Entrepreneur & Entrepreneurship: Meaning of Entrepreneur, Evolution of the concept – Theories and Models, Types of Entrepreneur, Stages in entrepreneurial process- Idea Generation, Screening, Selection and Managing Resources.	
Unit II:	**8 Hrs.**
Legal Compliances for Incorporating Start up: Fundamentals of choosing the Business Organization form for startup, Incorporation of Partnership, LL.P & Co – operative, Incorporation of One Person Company, Pvt. Ltd., Pub. Ltd. and not for profit company, Financing the legal Venture and Legal Compliances.	
Unit III:	**7 Hrs.**
Entrepreneurship and IP Strategy: Intellectual Property : Definition and Concept of Trade Mark, Patent, Copyright, Industrial Design, IP Strategy and Entrepreneurship.	
Unit IV:	**8 Hrs.**
Support to Entrepreneurs: Financing new ventures, Business Incubators – Government Policy for Small Scale Enterprises, Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Subcontracting.	
	Total Lecture **30 Hours**

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

Textbooks	
1.	Khanka. S.S., "Entrepreneurial Development" S.Chand & Co. Ltd.,Ram Nagar, New Delhi, 2013.
2.	Donald F Kuratko, "Entrepreneurship – Theory, Process and Practice", 9th Edition, Cengage Learning 2014.
3.	Corporate Law, 33rd ed. 2016, Taxman New Delhi.
4.	Narayanan, V. K., Managing technology and innovation for competitive advantage, first edition, Pearson education, New Delhi, (2006)
5.	Idris, K. (2003), Intellectual property: a power tool for economic growth, second edition, WIPO publication no. 888, Switzerland
6.	Khanka. S.S., "Entrepreneurial Development" S.Chand & Co. Ltd.,Ram Nagar, New Delhi, 2013.
7.	Ramaiya's Guide to the Companies Act, 18th ed. 2014, Lexis Nexis New Delhi.
Reference Books	
1.	Mehta, Monica- The Entrepreneurial Instinct : How everyone has the innate ability to start a successful small business – McGraw – Hill Education, New Delhi 2012, ISBN 978-0-07-179742-9
2	Prasanna Chandra "Protect Preparation, Appraisal, Implementation" Tata McGraw Hill. New Delhi
3	S Anil Kumar "Entrepreneurship Development" New Age International Publishers
4	Nishith Dubey "Entrepreneurship Development" PHI Learning
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0
2	https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.swayam2.ac.in/cec23_mg24/course- entrepreneurship development
2	https://onlinecourses.nptel.ac.in/noc23_mg74/announcements?force=true-entrepreneur
3	https://onlinecourses.nptel.ac.in/noc23_mg126/announcements?force=true- Business fundamentals for entrepreneurship

IV SEMESTER
23GE1405 : Marathi Language

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

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

Unit:1	गद्य विभाग	8 Hours

१.	भारतीय लोकशाहीचे भवितव्य काय?	- डॉ. बाबासाहेब आंबेडकर
२.	काळी आई	- व्यंकटेश माडगूळकर
३.	संत तुकारामांचे अभंग	- निर्मलकुमार फडकुले
४.	माझी शाळा	- प्रकाश खरात
५.	समतेचे वारकरी संत गाडगेबाबा आणि राष्ट्रसंत तुकडोजी महाराज	- अशोक राणा
६.	लोककल्याणकारी राजा :	- शरयू तायवाडे

Unit:2	पद्य विभाग	8 Hours

१.	ज्ञानेश्वरांचे अभंग	- संत ज्ञानेश्वर
२.	वनसुधा	- वामन पंडित
३.	नवा शिपाई	- केशवसुत
४.	मेंढरं	- विठ्ठल वाघ
५.	पोरी	- अनुराधा पाटील
६.	गाव	- हेमंतकुमार कांबळे

Unit:3	व्यावहारिक मराठी	7 Hours

१. म्हणी
२. मुलाखतलेखन - डॉ. वैशाली धनविजय
३. वाक्प्रचार
४. जाहिरातलेखन - डॉ. अजय देशपांडे

Unit:4	रोजगाराभिमुख मराठी व्यावहारिक कौशल्ये	7 Hours

१. प्रत्यक्ष मुलाखत कौशल्य
२. वाचन कौशल्य - (अ) बातमी वाचन (ब) कथा वाचन
३. ऑनलाईन कौशल्य - (अ) ग्राहक सेवा केंद्राशी संवाद, (ब) ऑनलाईन अर्ज करणे

Reference Books

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

IV SEMESTER
23GE1406 : Hindi Language

Course Objectives

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

Course Outcomes

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

Unit:1	गद्य विभाग	8 Hours

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

Unit:2	पद्य विभाग	8 Hours

१. कबीर के दोहे - कबीरदास
२. ले चल यहाँ भुलावा देकर - जयशंकर प्रसाद
३. स्नेह-निर्झर बह गया - हैसूर्यकांत त्रिपाठी "निराला"
४. प्रथम रश्मि - सुमित्रानंदन पंत
५. जीवन का झरना - आरसीप्रसाद सिंह
६. कविता के साथ - दामोदर खड़से

Unit:3	अन्य पाठ्य सामग्री	7 Hours

१. मुहावरे और लोकोक्तियाँ: पाठ्यपुस्तक में मुहावरे और लोकोक्तियाँ का अर्थ एवं वाक्य प्रयोग

२. विज्ञापन कला : अर्थ, परिभाषा, प्रकार, शीर्षक का महत्त्व, विज्ञापन के प्रयोजन, सत्य, लक्ष्य, विज्ञापन की भाषा, अच्छे विज्ञापन के गुण इत्यादि ।

Unit:4	कौशल्य आधारित घटक	7 Hours

१. वाचन कौशल्य (समाचार-वाचन, कहानी-वाचन)
२. सोशल मीडिया के शिष्टाचार
३. ऑनलाइन आवेदन, ग्राहक-सेवा केंद्र से संवाद

Reference Books

3. पाठ्यपुस्तक : **"पलाश"**

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	

IV SEMESTER
23CSE1401: Discrete Mathematics and Graph theory

Course Outcome
1. Identify the importance of statements in delivering valid interface. 2. Use relations and ordering methods to identify the relationship amongst the interfaces. 3. Select algebraic system to find solution for real time problems 4. Find suitable computing methods and applying graph theory concepts to solve complex problems.

UNIT I: Mathematical Logic and Set Theory	6
Statement and Notation: Negation, Conjunction, Disjunction, Tautologies, Truth Tables, Basic Concepts of Set Theory, Inclusion & equality of set, Power Set, Ordered Pairs and n-tuples, Operations on Sets, Partial order, Equivalence relations, mathematical induction. Propositions, Predicate, logic, formal mathematical systems.	
UNIT II: Relations and Functions	6
Relation and Ordering, Properties of Binary in a set, Relation Matrix and Graphs, Partition and Covering of a set, Equivalence relation, Partial ordering, Partially Ordered sets, Function (Definition and Introduction), Composition of functions, Inverse Functions, Characteristics function of a set.	
UNIT III: Group Theory	7
Groups (Definitions and Examples) Subgroups and Homomorphism, Cosets and Lagrange's theorem, Normal subgroups, Codes and Group Codes. Semi groups and Monoids (definitions and examples). Homomorphism of semi groups and monoids, Sub semi groups and monoids.	
UNIT IV: Rings (Definitions and Examples)	7
Integral domain, ring homomorphism, ideas of ring polynomial, Field, Lattice.	
UNIT V: Fuzzy Sets and Fuzzy Logic	6
Fuzzy sets and systems, crisp sets, overview of fuzzy logic and classical logic, fuzzy compliment, fuzzy union, fuzzy intersection and combinations of these fuzzy sets operations crisp and fuzzy relations.	
UNIT VI: Graph Theory	7
Basic concepts of graph theory, Basic definitions, Paths and circuits, Reach ability and connectedness, Matrix Representation of graphs, Tree and their representation and operations, Rooted trees, Path lengths in rooted trees, Multi graphs and weighted graphs, and graph isomorphism, shortest paths in weighted graphs, Hypergraphs, transitive closure, Spanning trees, Kruskal's algorithm, Prim's algorithm.	
Total Lectures	**39**

Text Books	
1	Discrete Mathematics Structure with application to Computer Science, 23rd re-print, 2005, J. P. Tremblay & R. Manohar ,Tata McGraw-Hills Publication Company Limited, New Delhi.
2	Advanced Engineering Mathematics, 8th revised edition, 2007, H.K. Dass, by.S.Chand and Company Limited Delhi.
3	Fuzy Logic with Engineering Applications, T. J. Ross, John Wiley &Sons, Ltd. ISBN: 978-81-265-3126-4

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

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0
2	https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042

MOOCs Links and additional reading, learning, video material	
1.	https://onlinecourses.nptel.ac.in/noc20_cs82/preview
2.	https://onlinecourses.nptel.ac.in/noc20_cs37/preview

IV Semester
23CSE1402: Operating Systems

Course Outcome
After undergoing this course student will be able to 1. Understand the fundamental concepts in Operating Systems (OS) and understand how various hardware features support OS functionality. 2. Explain various OS mechanisms and policies for managing system resources. 3. Analyse algorithms and techniques for managing various OS resources in a multiprogramming and other environments. 4. Evaluate the performance of algorithms for managing various OS resources.

UNIT I: Introduction to OS	7
evolution of OS, basic hardware support necessary for modern operating systems, Layered Structural of OS, process concept, process state transitions , Services provided by OS, system calls, privileged instructions, Dual mode of operation, I/O bound and CPU bound processes, concept of multiprogramming and multiprocessing.	
UNIT II: Process management	8
process control block, process context switch, process versus threads, CPU scheduling, goals of scheduling, CPU scheduling algorithms, Algorithmic evaluation of CPU scheduling algorithms, multi-queue scheduling, multithreading	
UNIT III: Interprocess communication and Synchronization	**8**
Operations on processes, Interprocess communication, process cooperation and synchronization, race condition, critical region, mutual exclusion and implementation, semaphores, classic problems of Synchronization using semaphores, other synchronization constructs.	
UNIT IV: Memory management techniques	8
Contiguous allocation, static and dynamic partitioning, non-contiguous allocation, paging, translation look aside buffer (TLB) and overheads, segmentation.	
UNIT V: Virtual memory	7
Demand paging, page replacement algorithms, thrashing, working set model. Deadlocks: necessary conditions, deadlock detection, deadlock avoidance, deadlock prevention, recovery from deadlock.	
UNIT VI: File systems	7
Introduction, Access methods, Directory Structure disk space management and space allocation strategies, disk arm scheduling strategies: FCFS, SSTF, SCAN, CSACN, LOOK, CLOOK, Selecting a disk scheduling algorithm.	
Total Lectures	**45**

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

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

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/Operating%20System%20Concept%208thedition.pdf
2	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/Operating%20System.pdf
3	

MOOCs Links and additional reading, learning, video material	
1.	https://archive.nptel.ac.in/courses/106/105/106105214/
2.	https://archive.nptel.ac.in/courses/106/102/106102132/
3.	

IV Semester
23CSE1403: Lab- Operating Systems

List of Experiment

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

IV Semester
23CSE1404: Introduction to Data Analysis

Course Outcomes
Upon successful completion of the course students will be able to: 1. Apply fundamental concepts of statistics and probability for data analysis. 2. Apply appropriate statistical methods on simple datasets. 3. Formulate and solve problems in a systematic manner. 4. Conduct investigation and Interpret output obtained from statistical analysis on datasets. 5. Obtain hands on experience with some popular software (like R)for analysis and visualization of data.

UNIT I: INTRODUCTION TO STATISTICS & PROBABILITY	7
The role of statistics. Grouping and displaying data. Measures of central tendency and dispersion, Basic terminology in probability, probability rules, Probabilities under conditions of statistical independence, probabilities under conditions of statistical dependence.	
UNIT II: PROBABILITY DISTRIBUTION:	6
What is probability distribution, random variables, use of expected value in decision making, and various probability distributions :Binomial, Poisson, Uniform and Normal distributions.	
UNIT III: SAMPLING DISTRIBUTION:	7
Introduction to sampling distributions, sampling distribution of mean and proportion, application of central limit theorem, sampling techniques. ESTIMATION THEORY: Estimation: Point and Interval estimates ,confidence intervals ,calculating interval estimates for population parameters of large sample and small samples, determining the sample size	
UNIT IV: TESTING OF HYPOTHESIS	7
Introduction, null hypothesis, tests of hypothesis and significance, type I and type II errors, one tailed and two tailed tests, p-value one sample tests for means and proportions of large samples (z-test), one sample tests for means of small samples (t-test), Chi-square tests for goodness of fit. Analysis of variance.	
UNIT V: NON-PARAMETRIC METHODS	6
Sign test for paired data. Rank sum test. Mann –Whitney U test and Kruskal Wallis H test. One sample run test, rank correlation. Kolmogorov-Smirnov –test.	
UNIT VI: REGRESSION and CORRELATION	6
Estimation of regression line by least square method, linear regressions, Multivariate regression ,Correlation analysis, non linear regression, logistic regression .	
Total Lectures	**39**

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

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

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1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/SERIES%20WISE%20BOOKS/COMPUTER%20SCIENCE/COMPUTER%20SCIENCE%20(E%20Series).pdf
2	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/The%20Art%20of%20R%20Programming.pdf

MOOCs Links and additional reading, learning, video material	
1.	https://onlinecourses.nptel.ac.in/noc21_ma74/preview

IV Semester
23CSE1405: Lab- Introduction to Data Analysis

List of Experiment

Sr. No.	Experiments based on
1.	Obtained the descriptive statistics for the given data using MSEXCEL and Check the obtained results using R.

Sample of daily production in meters of 30 carpet looms					
16.2	16.8	15.9	15.6	15.9	16.6
15.8	16	16	15.7	15.9	15.6
15.8	16.4	16.3	16	16.8	15.6
15.8	15.2	16	16.2	15.4	16.9
16.3	15.9	16.4	16.1	15.7	16.3

2. With reference to the **College** data set, which can be found in the file **College.csv**, answer the following:

[1] Produce a numerical summary of the variables in the data set.

[2] Produce a scatterplot matrix of the first ten columns or variables of the data.

[3] Produce side-by-side boxplots of Outstate versus Private.

[4] Create new qualitative variable, called Elite, by *binning* the Top10perc variable. We are going to divide universities into two groups based on whether or not the proportion of students coming from the top 10 % of their high school classes exceeds 50 %.
How many elite universities are there? Produce side-by-side boxplots of Outstate versus Elite.

[5] Produce some histograms with differing numbers of bins for a few of the quantitative variables.

3. With reference to the **Auto** data set, answer the following (Make sure that the missing values have been removed from the data):

[1] Which of the predictors are quantitative, and which are qualitative?

[2] What is the range of each quantitative predictor?

[3] What is the mean and standard deviation of each quantitative predictor?

[4] Now remove the 10th through 85th observations. What is the range, mean, and standard deviation of each predictor in the subset of the data that remains?

[5] Using the full data set, investigate the predictors graphically, using scatterplots or other tools of your choice. Create some plots highlighting the relationships among the predictors.

[6] Suppose that we wish to predict gas mileage (mpg) on the basis of the other variables. Do your plots suggest that any of the other variables might be useful in predicting mpg? Justify your answer.

4.	With reference to the **Boston housing** data set, answer the following (The Boston data set is part of the MASS library in R) **[1]** Which of the predictors are quantitative, and which are qualitative? **[2]** How many rows are in this data set? How many columns? What do the rows and columns represent? **[3]** Make some pairwise scatterplots of the predictors (columns) in this data set. Describe your findings. **[4]** Are any of the predictors associated with per capita crime rate? If so, explain the relationship. **[5]** Do any of the suburbs of Boston appear to have particularly high crime rates? Tax rates? Pupil-teacher ratios? Comment on the range of each predictor. **[6]** How many of the suburbs in this data set bound the Charles river? **[7]** What is the median pupil-teacher ratio among the towns in this data set? **[8]** Which suburb of Boston has lowest median value of owner-occupied homes? What are the values of the other predictors for that suburb, and how do those values compare to the overall ranges for those predictors? Comment on your findings. **[9]** In this data set, how many of the suburbs average more than seven rooms per dwelling? More than eight rooms per dwelling? Comment on the suburbs that average more than eight rooms per dwelling.
5.	Use Binomial/ Poisson/ Normal distribution to solve the following: **[1]** Suppose there are twelve multiple choice questions in an English class quiz. Each question has five possible answers, and only one of them is correct. Find the probability of having four or less correct answers if a student attempts to answer every question at random. **[2]** If there are twelve cars crossing a bridge per minute on average, find the probability of having seventeen or more cars crossing the bridge in a particular minute. **[3]** Assume that the test scores of a college entrance exam fits a normal distribution. Furthermore, the mean test score is 72, and the standard deviation is 15.2. What is the percentage of students scoring 84 or more in the exam? **[4]** For binomial distribution with n=10 and p=0.45, find: *(a)* P(r=8) *(b)* P(r>4) *(c)* P(r<=6)
6.	Use Binomial/ Poisson/ Normal distribution to solve the following: **[1]** Probability that a normal random variable with mean 22 and variance 25 *(a)* lies between 16.2 and 27.5 *(b)* is greater than 29 *(c)* is less than 17 *(d)* is less than 15 or greater than 25 **[2]** Probability that in 60 tosses of a fair coin the head comes up *(a)* 20,25 or 30 times *(b)* less than 20 times *(c)* between 20 and 30 times

	[3] A random variable X has Poisson distribution with mean 7. Find the probability that *(a)* X is less than 5 *(b)* X is greater than 10 *(c)* X is between 4 and 16 **[4]** Suppose that there are 10 independent trials, and that the probability of success on each trial is 0.6, find the probability of 5 successes.
7.	Use Binomial/ Poisson/ Normal distribution to solve the following: **[1]** Suppose that there are 10 independent trials, and that the probability of success on each trial is 0.6, find the probability of 5 successes. **[2]** At Kerr Pharmacy owner determined that there is a 0.4 chance of any one employee being late. 5 employees are in the pharmacy. find the probabilities of 0,1,2,3,4, or 5 employees being late simultaneously? **[3]** For binomial distribution with n=10 and p=0.45, find: *(a)* P(r=8) *(b)* P(r>4) *(c)* P(r<=6) **[4]** Suppose toy weights produced at LEGO Toys Works have weights that are normally distributed with mean 17.46 grams and variance 375.67 grams. What is the probability that a randomly chosen toy weighs more than 19 grams?
8.	With reference to sampling and sampling distribution, answer the following: **[1]** Generate a sample of size 100 from a standard normal distribution (with mean 0 and standard deviation 1). Display the first 10 observations. Evaluate the mean and standard deviation of the sample values. **[2]** Generate a sample of size 100 from a normal distribution with mean 2 and standard deviation 5. Display the first 10 observations. Evaluate the mean and standard deviation of the sample values. **[3]** In a sample of 16 observations from a normal distribution with mean 150 and standard deviation 16. Display the first 10 observations. Evaluate the mean and standard deviation of the sample values. Also, answer the following: *(a)* What is P(xbar less than equals to 160) = ? *(b)* What is P(xbar > 142) = ? **[4]** Suppose widget weights produced at Acme. Widget Works have weights that are normally distributed with mean 17.46 grams and variance 375.67 grams. What is the probability that a randomly chosen widget weighs more than 19 grams?
9.	With reference to sampling and sampling distribution, answer the following: **[1]** A bottling company uses a filling machine to fill plastic bottles with a popular cola. The bottles are supposed to contain 300 ml. In fact, the contents vary according to a normal distribution with a mean (mu) = 298 ml and standard deviation (sigma) = 3 ml. What is the probability that the average contents of 6 randomly selected bottles is < 295? **[2]** Consider Mean = 8000 and standard deviation is = 3200 , n=64. *(a)* What is P(xbar> 9000) = ?

	(b) What is P(xbar<=8500) = ? **[3]** In a sample of observations from a normal distribution with mean18 and standard deviation 4.8. *(a)* What is P(xbar less than or equal to 16) = ? *(b)* What is P(xbar > 16) = ? *(c)* What is P(xbar <= 20) = ?
10.	With reference to hypothesis testing, answer the following: **[1]** Suppose the mean weight of King Penguins found in an Antarctic colony last year was 15.4 kg. In a sample of 35 penguins same time this year in the same colony, the mean penguin weight is 14.6 kg. Assume the population standard deviation is 2.5 kg. At .05 significance level, can we reject the null hypothesis that the mean penguin weight does not differ from last year? **[2]** Suppose the manufacturer claims that the mean lifetime of a light bulb is more than 10,000 hours. In a sample of 30 light bulbs, it was found that they only last 9,900 hours on average. Assume the population standard deviation is 120 hours. At .05 significance level, can we reject the claim by the manufacturer? **[3]** Suppose the food label on a cookie bag states that there is at most 2 grams of saturated fat in a single cookie. In a sample of 35 cookies, it is found that the mean amount of saturated fat per cookie is 2.1 grams. Assume that the sample standard deviation is 0.3 gram. At .05 significance level, can we reject the claim on food label?

IV Semester
23CSE1406: Lab - Vocational & Skill Enhancement - Web Technology

Course Outcomes
• Develop structured and responsive web pages using HTML, CSS, and Bootstrap • Implement interactive client-side functionality using JavaScript • Build dynamic web applications with React.js components and state management • Develop server-side applications using Node.js and handle HTTP requests. • Manage databases using MySQL and MongoDB for full-stack development.

Unit I:
HTML Elements, Attributes, Images, Complex table structure, Lists, Layout, Responsive website using Layout Elements and <meta>tags ,Forms, Iframes, Canvas, SVG, Symbols, Emojis, HTML Media- Video, Audio.
Unit II:
Bootstrap Containers, Colors, Tables, Images, Alerts, Buttons, dropdown menu, Navbars, Scrollspy, Dark Mode, Offcanvas, Spinners, Cards, Popovers, Flex, Forms, Select Menu, Checkboxes and Radio buttons, Form Validation
Unit-III
JavaScript Introduction, Loop, Regular Expressions, Event Handling, Dialog Boxes, Cookies, image slider, Arrow Functions, Callbacks, Asynchronous, Promises, Async/Await.
Unit-IV
React Components, Class Components, Props, Events, Conditional Rendering, Lists, Forms, Router, Memo, Styling React Using CSS, Styling React Using Sass.
Unit-V
Node.js Modules, Node.js HTTP Module, Node.js File System Module, Node.js URL Module, Node.js NPM, Node.js Events, Node.js Upload Files, Node.js Send an Email
Unit-VI
Node.js MySQL Create Database, Create Table, Insert Into, Select From, Where, Order By, Delete, Drop Table, Update, Limit, Join, Node.js MongoDB.

Text Books	
1.	Thomas A. Powell, "HTML & CSS: The Complete Reference, Fifth Edition", McGraw Hill LLC,2010.
2.	David Herron , "Node.js Web Development", Packt Publishing,2020.

Reference Book:	
1.	Mark J. Collins, "Pro HTML5 with CSS, JavaScript, and Multimedia", Apress, 2017.
2.	David Herron , "Node.js Web Development", Packt Publishing,2018.
3.	Brad Dayley, Brendan Dayley, Caleb Dayley , "Node.js, MongoDB and Angular Web Development", Pearson Education,2017.

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2	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/The-Definitive-Guide-to-MongoDB.pdf

MOOCs Links and additional reading, learning, video material	
1.	https://archive.nptel.ac.in/courses/106/105/106105084/
2.	https://archive.nptel.ac.in/courses/106/105/106105084/

IV SEMESTER

Multidisciplinary Minor Courses

Track 1

Courses	Sem	MDMT1CSE101 : Image processing and Computer Vision
MDM-I	3	(MDM1CSE101) Algorithms and Data Structure
MDM-II	4	(MDM2CSE102) Fundamentals of Digital Image Processing
MDM-III	5	(MDM3CSE103) Computer Vision Essentials
MDM-IV	6	(MDM4CSE104) Programming Framework for Computer Vision
MDM-V	7	(MDM5CSE105) Basics of Artificial Neural Network
MDM-VI	8	(MDM6CSE106) Machine Learning fundamentals

Track 2

Courses	Sem	MDMT2CSE201 : Cryptography and Digital Forensics
MDM-I	3	(MDM1CSE201) Internet technologies and Cyber laws
MDM-II	4	(MDM2CSE202) Digital Forensic
MDM-III	5	(MDM3CSE203) Ethical Hacking
MDM-IV	6	(MDM4CSE204) Cryptography
MDM-V	7	(MDM5CSE205) Cyber Audit
MDM-VI	8	(MDM6CSE206) IOT Security

Track 3

Courses	Sem	MDMT3CSE301 : Software Systems
MDM-I	3	(MDM1CSE301) Data Structure Essentials
MDM-II	4	(MDM2CSE302) Object Oriented Concepts using Java
MDM-III	5	(MDM3CSE303) Software Engineering Concepts
MDM-IV	6	(MDM4CSE304) Software Design Patterns
MDM-V	7	(MDM5CSE305) Software Testing Essentials
MDM-VI	8	(MDM6CSE306) Software Project Management in Practice

IV Semester

Track1 : MDMT1CSE101 : Image processing and Computer Vision (MDM2CSE102) Programming with Open CV

Course Outcome
Upon successful completion of the course the students will be able to CO1: Understand basic principles of image processing. CO2: *Apply* image enhancement in spatial Domain. CO3: *Analyze* image segmentation methods. CO4: *Evaluate* image compression algorithms

Unit No.	Contents	Max. Hrs.
Unit:1	**Fundamentals of Image Processing**: Digital Image Fundamentals: Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships between Pixels, Linear and Nonlinear Operations.	6 Hours
Unit:2	**Image Enhancement in spatial domain**: Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters. Color image enhancement.	6 Hours
Unit:3	**Image Segmentation**: Detection of Discontinuities, Edge Linking and Boundary/Edge Detection, Thresholding, Region-Based Segmentation: Region growing and Region Spitting and Merging, Segmentation by Morphological Watersheds.	6 Hours
Unit:4	**Image Compression:** Image Compression: Fundamentals, Some Basic Compression Methods -Run Length Coding, Huffman Coding, Arithmetic Coding, Bit Plane Coding, Block Truncation Coding. JPEG Compression.	6 Hours

Text Books	
1	Digital Image Processing, (DIP/3e), 3rd edition, Gonzalez and Woods, Prentice Hall - 2008

Reference Books	
1	Digital Image Processing, Kenneth R Castleman, Pearson Education
2	Fundamentals of Digital image Processing, Anil Jain.K, Prentice Hall of India

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Technology/19-2016_Book_DigitalImageProcessing.pdf
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc21_cs04/preview
2	https://onlinecourses.nptel.ac.in/noc22_cs80/preview

IV Semester

MDM2CSE202: Digital Forensic

(Track 2- Cryptography and Digital Forensics)

Course Outcomes
• Conduct digital investigations that conform to accepted professional standards and are based on the investigative process: identification, preservation, examination, analysis, and reporting. • Identify and document potential security breaches of computer data that suggest violations of legal, ethical, moral, policy, and/or societal standards. • Processing crimes and incident scenes, securing a computer incident or crime, seizing digital evidence at scene, storing digital evidence, obtaining digital hash, reviewing case. • To be well-trained as next-generation computer crime investigators.

UNIT I: Introduction- Key developments, Digital devices in society, Technology and culture. **Evidential Potential of Digital Devices**- Closed vs. open systems, Evaluating digital evidence potential.	6
UNIT II: Device Handling- Seizure issues, Device identification, Networked devices, Contamination., **Examination Principles**- Previewing, Imaging, Continuity and hashing, Evidence locations	6
UNIT III: Evidence Creation- A seven-element security model, A developmental model of digital systems, Knowing, Unknowing, Audit and logs. **Evidence Interpretation**- Data content, Data context	6
UNIT IV: Intelligence- Device usage, Profiling and cyber-profiling, Evaluating online crime: automating the model, Application of the formula to case studies, From success estimates to profiling	6
Total Lectures	**24**

Text Books:

1.	Digital Forensics Digital Evidence in Criminal Investigation Angus M. Marshall University of Teesside, UK, Willey- Blackwell Publications
2.	Warren G. Kruse II and Jay G. Heiser, "Computer Forensics: Incident Response Essentials", Addison Wesley, 2002.

Reference Book:

1. Nelson, B, Phillips, A, Enfinger, F, Stuart, C., "Guide to Computer Forensics and Investigations, 2nd ed., Thomson Course Technology, 2006, ISBN: 0-619-21706-5.
2. Digital Forensic, Anders Flaglien, Inger Marie Sunde, Ausra Dilijonaite, Jeff Hamm, Jens Petter Sandvik, Petter Bjelland, Katrin Franke, Stefan Axelsson First published:23 May 2017, Copyright © 2018 John Wiley & Sons, Ltd. All rights reserved

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	https://books.google.co.in/books/about/Digital_Forensics.html?id=xqNaDwAAQBAJ&redir_esc=y

MOOCs Links and additional reading, learning, video material	
1.	Digital Forensics - Course (swayam2.ac.in)
2.	Digital Forensics Concepts | Coursera

IV Semester

MDM2CSE302: Object Oriented Concepts using Java

(Track 3- Software Systems)

Course Outcome
After completion of the course students will be able to: 1. Demonstrate the understanding of Object oriented concepts. 2. Make use of predefined classes and frameworks for reducing coding efforts and improving performance. 3. Apply features of object oriented programming to write programs to solve real world problems.

UNIT I: Introduction to object oriented programming paradigm	7
Introduction to object oriented programming paradigm, procedure oriented programming vs OOP, features of OOP, benefits of OOP, defining class, instantiating a class. Declaring Classes and objects, Creating Classes and objects, methods, argument passing, Recursion, this keyword, constructors ,Visibility control	
UNIT II: Other Class Modifiers	7
static, final, Abstract, Method overloading, Super keyword, Overriding (polymorphism), nested inner classes, packages (encapsulation), Interfaces (multiple Inheritances) Arrays, Strings ,Arrays, variable size arrays, Strings and String Buffer classes, Wrapper Classes	
UNIT III: Exception handling mechanism	7
Fundamentals exception types, uncaught exception, try-catch Block, displaying description of an exception, multiple catch clauses, nested try-catch statements, throw, throws, finally, built in exceptions, creating own exception subclasses. Introduction to multithreading, life cycle of Thread, Runnable interface and Thread class.	
UNIT IV: Collection Vector and Framework, IO Steam	7
Introduction to collection framework, Vectors, Array List, Linked list, Hashset, Treeset, Hashmap, Accessing a collection via Iterator, Comparators, Introduction to stream classes, use of stream classes,I/O stream, bytes stream, character stream, predefined stream, reading console input, reading character, reading string, writing console output, the print write class, reading & writing files	
Total Lectures	**28**

Text Books
1. Java Complete Reference, 7th, Herbert Schildt, McGraw-Hill

Reference Books
1. Thinking in Java, 4th, Bruce Eckel, Prentice Hall
2.Programming with Java, E. Balagurusamy, TATA McGraw-Hill

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/JAVA_Complete_Reference_Fifth_Edition.pdf
2	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/thinking_in_java_4th_edition.pdf
3	

MOOCs Links and additional reading, learning, video material	
1.	https://onlinecourses.nptel.ac.in/noc22_cs47/preview

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

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

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

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

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Technology

SoE & Syllabus 2023

5th Semester

(Department of Computer Science & Engineering)

B. Tech in Computer Science and Engineering

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.TECH SCHEME OF EXAMINATION 2023

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

(Department of Computer Science & Engineering)

B. Tech. in Computer Science & Engineering

SoE No. 23CSE-101

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
FIFTH SEMESTER															
1	5	PC	CSE	23CSE1501	Theory of computation	T	3	0	0	3	3	30	20	50	3
2	5	PC	CSE	23CSE1502	Database management systems	T	3	0	0	3	3	30	20	50	3
3	5	PC	CSE	23CSE1503	**Lab :** Database management systems	P	0	0	2	2	1		60	40	
4	5	PC	CSE	23CSE1504	Design and Analysis of Algorithms	T	3	0	0	3	3	30	20	50	3
5	5	PC	CSE	23CSE1505	**Lab :** Design and Analysis of Algorithms	P	0	0	2	2	1		60	40	
6	5	PC	CSE	23CSE1506	**Lab :** Open Source Tools	P	0	0	2	2	1		60	40	
7	5	PE	CSE		**Professional Elective I**	T	3	0	0	3	3	30	20	50	3
8	5	PE	CSE		**Lab : Professional Elective I**	P	0	0	2	2	1		60	40	
9	5	OE-3	OE		**Open Elective -III**	T	3	0	0	3	3	30	20	50	3
10	5	MDM	CSE		**MD Minor Course-III**	T	3	0	0	3	3	30	20	50	3
11	5	STR	CSE	23CSE1507	Intership, Seminar and Report	P	0	0	2	2	1		60	40	
					TOTAL		**18**	**0**	**10**	**28**	**23**				
List of Mandatory Learning Course (MLC)															
1	5	HS	T&P	MLC2125	**YCAP5 :** YCCE Communication Aptitude Preparation	**A**	3	0	0	3	**0**				

Professional Elective - I

1	5	PE-I	CSE	23CSE1521	**PE-I :** Digital Image Processing
2	5	PE-I	CSE	23CSE1522	**PE-I : Lab :** Digital Image Processing
3	5	PE-I	CSE	23CSE1523	**PE-I :** Business Intelligence
4	5	PE-I	CSE	23CSE1524	**PE-I : Lab :** Business Intelligence
5	5	PE-I	CSE	23CSE1525	**PE-I :** Mobile Application Development
6	5	PE-I	CSE	23CSE1526	**PE-I : Lab :** Mobile Application Development
7	5	PE-I	CSE	23CSE1527	**PE-I :** Internet of Things
8	5	PE-I	CSE	23CSE1528	**PE-I : Lab :** Internet of Things
9	5	PE-I	CSE	23CSE1529	**PE-I :** Introduction to geographical information system
10	5	PE-I	CSE	23CSE1530	**PE-I : Lab :** Introduction to geographical information system
11	5	PE-I	CSE	23CSE1531	**PE-I :** Neural networks and applications
12	5	PE-I	CSE	23CSE1532	**PE-I : Lab :** Neural networks and applications
13	5	PE-I	CSE	23CSE1533	**PE-I :** Advanced web technology
14	5	PE-I	CSE	23CSE1534	**PE-I : Lab :** Advanced web technology Lab
15	5	PE-I	CSE	23CSE1535	**PE-I :** Customer Relationship Management
16	5	PE-I	CSE	23CSE1536	**PE-I : Lab :** Customer Relationship Management

Coursera Electives

1	5	PE-I	PC	23CSE1537	PE-I : IBM Generative AI Engineering Professional Certificate
2	5	PE-I	PC	23CSE1538	PE I : **Lab.:** IBM Generative AI Engineering Professional Certificate

Open Elective - III

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

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

V Semester
23CSE1501: Theory of Computation

Course Outcomes:

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

CO1. To understand and apply the basic properties of formal languages and to design finite automata for regular expression and Regular Grammar.
CO2. To construct context free grammar for various languages.
CO3. To solve various problems of push down automata for context free language
CO4. To design Turing Machines for given any computational problem.

Unit No.	Contents	Max. Hrs.
Unit:1		**7 Hours**
Alphabet, Symbols, Sets, Strings, Language, Operations, Relations, Design of Finite State Machines, Acceptance of strings and languages, Non Deterministic Finite Automation, Deterministic Finite Automation, Equivalence between NFA and DFA, NFA with ε-transition, Minimization of FA.		
Unit:2		**7 Hours**
Regular sets, Regular expressions, Manipulation of regular expressions, Equivalence between RE and FA. Pumping Lemma, closure properties of regular sets, Regular grammars, Right linear and left linear regular grammars, inter-conversion between LLG & RLG, Equivalence between regular grammar and F.A., Inter-conversion between RE and RG.		
Unit:3		**7 Hours**
Context free grammar, Derivation trees (Syntax tree and Parse tree), Ambiguous Grammar, Context Free Language (CFL), Normal Form of grammar: Chomsky Normal form, Greibach normal form.		
Unit:4		**6 Hours**
Push down automata, definition, and model, acceptance of CFL by empty Stack and by final state, equivalence CFL and PDA, Inter-conversion, Closure of properties of CFL, DPDA & NDPDA.		
Unit:5		**6 Hours**
Turing machine, 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 :6		**6 Hours**
Un-decidability Problems related to Recursive enumerable language and Turing Machine, post correspondence problem. Recursive function Theory –Basis functions and operations on them. Bounded		

minimization pre-emptive μ recursive function unbounded minimization and recursive function	
Total Lecture Hours	**39 Hours**

Textbooks	
1.	Introduction to Automata Theory, Languages, and computation,3rd Edition,Hopcroft J.E., Rajeev Motwani, Jeffrey D. Ullman, Pearson Education
2.	Introduction to languages and the Theory of Computation, 3rd Edition,John C.Martin, Mc Graw Hill
Reference Books	
1.	Introduction to the Theory of Computation,2nd Edition,Michael Sipser, GALE CENGAGE Learning
2.	Theory of Computation, 1st Edition, Dr. O. G. Kakde , Laxmi Publication
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	Introduction to Languages and the Theory of Computation
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc22_cs63/preview
2	https://ocw.mit.edu/courses/18-404j-theory-of-computation-fall-2020/pages/lecture-notes/

V Semester
23CSE1502: Database Management Systems

Course Outcome
Upon successful completion of the course, the student will be able to: CO1. Analyze & compare different levels of abstraction & data independence. CO2. Design Entity Relationship Diagram for any scenario. CO3. Solve queries based on relational algebra & SQL. CO4. Identify functional dependencies & normalize the database and apply ACID properties. CO5. Analyze transaction management, various concurrency control protocols and crash recovery methods.

Unit No.	Contents	Max. Hrs.
1	**Introduction to Database Management System:**	6
General File System and Database system Concepts and Architecture, Data Models, Schemas and Instances, Abstraction & Different Levels of Data Abstraction, Data Independence: Logical & Physical Independence.		
2	**Entity-Relationship Model**:	7
Entities and Entity Sets, Relationships and Relationship Sets, Attributes, Mapping Constraints, Keys, Entity Relationship Diagram, Reducing E-R Diagrams to Tables, Generalization, Aggregation, Design of an E-R Database Scheme		
3	**SQL and Advanced SQL**	7
SQL: Data definition language (DDL), Data Manipulation Language (DML), Basic structure of SQL Queries, Set operations, Null Values, Nested subqueries, views, modification of database, transaction, Joins. **Advanced SQL:** SQL data types & schemas, Integrity Constraints, Domain Constraints, Assertions, triggers, Advanced SQL Features.		
4	**Relational Data Model**:	7
Structure of Relational Databases, **Relational Database Design**: Pitfalls in Relational Database Design, Functional Dependencies, Normalization using Functional Dependencies, Alternative Approaches to Database design. **Relational Algebra**: Structure of relational databases, Fundamental Relational-Algebra Operations, Additional relational algebra operations, extended relational algebra operations, modification of the databases		
5	**Data Storage and Querying & Transaction Management**	6
Data Storage and Querying: Storage and File Structure, Indexing and Hashing, Query Processing, query-evaluation.		

Transaction Management: ACID Properties, Implementation of ACID Properties, Database processes to support ACID Properties, Schedules, and Testing of Serializability.		
6	**Concurrency Control & Crash Recovery**	6
Concurrency Control: Lock-based Protocols, Timestamp Based Protocols, Validation Techniques, Multiple Granularity, Multi version Timestamp Protocol, Transaction isolation levels, Read consistency. **Crash Recovery**: Failure Classification, Log Based Recovery, Buffer Management, Checkpoints, Shadow Paging.		
	Total Lectures	39

Text Books	
1	Database System Concepts,Korth, Silberschatz, sudarshan ,McGraw-Hill publication
2	Fundamentals of Database Systems, Elmasri, Navathe & Gupta,Pearson Education.
Reference Books	
1	SQL & PL / SQL for Oracle 11g Black Book Kindle Edition,3rd Edition, Dr. P.S. Deshpande, Dreamtech Press
2	Database Systems, 3rd Edition,Connolly, Begg , Pearson Education
3	Database Systems, 6th Edition,S. K. Singh,Pearson Education

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/noc21_cs04/preview
2	https://onlinecourses.nptel.ac.in/noc22_cs80/preview

V Semester
23CSE1503: Lab: Database management systems

Course Outcomes:
Upon successful completion of the course the students will be able to CO1.Apply basic SQL commands for data definition and data manipulation on relational databases. CO2.Design Entity-Relationship (ER) diagrams for real-world scenarios and convert them into relational schemas. CO3.Use SQL aggregate functions, grouping, and set operations to extract meaningful insights from data. CO4.Implement joins, views, and transaction control commands to manage complex database queries and ensure data integrity. CO5.Demonstrate database connectivity using JDBC and implement PL/SQL programs for procedural operations.

Sr.No.	Experiment based on
1	To implement different basic Data Definition Language(DDL) & Data Manipulation Language(DML) Commands in SQL.
2	To design an ER Diagram.
3	To implement aggregate function & grouping commands.
4	To implement basic set operations in SQL
5	To apply BETWEEN…AND, NOT BETWEEN, IN, NOT IN, IS NULL, IS NOT NULL clause on created database.
6	To implement commands that involves constraints.
7	To implement commands for various joins.
8	To create and manipulate various database object of table using views.
9	To implement Transaction Control Language (TCL) commands.
10	To display file database connectivity using JDBC.
11	Write a program in PL/SQL to check given number is even or odd

V Semester
23CSE1504: Design and Analysis of Algorithms

Course Outcomes:

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

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

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

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

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

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

Unit No.	Contents	Max. Hrs.
Unit:1	**Introduction**	**7 Hours**

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

Unit:2	**Recursive Functions**	**6 Hours**

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

Unit:3	**Divide and conquer**	**7 Hours**

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

Unit:4	**Dynamic Programming**	**7 Hours**

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

Unit:5	**Backtracking**	**6 Hours**

Backtracking: General method, Applications- n-queen problem, Sum of subsets problem, Graph coloring and Hamiltonian cycles. **BRANCH AND BOUND**: General method, applications - travelling sales person

problem, 0/1 knapsack problem.		
Unit :6	**NP-hard and NP-complete problems**	**6 Hours**
NP-hard and NP-complete problems, basic concepts, non-deterministic algorithms, NP-hard and NP-complete, Cook's Theorem, decision and optimization problems, polynomial reduction.		
Total Lecture Hours		**39 Hours**

Textbooks	
1	Computer Algorithms, Third edition, Horowitz, Sahani, Rajsekharan , Galgotia Publications Pvt. Ltd.
2	Introduction to Algorithms, Third edition, Thomas H. Cormen, Prentice Hall of India.
3	Ellis Horowitz, Satraj Sahni, Rajasekharam (2007), Fundamentals of Computer Algorithms, 2nd edition, University Press, New Delhi.
Reference Books	
1	Aho, Ullman, Hopcroft (2009), Design and Analysis of algorithms, 2nd edition, Pearson education, New Delhi
2	R. C. T. Lee, S. S. Tseng, R.C. Chang and T. Tsai (2006), Introduction to Design and Analysis of Algorithms A strategic approach, McGraw Hill, India.
3	Allen Weiss (2009), Data structures and Algorithm Analysis in C++, 2nd edition, Pearson education, New Delhi.
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0
2	https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042
MOOCs Links and additional reading, learning, video material	
1	https://archive.nptel.ac.in/courses/106/101/106101060/
2	https://nptel.ac.in/courses/106101060

V Semester

23CSE1505: Lab: Design and Analysis of Algorithms

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

V Semester
23CSE1506: Lab: Open Source Tools

Course Outcomes:

Upon successful completion of the course the students will be able

1. Install and operate Linux systems (Ubuntu/Fedora) and perform basic command-line operations.
2. Create documents, spreadsheets, and presentations using open-source tools; perform Git operations like commit, branch, merge, push, and pull.
3. Develop basic Python programs using functions, file handling, and OOP concepts.
4. Design and host static websites using HTML5, CSS3, and Bootstrap; create and query simple databases.
5. Build a basic ML model, develop an IoT dashboard using Node-RED, design mobile app UI mockups, and manage projects using Kanban and user stories.

Sr.No.	Experiment based on
1	Install, configure, and operate Linux (Ubuntu/Fedora) and basic command-line operations.
2	Create documents, spreadsheets, and presentations using open-source office suites
3	Develop and test basic Python programs (functions, file handling, OOPs)
4	Version control operations: Initialize repository, commit, branch, merge, push and pull.
5	Design and host a basic static website using HTML5, CSS3, and Bootstrap.
6	Develop a small database application: Create DB, insert records, and perform queries.
7	Build a simple IoT Dashboard to monitor virtual sensors using Node-RED.
8	Create a simple Machine Learning model (e.g., linear regression) and visualize data.
9	Design low-fidelity wireframes and high-fidelity mockups for a mobile app.
10	Collaborative project management simulation: Create user stories, Kanban boards, and track project issues

V Semester
23CSE1521: PE-I : Digital Image Processing

Course Outcomes:

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

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

Unit No.	Contents	Max. Hrs.
Unit:1	**Introduction**	**5 Hours**
Fundamental Steps in Image Processing, Elements of DIP systems, Elements of Visual Perception, Fundamentals of Image processing, A Simple Image Model, Sampling and Quantization, Some Basic Relationships between Pixels.		
Unit:2	**Image Enhancement in the Spatial Domain**	**6 Hours**
Introduction to Spatial and Frequency methods, Basic Gray Level Transformations, Histogram Equalization, Image Subtraction, Image Averaging, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters.		
Unit:3	**Transforms & Image Enhancement in the frequency Domain**	**7 Hours**
Transforms: Introduction to the Fourier Transform, Discrete Fourier Transformation, Fourier Properties, 2DFT, inverse Fourier transform, **Image Enhancement in the frequency Domain:** Filtering in the Frequency Domain, Correspondence between Filtering in the Spatial and Frequency Domain, Smoothing Frequency-Domain Filters, Sharpening Frequency-Domain Filters, Homomorphic Filtering.		
Unit:4	**Image Compression**	**6 Hours**
Fundamentals of Image compression, coding redundancy, spatial and temporal redundancy, Measuring Image Information, Fidelity criteria, Image compression models, Basic compression methods, Huffman coding, arithmetic coding, LZW coding, run length coding.		
Unit:5	**Image Segmentation**	**6 Hours**
Point Detection, Line Detection, Edge Detection, Gradient Operator, Edge Linking and Boundary Detection, Thresholding, Region-oriented Segmentation.		
Unit :6	**Image Representation**	**5 Hours**
Chain Codes, Polygonal Approximations, Signatures, Boundary Segments, Skeleton of a Region. Description: Boundary Descriptors, Shape Numbers, Regional Descriptors, Topological Descriptors.		

Introduction to color image processing: RGB and HSI color models.	
Total Lecture Hours	**39 Hours**

Textbooks	
1	Digital Image Processing, 3rd edition 2007, Rafael C. Gonzalez and Richard, E. Woods, Prentice Hall
2	Digital Image Processing,2009, S Jayaraman, Tata McGraw Hill
Reference Books	
1	Fundamentals of Digital Image Processing, A K Jain, Prentice Hall, 1988
	Image Processing Principles & Applications 2005, TinkuAcharya&Ajoy K. Ray, Willey Inter-Science
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/37.Digital.Image.Processing.4th.Edition.www.EBooksWorld.ir.pdf
2	Index of /YCCE/DTEL Material/6.Computer Technology/DTEL PPT's with copyrights/DIP
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc21_ee78/preview
2	https://onlinecourses.nptel.ac.in/noc21_ee100/preview

V Semester

23CSE1522: Lab: PE-I : Digital Image Processing

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

V Semester
23CSE1523: PE-I : Business Intelligence

Course Outcome

After completion of the course Students will be able to :

1. Explain the fundamental concepts, architecture, trends and applications of Business Intelligence and its role in decision-making
2. Demonstrate the importance of SQL knowledge in Business Intelligence by applying SQL queries for data extraction, transformation, and analysis to support decision-making
3. Design data warehousing solutions, including ETL processes, to support BI applications.
4. Explore and analyze the Business Intelligence (BI) lifecycle and its phases, to support data-driven decision-making.

Unit No.	Contents	Max. Hrs.
1	**Introduction to Business Intelligence :**	7
What is business intelligence, why do we need BI, EIS,MIS,DSS& BI, information pyramid-data, information, Knowledge & intelligence. Basis For operational, tactical & strategic decision making , OLTP vs. OLAP, Requirement gathering in BI through business question BI in various domains and functional area, role of datawarehousing in BI.		
2	**SQL the universal language for Business Intelligence :**	6
Introduction to RDBMS, Language for retrieving data from a database,various clauses in a SQL retrieving data from multiple tables- joins filtering, sorting & grouping datasets, Introduction to DDL & DML statements, various built- in functions in SQL,Use of sub- queries,data dictionary and dynamic SQL.		
3	**Basics of data Integration (Extraction ,Transformation, Loading- ETL)**	7
Concepts of data integration, need and advantages of using data integration, introduction to common data integration approaches, introduction to ETL, introduction to data quality, data profiing concepts and applications		
4	**Principles of Dimensional modelling:**	7
Introduction to multidimensional data model , ER modelling vs Multidimensional modelling, concepts of dimensions, facts, cubes, attributes, hierarchies , Foundation for fact based decision making, star and snowflake schema, Pros& cons of the star/snowflake schema dimensional model, Slowly changing dimension tables, Fact-less fact strategy, Time dimension.		
5	**Business Intelligence system architecture:**	6
Need for enterprise class business intelligence infrastructure, The BI ecosystem, Building blocks of a n- tier BI system-servers & communication protocols, The central repository-metadata, Information consumption		

user interfaces-desktop vs. web vs. Mobile. Open architecture, Scalability, performance in BI-in memory analytics.		
6	**BI Project Lifecycle :**	6
Typical BI project lifecycle, Requirements gathering & analysis-functional & non- functional requirements, reports and dashboards design- mock – up and storyboarding, Testing in a BI project, BI project deployment, Post production support, Applications of BI, BI best practices		
	Total Lectures	39

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

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

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1. http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/26.Business%20Intelligence_%20The%20Sav%20-%20David%20Loshin_1391.pdf	
2. http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/book%20details/CSD.aspx	
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc21_mg65/preview
2	https://nptel.ac.in/courses/110107092

V Semester

23CSE1524: Lab: PE-I : Business Intelligence

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

V Semester
23CSE1525: PE-I : Mobile Application Development

Course Outcomes:

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

1. Understand the basics of mobile programming.
2. Apply mobile programming concepts.
3. Design user interfaces.
4. Design mobile database.
5. Analyse inter – application communication.

Unit No.	Contents	Max. Hrs.
Unit:1	**Introduction to Mobile Operating System**	**6 Hours**
Mobility Technology Trends, Mobile Ecosystem Overview, Mobile Devices Overview, Mobile Development, Methodology, Wireless Networks Overview, Proximity Technologies		
Unit:2	**Introduction to Android**	**7 Hours**
Android Overview, Basic building blocks, Introduction to Activities/Fragments, Introduction to Services, broadcast receivers, content providers, Android Application Structure, Source Files, Resources, Assets, Manifest, Basic IDE Operation (Android Studio), Project Creation and Handling (App Creation through Wizard), Running App on AVD and Device, DDMS and Debugging, Layout Overview, Linear Layout, Relative Layout, Frame Layout, Widgets (UI Controls) Overview, Text View, Image View, button.		
Unit:3	**User Interface Designing**	**6 Hours**
Notifications, Toast, Dialog, Listview and Adapter, View Re-usability, Spinner, Complex View, Android Component overview, Intent Resolution, Activity Stack, Launch Modes , Activity Flags, Service Overview, Service Lifecycle, Service Usage and Applicability, Message Binder.		
Unit:4	**Data Management**	**7 Hours**
Data Storage Overview, Persistant v/s Local, Shared Preferences, Internal Storage, SQLite Data Base, Thread, process overview, Async Task, Loaders, Handlers, Intent and Intent Filters, Broadcast receiver Overview, Manifest Registration vs Component Registration, Unregistration, SMS, Boot, Network etc., Action Bar and Context Menu.		
Unit: 5	**User Interface Designing**	**6 Hours**
Inter app communication requirement overview, Intents Based, Gallery, Camera, SMS App, Contacts, Content provider Overview ,Need and Usage, Content Provider structure, URI Permissions, Views, triggers, Network communication basics, Connecting to server/ request creation, Response Formats		

XML/JSON, Rest / Web Services.		
Unit :6	**Data Management**	**7 Hours**
Data Storage Overview, Persistant v/s Local, Shared Preferences, Internal Storage, SQLite Data Base, Thread, process overview, Async Task, Loaders, Handlers, Intent and Intent Filters, Broadcast receiver Overview, Manifest Registration vs Component Registration, Unregistration, SMS, Boot, Network etc., Action Bar and Context Menu.		
	Total No. Lectures	**39**

Textbooks	
1	*Mobile Design and Development,* Brian Fling, O'Reilly Media, Inc
2	*Android Programming: The Big Nerd Ranch Guide,* Bill Phillips, Chris Stewart, Brian Hardy, and Kristin Marsicano, Big Nerd Ranch LLC
Reference Books	
1.	*Programming the Mobile Web, Maximilian o Firtman, O'Reilly Media, Inc.*
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	
1	https://onlinecourses.swayam2.ac.in/nou21_ge41/preview
2	https://onlinecourses.nptel.ac.in/noc20_cs52/preview

V Semester

23CSE1526: Lab: PE-I : Mobile Application Development

Course Outcomes:
Upon successful completion of the course the students will be able to: 1. Understand and implement the basics of mobile programming. 2. Apply mobile programming concepts. 3. Design user interfaces. 4. Design mobile database. 5. Analyse and develop inter – application communication.

Sr. No.	Experiments based on
1	Study of Mobile devices & their history.
2	Study of Mobile Apps Architecture.
3	Installation of Android Studio.
4	Modification to AndroidManifest File.
5	Develop an app making use of Android layout.
6	Develop an app based on Android widgets.
7	Design & Develop an app making use of Event Handling.
8	Develop an app to demonstrate fragment manager.
9	Design & Develop an app making use of mobile database.
10	Design & Develop an app based on inter application communication.

V Semester
23CSE1527: PE-I : Internet of Things

Course Outcomes:

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

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

Unit No.	Contents	Max. Hrs.
Unit:1	**Introduction**	**6 Hours**
Concepts behind the Internet of Things, Characteristics of IoT, IoT enabling technologies, IoT Communication Model, IoT architecture, Applications of IoT, Transducers, Sensors, Sensor classes, Sensor types, Actuators and its types.		
Unit:2	**IOT Protocols**	**6 Hours**
Application layer: MQTT, COAP, XMPP, AMQP, Network Layer: IPv4, IPv6, 6LoWPAN, IoT Communication protocols: IEEE802.15.4, ZigBee, Wireless HART, Zwave, Bluetooth, NFC, RFID.		
Unit:3	**Wireless Sensor networks**	**7 Hours**
Components of sensor nodes, Node Behavior in WSNs, Applications, WSN Coverage, OGDC algorithm, Stationary and Mobile Wireless Sensor Networks.		
Unit:4	**Cloud Computing**	**6 Hours**
Recent Trends in Computing, Characteristics, Components of Cloud Computing, Service Models, Deployment Models, Service Management, Cloud Security, IoT Data analytics, Case studies, Middleware for IoT		
Unit:5	**Machine to Machine Communication**	**6 Hours**
Node types, IP and Non IP based M2M network Interoperability in Internet of Things: Current Challenges in IoT, Interoperability, Types of Interoperability		
Unit :6	**Software-Defined Networking**	**6 Hours**
Current Network to SDN, SDN Architecture, Challenges, OpenFlow Protocol, APIs in SDN, Controller Placement, Recent Advances of SDN in IoT, Industrial internet of things, Case studies		
	Total Lecture Hours	**39 Hours**

Textbooks	
1.	Internet of Things: A Hands-On Approach, Arsheep Bahga, Vijay Madisetti
Reference Books	
1.	Introduction to IOT Latest S.Misra , A. Mukherjee, A.Roy, 2020
2.	Introduction to Industrial Internet of Things and Industry S. Misra, C. Roy, and A. Mukherjee, 2020.
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/21.405352151-Industry-4-0-The-Industrial-Internet-of-Things-Apress-2016.pdf
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc21_cs17/preview
2	https://onlinecourses.nptel.ac.in/noc21_ee85/preview

V Semester
23CSE1528: Lab: PE-I : Internet of Things

Course Outcomes:
Upon successful completion of the course the students will be able to: CO1: Demonstrate proficiency in interfacing sensors and actuators with Arduino and Raspberry Pi platforms. CO2: Develop and implement embedded system applications for real-time data acquisition, processing, and display. CO3: Design communication protocols for data exchange between embedded systems and cloud platforms for remote data storage and analysis. CO4: Integrate IoT hardware with web technologies to enable real-time monitoring and control through online interfaces. CO5: Evaluate and troubleshoot complete IoT systems comprising embedded devices, cloud connectivity, and user interfaces for optimized performance.

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

V Semester

23CSE1529: PE-I : Introduction to Geographical information system

Course Outcomes:

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

1. Understand the basic concepts and applications of GIS
2. Work with spatial data models, coordinate systems, and map projections
3. Perform basic spatial analysis and data visualization
4. Use GIS software tools for solving real-world problems
5. Apply GIS techniques in fields like urban planning, environmental management

Unit No.	Contents	Max. Hrs.
Unit:1	**Introduction to GIS**	**6 Hours**
Introduction to GIS : Definition and development of GIS, Components and functions of GIS, Applications of GIS in various domains (urban planning, disaster management, agriculture, etc.), Differences between GIS, GPS, and Remote Sensing		
Unit:2	**Spatial Data and Data Models**	**7 Hours**
Spatial Data and Data Models : Spatial vs non-spatial data, Data types: Raster and Vector , Attribute data and databases, Data sources: Maps, GPS, Satellite Images, Survey Data, Data input methods and digitization		
Unit:3	**Coordinate Systems and Map Projections**	**6 Hours**
Coordinate Systems and Map Projections : Basics of Geodesy and Earth models, Coordinate reference systems: geographic and projected,Common map projections and their uses, Transformation between coordinate system		
Unit:4	**Spatial Data Analysis**	**7 Hours**
Spatial Data Analysis : Query and analysis in GIS, Buffering, overlay, and spatial join operations,Raster data analysis: reclassification, map algebra,Network analysis and terrain modeling (basic concepts)		
Unit:5	**GIS Software and Tools**	**6 Hours**
GIS Software and Tools : Introduction to popular GIS software: QGIS, ArcGIS, etc. ,Basics of data visualization and cartography,Creating and interpreting thematic maps,Introduction to web GIS and mobile GIS (overview)		
Unit :6	**Case studies**	**7 Hours**
Case studies in urban planning, environmental management, public health, transportation, Integration of GIS with Remote Sensing and GPS, Trends in GIS: Big Data, AI in GIS, and real-time GIS		
	Total Lecture Hours	**39 Hours**

Textbooks	
1	Introduction To Geographic Information Systems 4th Edition (English, Paperback, Chang Kang-Tsung)
2	Introduction to Geographic Information Systems,Authors R. Adam Dastrup, MA, GISP
3	Introduction to Geographic Information Systems,9th edition, by Kang-tsung Chang
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS] –	
1	https://www.esri.com/en-us/what-is-gis/overview
2	https://www.manage.gov.in/studymaterial/gis.pdf

V Semester

23CSE1530: Lab: PE-I : Introduction to Geographical Information System

(Practical's based on above syllabus)

V Semester

23CSE1531: PE-I: Neural Networks and Applications

Course Outcomes:

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

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

Unit	Contents	Max. Hrs.
Unit:1	**Introduction to Biological and Artificial Neural Networks:**	**7 Hours**
Biological Neurons, General Artificial Neuron Model, MP Neuron, Perceptrons, Neural Network learning Rules, types of neural networks, feedforward vs recurrent neural networks		
Unit:2	**Perceptrons and Machine Learning Basics:**	**6 Hours**
Single Discrete Perceptron algorithm, linear machine and minimum distance classification, gradient descent and Single Continuous Perceptron algorithm Machine learning basics: supervised vs unsupervised learning, various Machine learning tasks like classification, regression, machine Translation, Anomaly detection, etc. Capacity, Overfitting and Underfitting, bias and variance.		
Unit:3	**Multilayer Perceptrons and Backpropagation Algorithm**	**7 Hours**
Multilayer Perceptrons (MLPs), Representation Power of MLPs, Feed forward Neural Networks, Backpropagation, algorithm, Momentum Based Gradient Descent (GD), Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMSProp, Adam, Applications of MLPs for classification and regression,Performance measures.		
Unit:4	**Regularization:**	**6 Hours**
L1, L2 Regularization, Early stopping, Dataset augmentation, Parameter sharing and tying, Injecting noise at input, any other recent topics.		
Unit:5	**Introduction to Deep Networks:**	**7 Hours**
History of deep learning, Types of deep networks, Introduction to Convolutional Neural Networks, LeNet, Alex Net, ZF-Net, VGGNet, GoogLeNet, ResNet, Transfer learning using CNNs, comparison of shallow and deep networks.		
Unit :6	**Autoencoders:**	**6 Hours**
Auto encoders, Regularization in auto encoders, Denoising auto encoders, Sparse auto encoders, Contractive auto encoders.		
	Total Lecture Hours	**39 Hours**

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

V Semester
23CSE1532: Lab: PE-I : Neural Networks and Applications

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

V Semester
23CSE1533: PE-I : Advanced Web Technology

Course Outcomes:

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

1. Understand the core concepts of JavaScript and Node.js and their application in web development.
2. Design and structure scalable Angular applications
3. Implement advanced features in Angular, including component communication and reactive programming.
4. Develop secure and maintainable Angular applications by integrating services, route guards, and dependency injection.

Unit No.	Contents	Max. Hrs.
Unit:1	**Introduction To Javascript Using NodeJs**	**7 Hours**
Javascript , nodejs, Variables (var, let, const), Data types (number, string, boolean, object, null, undefined, symbol),Operators (arithmetic, assignment, comparison, logical),Conditional statements (if, else if, else, switch),Loops (for, while, do...while),Break and continue , Functions: Declaring functions, Function expressions, Arrow functions , Parameters and arguments, Return values, Scope (local vs. global) , Objects and Arrays: Creating and accessing objects, Object methods, Creating and accessing arrays, Array methods (push, pop, shift, unshift, map, filter, reduce)		
Unit:2	**Angular**	**6 Hours**
Angular Installation , Angular, CLI , Project Setup and First App , Basic File Structure, How an Angular App gets loaded and started, Components - 3 Files (ts,html , css, @component) , JSON ,Databinding , String Interpolation , Property Binding , Event Binding ,Attribute Binding		
Unit:3	**Conditions & modules**	**6 Hours**
Two-Way Binding , Forms Module and Two Way Binding , Understanding Directives ,Using ngIf and Else Conditions , ng-switch and ng-class, Displaying Lists using ngFor ,Creating Components , selector, Understanding app-module.ts, Module Introduction.		
Unit:4	**Angular Routing and Forms**	**7 Hours**
Introduction to Routing , Component Routing , Navigating to Router Links, Lazy Loading ,Forms in angular , Reactive Forms with validations, Dynamic Forms using FormArray and FormGroup, Different types of inputs (Input box ,Dropdown ,Radio , Checkbox)		
Unit:5	**Pipes & Directives**	**6 Hours**
Component Communication in angular , Components Life-Cycle Hooks, Pipes & custom pipes , Directives & Custom Directives , Introduction to Guards , Understanding can activate , Understanding can Activate Child, Understanding can deactivate, Understanding Resolve Guard		

Unit :6	Angular Advance Concepts	7 Hours
Understanding Services and Implementing Dependency Injection, Creating a Service, Injecting the service into Components, Introduction to HTTP Communication using HttpClientModule, CRUD Operations using HTTP Client (GET, POST, PUT, DELETE), Observables and Subscription Handling in Angular, Angular Material UI Library (Basics of Buttons, Cards, and Form Fields)		
	Total Lecture Hours	**39 Hours**

Textbooks	
1	Getting MEAN with Mongo, Express, Angular, and Node" by Simon Holmes and Clive Harber
2	Pro Angular 9: Build Powerful and Dynamic Web Apps., Adam Freeman
Reference Books	
2.	Angular Up & Running: Learning Angular, Step by Step" by Shyam Seshadri
3.	Eloquent JavaScript: A Modern Introduction to Programming" by Marijn Haverbeke
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	
MOOCs Links and additional reading, learning, video material -	
1	https://onlinecourses.swayam2.ac.in/nou24_cs09/preview

V Semester
23CSE1534: Lab: PE-I : Advanced Web Technology

Course Outcomes:

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

1. Apply JavaScript programming concepts to solve computational problems.
2. Develop and Structure Angular Applications with Components and Data Binding
3. Implement Advanced Angular Features for Dynamic Web Applications
4. Develop Angular Services, Implement HTTP Calls, and Create Custom Extensions for Scalable Applications

Sr.No.	Experiment based on
1	Create a JavaScript program that iterates through an array of numbers. For each number, check if it is even or odd using a loop. Log each number and its classification (even or odd) to the console.
2	Create a JavaScript program for managing a shopping cart: a) Initialize an empty array named shoppingCart. b) Write a function addToCart(item) that adds a given item (an object with name and price properties) to the shoppingCart array using the push method. c) Implement a function removeFromCart(itemName) that removes an item from shoppingCart based on its name using the filter method. d) Create a function calculateTotal() that calculates and logs the total price of all items in the shoppingCart using the reduce method. e) Test your program by adding a few items, removing one item by name, and calculating the total price of the remaining items.
3	Install Angular and set up a new Angular project using CLI. Create a basic application that displays "Hello, Angular!" on the homepage.
4	Create a new Angular component with its own HTML, CSS, and TypeScript files. Use the component in the main application.Also Implement string interpolation, property binding, event binding, and attribute binding in an Angular component to demonstrate data binding techniques.
5	Display a list of items using ngFor in an Angular component. Allow users to add and remove items from the list.
6	Set up routing in an Angular application. Create multiple components and use Angular Router to navigate between them.Also Implement lazy loading in an Angular application. Configure the

	router to load specific modules only when they are needed.
7	Create a reactive form in Angular with validation. Include various input types such as input boxes, dropdowns, radios, and checkboxes.
8	Develop an Angular component that communicates with another component using @Input and @Output decorators. Demonstrate component communication.
9	Create custom pipes and custom directives in Angular. Use these custom pipes and directives in an Angular component.
10	Develop a simple CRUD application in Angular where you fetch, add, update, and delete user data using a dummy REST API and HttpClientModule.
11	Create an Angular service and use dependency injection to inject the service into components. Implement HTTP calls in the service to fetch data from an external API.

V Semester

23CSE1535: PE-I : Customer Relationship Management

Course Outcomes:

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

1. Understand the elements of CRM
2. Apply the elements of CRM to manage customer portfolios.
3. Understand the tools of CRM
4. Apply the tools of CRM to manage customer portfolios.
5. Understand different analytical methods of CRM to enhance customer experience

Unit No.	Contents	Max. Hrs.
Unit:1	**CRM concepts**	**6 Hours**
CRM concepts - Acquiring customers, - Customer loyalty and optimizing customer relationships - CRM defined - success factors, the three levels of Service/ Sales Profiling - Service Level Agreements (SLAs), creating and managing effective SLAs.		
Unit:2	**CRM in Marketing**	**6 Hours**
CRM in Marketing - One-to-one Relationship Marketing - Cross Selling & Up Selling - Customer Retention, Behaviour Prediction - Customer Profitability & Value Modelling, - Channel Optimization - Event-based marketing. - CRM and Customer Service - The Call Centre, Call Scripting - Customer Satisfaction Measurement.		
Unit:3	**Sales Force Automation**	**7 Hours**
Sales Force Automation - Sales Process, Activity, Contact- Lead and Knowledge Management - Field Force Automation. - CRM links in e-Business - E-Commerce and Customer Relationships on the Internet - Enterprise Resource Planning (ERP), - Supply Chain Management (SCM), - Supplier Relationship Management (SRM), - Partner relationship Management (PRM).		
Unit:4	**ANALYTICAL CRM**	**7 Hours**
Analytical CRM - Managing and sharing customer data - Customer information databases - Ethics and legalities of data use - Data Warehousing and Data Mining concepts - Data analysis - Market Basket Analysis (MBA), Click stream Analysis, Personalization and Collaborative Filtering.		
Unit:5	**MANAGING CUSTOMER EXPERIENCE AND VALUE**	**7 Hours**
Understanding Value and when do customers experience value, Modelling customer-perceived value, Sources of customer value, Value through the marketing mix, Customisation for customer value. Understanding customer experience and concepts, how to manage customer experience, CRM vs CEM, Use of CRM software in CEM		

Unit :6	CRM Implementation	6 Hours
CRM Implementation - Defining success factors - Preparing a business plan requirements, justification and processes. - Choosing CRM tools - Defining functionalities - Homegrown versus out-sourced approaches - Managing customer relationships - conflict, complacency, Resetting the CRM strategy. Selling CRM internally - CRM development Team - Scoping and prioritizing - Development and delivery - Measurement		
	Total Lecture Hours	**39 Hours**

Textbooks	
1	Alok Kumar Rai, CUSTOMER RELATIONSHIP MANAGEMENT CONCEPT & CASES, Prentice Hall of India Private Limted, New Delhi. 2011
2	S. Shanmugasundaram, CUSTOMER RELA TIONSHIP MANAGEMENT, Prentice Hall of India Private Limted, New Delhi, 2008
Reference Books	
1	Kaushik Mukherjee, CUSTOMER RELATIONSHIP MANAGEMENT, Prentice Hall of India Private Limted, New Delhi, 2008
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	
2	
MOOCs Links and additional reading, learning, video	
1	https://onlinecourses.nptel.ac.in/noc20_mg57/preview

V Semester

23CSE1536: Lab: PE-I : Customer Relationship Management

(PRACTICALS BASED ON ABOVE SYLLABUS)

V Semester
MDM3CSE103: Computer Vision Essentials

Course Outcomes:

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

CO1 Understand the basic concepts of computer vision, image formation, and its real-world application

CO2 Apply fundamental image processing techniques such as filtering, transformations, and thresholding.

CO3 Analyze and extract features from images using edge, corner, and blob detection methods.

CO4 Implement basic object detection and recognition techniques using computer vision libraries.

CO5 Evaluate the impact of computer vision technologies in different engineering domains and their ethical implications.

Unit No.	Contents	Max. Hrs.
Unit:1	**Introduction to Computer Vision**	**7 Hours**
Definition and scope of computer vision, Applications in robotics, industry, medicine, etc., Human vs. computer vision, Basic steps in a computer vision system		
Unit:2	**Image Formation and Representation**	**7 Hours**
Image sensing, acquisition, and digitization, Color spaces (RGB, HSV, Grayscale), Image file formats and metadata, Introduction to OpenCV for image loading and viewing		
Unit:3	**Image Processing Fundamentals**	**7 Hours**
Point operations: brightness, contrast, thresholding, Geometric transformations: rotation, scaling, cropping, Image filtering: smoothing and sharpening (blur, Gaussian, median),Histogram and equalization.		
Unit:4	**Feature Detection and Description**	**6 Hours**
Edge detection: Sobel, Canny, Corner detection: Harris and Shi-Tomasi Blob detection: LoG, DoG, Introduction to keypoint descriptors (SIFT, ORB)		
Unit:5	**Object Detection and Recognition**	**6 Hours**
Template matching, Contour detection, Object classification (intro to ML-based methods), Simple face/object detection using pre-trained models (e.g., Haar cascades)		
Unit :6	**Applications and Case Studies**	**6 Hours**
Industry case studies: automation, manufacturing, surveillance, Vision in healthcare, agriculture, and autonomous vehicles. Project discussions: barcode reader, face unlock, gesture detection,Ethical considerations in computer vision		
Total Lecture Hours		**39 Hours**

Textbooks	
1	Richard Szeliski, *Computer Vision: Algorithms and Applications* – Springer
2	Sonka, Hlavac, Boyle, *Image Processing, Analysis, and Machine Vision* – Cengage
Reference Books	
1	Gary Bradski & Adrian Kaehler, *Learning OpenCV* – O'Reilly Media
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/54.NLP_Language_processing_jurafsky_BOOK.pdf
2	
MOOCs Links and additional reading, learning, video material	
1	https://www.youtube.com/live/FbOCV344iLA?si=IQdy1JM1b4z-Evww

V Semester
MDM3CSE203: Ethical Hacking

Course Outcomes:

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

CO1: Explain the phases of ethical hacking (reconnaissance, scanning, exploitation, post-exploitation) and relevant laws/ethics.
CO2: Execute network and host discovery techniques (OSINT, Nmap, Nessus) to map attack surfaces.
CO3: Demonstrate hands-on exploitation of system vulnerabilities (password attacks, buffer overflows, rootkits).
CO4: Conduct web-application attacks (SQL injection, XSS, CSRF) and wireless exploits (WEP/WPA2 cracking).
CO5: Evaluate penetration-test findings to assess an organization's security posture and propose mitigations.
CO6: Prepare professional-grade penetration-testing reports and present actionable recommendations to technical and non-technical stakeholders.

Unit No.	Contents	Max. Hrs.
Unit:1	**Introduction to Management**	**7 Hours**
Introduction to Ethical Disclosure, Types of Hackers(What Hat, Black Hat, Grey Hatetc), Legal Framework and Cyber Laws(Indian Act 2000), Penetration Testing vs Ethical Hacking ,Legal and Ethical Considerations		
Unit:2	**Networking Basics**	**7 Hours**
OSI Model and TCP/IP Model, IP Addressing, Subletting ports, protocol and services. System Hacking Concepts, Cracking Passwords , Escalating Privileges , Executing Applications , Hiding Files , Covering Tracks , Penetration Testing		
Unit:3	**Foot printing and Reconnaissance**	**6 Hours**
Information Gathering Techniques, DNS Footprinting ,WHOIS Lookups Port and Vulnerability Scanning, Enumeration Method, Social Engineering Concepts		
Unit:4	**Scanning and Enumeration**	**7Hours**
Network Scanning Techniques, Port and Vulnerability Scanning, Enumeration Method, NetBIOS Enumeration , Enumeration Pen Testing ,Nmap, Zenmap, Advanced Scan Types, Banner Grabbing, □ Enumeration: SMB, SNMP, LDA OS Fingerprintin,Vulnerability Scanning (Nessus,OpenVAS)		
Unit:5	**Vulnerability Analysis**	**6 Hours**
Passive Analysis ,Advanced Static Analysis with IDA Pro , Advanced Reverse Engineering, Client-Side Browser Exploits, Exploiting the Windows Access Control Model ,Intelligent Fuzzing with Sulley ,From Vulnerability to Exploit , Closing the Holes: Mitigation		

Unit :6	Malware Analysis	6 Hours

Collecting Malware and Initial Analysis , Types of Malware , Malware Defensive Techniques, Latest Trends in Honeynet Technology ,Honeypots, Honeynets, Why Honeypots Are Used , Limitations of Honeypots , Low-Interaction Honeypots , High-Interaction Honeypots, Types of Honeynets , Thwarting VMware Detection Technologies , Catching Malware: Setting the Trap , VMware Host Setup , VMware Guest Setup , Using Nepenthes to Catch a Fly ,Initial Analysis of Malware , Static Analysis , Live Analysis , Norman SandBox Technology , Hacking Malware ,Trends in Malware Embedded Components, Use of Encryption , User Space Hiding Techniques , Use of Rootkit Technology Persistence Measures , De-obfuscating Malware , Packer Basics , Unpacking Binaries , Reverse-Engineering Malware.

	Total Lecture Hours	39 Hours

Textbooks

1.	Gray Hat Hacking The Ethical Hacker's Handbook Third Edition Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, Gideon Lenkey, and Terron Williams Gray Hat Hacking, by MSGRAW HIL PBLICATION.
2.	Certified Ethical Hacker Study Guide v9, Sean-Philip Oriyano, Sybex; Study Guide Edition,2016

Reference Books

1.	Certified Ethical Hacker: Matt Walker, TMH,2011
2.	Certified Ethical Hacker: Michael Gregg, Pearson Education,1st Edition, 2013 2
3.	The Basics of Hacking and Penetration Testing Ethical Hacking and Penetration Testing Made Easy Second Edition Dr. Patrick Engebretson David Kennedy, Technical Editor

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	http://www.pentest-standard.org/index.php/PTES_Technical_Guidelines https://www.owasp.org/index.php/Category:OWASP_Top_Ten_2017_Project https://www.owasp.org/index.php/Mobile_Top_10_2016-Top_10 https://www.owasp.org/index.php/OWASP_Testing_Guide_v4_Table_of_Contents https://www.owasp.org/index.php/OWASP_Secure_Coding_Practices_-_Quick_Reference_+Guide
2	http://resources.infosecinstitute.com/applications-threat-modeling/#gref
3	https://cve.mitre.org/ https://access.redhat.com/blogs/766093/posts/2914051 1

V Semester
MDM3CSE303: Software Engineering Concepts

Course Outcomes:

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

1. Explain the fundamental concepts of software engineering, software processes, and characteristics of software products.
2. Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices.
3. Translate end-user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Specification Document (SRS).
4. Design software architecture and models using UML diagrams for given software requirements.
5. Experience awareness of testing problems and will be able to develop a simple testing report.

Unit No.	Contents	Max. Hrs.
Unit:1	**Introduction**	**6 Hours**
Software, Program, Software Crisis and Solutions, Software Evolution, Software Development Paradigm, Need of Software Engineering, Software Processes, Software Characteristics, Attributes of Software Product, Software Myths, Software basic terminologies, Characteristics of good software.		
Unit:2	**Software Development Life Cycle Models**	**6 Hours**
Build and Fix, Waterfall, Prototype, Iterative Enhancement, Rapid Application Development, Evolutionary, Prototyping, and Spiral Model.		
Unit:3	**Software Requirements Analysis and Specifications**	**7 Hours**
Requirement Engineering, Types of Requirements. Requirement Elicitation: Interview, Brainstorming, Quality Functional Deployment, Use Case 10 Approach.		
Unit :4	**Requirements Analysis**	**7 Hours**
Problem Analysis, Data Flow Diagrams, Data Dictionaries, EntityRelationship Diagram, Requirements Documentation, Requirements Validation, Software Requirement and Specifications, Requirements Management, Change Management Form, Structure of SRS, IEEE Std 830-1993, Software Prototyping.		
Unit :5	**Design Engineering**	**7 Hours**
Design process and design quality, design concepts, the design model. Creating an architectural design: software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.		
Unit :6	**Testing Strategies**	**6 Hours**
A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging. Product metrics: Software quality, metrics for analysis model, metrics for design model, metrics for source code, metrics for testing, metrics for maintenance.		
Total Lecture Hours		**39 Hours**

Textbooks	
1.	Software Engineering – A practitioner's approach, R. S. Pressman, 6th ed., McGraw Hill Int. Ed.
2.	Software Engineering, Ian Sommerville, Pearson Education; Tenth edition.

Reference Books	
1.	Software Engineering Concepts, Richard Fairley, McGraw Hill Education.
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS] –	
1	
MOOCs Links and additional reading, learning, video material -	
1	https://archive.nptel.ac.in/courses/106/105/106105182/

V Semester
Open Elective –III: 23OE3501-Social Reformers in Modern Maharashtra

Course Outcomes:

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

CO1: Identify the major social challenges in 19th–20th century Maharashtra and the reform movements addressing them.

CO2: Analyze the contributions of reformers like Phule, Ambedkar, and Savitribai through ethical frameworks.

CO3: Evaluate how religion, spirituality, and socio-political movements contributed to change.

CO4: Understand the origins and goals of the Dalit movement and gender justice in Maharashtra.

CO5: Apply lessons from reform history to contemporary socio-technical challenges and professional conduct.

Unit:1	**Introduction to Social Reform Movements in Maharashtra**	**7 Hours**

Historical background of 19th century Maharashtra, Social evils: caste system, gender, discrimination, untouchability, British colonial context and socio-political conditions, The emergence of social consciousness in 19th-century Maharashtra, Overview of reform organizations and thought leaders,

Unit:2	**Early Reformers and Their Contributions**	**7Hours**

Early Reformers and Their Contributions : Raja Ram Mohan Roy: religious, reform, Brahmo Samaj (national context) Mahatma Jyotirao Phule: education for oppressed, anti-caste movement, Satyashodhak Samaj, Savitribai Phule: first female teacher, women's rights and empowerment,Gopal Hari Deshmukh (Lokhitwadi): rationalism, public awakening Raja Ram Mohan Roy (Brief context from Bengal)

Unit:3	**Reform Through Religion and Spirituality**	**7 Hours**

Bhakti Movement and Sant, Parampara: Dnyaneshwar, Tukaram, Namdev,Ethical values in religious philosophy and poetry, Swami Vivekananda: spiritual nationalism, youth empowerment, Religious tolerance and inclusive spiritual reform

Unit:4	**Social Justice and Dalit Movement**	**6 Hours**

Social Justice and Dalit Movement: Dr. B.R. Ambedkar: biography, philosophy, and contributions, Annihilation of Caste: critical ideas and implications, Dalit Sahitya and post-Ambedkarite movements, Role of legal reform, Constitution, and reservation in social justice

Unit:5	**Women Reformers and Gender Justice**	**6 Hours**
Women Reformers and Gender Justice: Contributions of Savitribai Phule, Tarabai Shinde, Pandita Ramabai, Textual analysis of Stri-Purush Tulana, Women's education, legal rights, and socio-religious resistance, Gender inequality in contemporary STEM fields.		
Unit :6	**Contemporary Relevance and Legacy**	**6 Hours**
Contemporary Relevance and Legacy: Continued influence of reformers on, Indian democracy, Technology and social inclusion: caste, class, and gender access Engineers' role in promoting equity and sustainability, Ethical leadership and professional responsibility, Legacy of social reformers in today's Maharashtra		
	Total Lecture Hours	**39 Hours**

Textbooks

1	P. Deshpande (Ed.) *Selected Writings of Jyotirao Phule*
2	Eleanor Zelliot – *From Untouchable to Dalit: Essays on the Ambedkar Movement*
3	Gail Omvedt – *Dalits and the Democratic Revolution*
4	Rosalind O'Hanlon – *Caste, Conflict, and Ideology*
5	Selected speeches and writings of Dr. B.R. Ambedkar,Ambedkar, B.R. – Annihilation of Caste
6	Gail Omvedt – Dalit Visions, Cultural Revolt in a Colonial Society, IGNOU/NCERT Texts on Social Reform, Documentaries: India Untouched, Children of Savitribai, Ambedkar Now, AICTE Model Curriculum and UHV Modules

Reference Books

1	**Jyotirao Phule** *Gulamgiri*, *Shetkaryacha Asud*, Hunter Commission deposition) *Gulamgiri* (original Marathi 1873; English preface) *Shetkaryacha Asud* (The Cultivator's Whipcord, 1881)
2	*Savitribai Phule – Samagra Wangmay* (complete writings, ed. M.G. Mali) *Kavya Phule* (1854) and *Bavan Kashi Subodh Ratnakar* (1892) – her two poetry anthologies
3	**Dr. B.R. Ambedkar and the Dalit Movement** • **From Untouchable to Dalit: Essays on the Ambedkar Movement** A foundational collection of 16 essays tracing the political, religious, and literary dimensions of Ambedkar's movement. AmazonGoogle Books • **Ambedkar's World: The Making of Babasaheb and the Dalit Movement**

	Examines Ambedkar's intellectual development and the growth of Dalit Buddhism. Wikipedia • **Untouchable Saints: An Indian Phenomenon** (eds. Eleanor Zelliot & Rohini Mokashi-Punekar) Anthemic studies of medieval Dalit saint-poets. Wikipedia
4.	**Pandita Ramabai: Pioneer of Women's Emancipation:** *Pandita Ramabai through Her Own Words: Selected Works* (Meera Kosambi, ed.) Collected writings—Marathi originals & English translations—ideal for women's studies. *The High-Caste Hindu Woman* (1888) Ramabai's landmark exposé on child marriage and widowhood in British India.
5.	Thematic & Contextual Studies: **Makers of Modern India** (Ramachandra Guha, 2010) Profiles key figures—from Ram Mohan Roy to Ambedkar—including Phule and Savitribai Phule.
6.	**Caste Matters** (Suraj Yengde, 2019) Contemporary sociological analysis of caste persistence and Dalit identity in modern India.
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	https://archive.org/details/highcastehinduwo00ramaiala
2	https://www.cambridge.org/core/books/from-untouchable-to-dalit/…
3	https://archive.org/details/dli.ministry.13898
4	https://yalebooks.yale.edu/book/9780300259434/caste-matters
5	https://orientblackswan.com/book/dalits-and-the-democratic-revolution

V Semester

Open Elective –III: 23OE3502- Independent India 1948-2010

Course Outcomes:

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

CO1: Analyze the political legacy of colonialism.
CO2: Understand the historical context and process of framing the Indian Constitution.
CO3: Analyze major political developments in India since 1947
CO4: Evaluate the economic challenges and transformations between 1965–1991
CO5: Examine the rise and impact of terrorism and separatism in Punjab
CO6: Identify and evaluate the significance of historical and tourist places in India

Unit:1	**The Legacy of Colonialism and National Movement:-**	**7 Hours**

Political legacy of Colonialism, Economic and Social Legacy of Colonialism, **National movements**: Its significance, Value and Legacy

Unit:2	**The making of the Constitution and consolidation as a new nation:-**	**8 Hours**

Framing of Indian Constitution - Constituent Assembly, Draft Committee Report, declaration of Indian Constitution, Indian constitution- Basic Features and Institutions The Initial Years: Process of National Consolidation and Integration of /Indian States – Role of Sardar Patel Kashmir issue Indo Pak war 1948, the Linguistic Reorganization of the States, Regionalism and Regional Inequality.

Unit:3	**Political developments in India since Independence**:-	**7 Hours**

Political development in India since Independence, Politics in the States: Tamil Nadu, Andhra Pradesh, Assam, West Bengal and Jammu and Kashmir, the Punjab Crisis, The Post-Colonial Indian State and the Political Economy of Development: An Overview, Foreign policy of India since independence.

Unit:4	**Socio-Economic development since independence:-**	**8 Hours**

Indian Economy, 1947-1965: the Nehruvian Legacy Indian Economy, 1965-1991, Economic Reforms since 1991 and LPG, Land Reforms: Zamindari Abolition and Tenancy Reforms, Ceiling and the Bhoodan Movement, Cooperatives and an Overview, Agriculture Growth and the Green Revolution And Agrarian Struggles Since Independence, Revival and Growth of Communalism, Caste, Untouchability, Anti-caste Politics and Strategies.

Unit:5	**Peasants Struggle**:-	**7 Hours**

Terrorism in Punjab, Assam Struggle Telengana Struggle Foreign Policy of India, India and Non- Aligned Movement, India and UNO-SAARC.

Unit :6	**Development of Education**:-	**8 Hours**

Planned Economic Development ,Transport and Communication- Cultural Activities in India. Visit Historical and important Tourist places in India

Total Lecture Hours	**45 Hours**

Textbooks	
1	Ghai, K.K., Indian Government and Politics, New Delhi, 1912.
2	Menon, V.P ,The story of the integration of the Indian States, Orient Longmans, 1961.
3.	Bipan Chandra, Mridula Mukherjee and Aditya Mukherjee, *India Since Independence*, New Delhi, 2008.
Reference Books	
1	Biphan Chandra, India after Independence, (1947-2000) Penguin Books, New Delhi, 2000.
2	Braw P.K., Politics of India since Independence, New Delhi, 1999.
3	Chakaravarthy S.R, Contemporary India, New Delhi, 2005.

V Semester

Open Elective –III: 23OE3527- Human Rights & International Laws

Course Outcomes:

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

CO1: Explain the concept, evolution, and significance of human rights in a global and Indian context. **CO2:** Analyze key provisions of international human rights laws and their impact on digital and cyber laws**.**

CO3: Examine the working of various human rights protection mechanisms at national and international levels.

CO4: Understand the ethical implications of AI, privacy rights, and digital freedom in technology and law.

CO5: Evaluate case studies of human rights violations and suggest possible legal remedies.

CO6: Apply human rights principles to software development, AI ethics, and cyber regulations**.**

Unit:1	**Introduction to Human Rights**	**7 Hours**

- Definition, Nature, and Characteristics of Human Rights
- Evolution of Human Rights: Ancient, Medieval, and Modern Developments
- Universal Declaration of Human Rights (UDHR)
- Indian Constitution and Human Rights: Fundamental Rights and Duties
- Role of Judiciary in Protecting Human Rights

Unit:2	**International Human Rights Law**	**7 Hours**

- International Bill of Human Rights: UDHR, ICCPR, ICESCR
- Role of United Nations (UN), International Court of Justice (ICJ), International Criminal Court (ICC)
- Convention on Elimination of Discrimination, Child Rights, Refugees
- Human Rights in Armed Conflicts, War Crimes, and Geneva Conventions
- Case Studies on International Human Rights Violations

Unit:3	**Human Rights and Technology**	**6 Hours**

- Right to Privacy, Data Protection, and Cyber Ethics
- Surveillance, AI, and Human Rights Issues
- Freedom of Speech & Expression in Digital Space
- Cybersecurity Laws and Ethical Hacking
- Case Studies: Pegasus Spyware, Cambridge Analytica, AI Bias in Decision Making
- Digital Rights and Responsibilities of Software Engineers

Unit:4	**National Mechanisms for Human Rights Protection**	**7 Hours**

- Role of National Human Rights Commission (NHRC) and State Human Rights Commissions (SHRCs)
- Indian Judiciary and Landmark Human Rights Cases

• Protection of Women, Children, LGBTQ+, and Minorities in India • Legal Remedies for Human Rights Violations in India • Case Studies on Human Rights Implementation in India		
Unit:5	**International Law and Human Rights Treaties**	**6 Hours**
• Sources of International Law: Treaties, Customs, General Principles • United Nations Charter and Human Rights Enforcement • Extradition and Asylum Laws • Human Rights & International Trade (WTO, MNCs, and Labour Rights) • Role of NGOs in Human Rights Protection (Amnesty International, Human Rights Watch, etc.) • Case Studies on International Human Rights and Legal Issues		
Unit :6	**Human Rights in the Digital Age & Future Challenges**	**7 Hours**
• Ethical Issues in AI, Machine Learning, and Robotics • Social Media, Hate Speech, and Online Censorship • Impact of Big Data, Facial Recognition, and Biometric Surveillance on Human Rights • Future Challenges in Space Law, Bioethics, and Genetic Engineering • Role of Engineers and Computer Scientists in Promoting Human Rights • Emerging Legal and Ethical Frameworks for Digital Human Rights		
Total Lecture Hours		**39 Hours**

Textbooks	
1	International Law and Human Rights, H.O. Agarwal, Central Law Publications, 23rd Edition, 2021
2	Human Rights Under International Law and Indian Law, S.K. Kapoor, Central Law Agency 7th Edition, 2017
Reference Books	
1	Human Rights and Constitutional Law, D.D. Basu, LexisNexis, 3rd Edition, 2008
2	Human Rights, U. Chandra, Allahabad Law Agency,5th Edition, 2014

V Semester
Open Elective –III: 23OE3528- Cyber Crime Administration

Course Outcomes:

After completion of the course students will be able to:

1. Understand the fundamentals of cybercrime, its classification, and the legal framework associated with cyber laws in India and globally.
2. Analyze various types of cybercrimes and investigate real-world case studies to comprehend the modus operandi of cybercriminals.
3. Apply cyber investigation techniques and digital forensic tools to detect, trace, and document cyber incidents.
4. Evaluate the roles and responsibilities of cybercrime administration, including law enforcement agencies, cyber cells, and international collaboration.
5. Develop awareness of emerging cyber threats and propose suitable cyber policies or preventive strategies in response to evolving digital crime landscapes.

Unit:1	**Fundamentals of Cybercrime**	**7 Hours**
Definition, history, and evolution of cybercrime, Classification: Financial crimes, cyberstalking, cyberbullying, hacking, Motivation and psychology behind cybercriminals, Impact of cybercrime on individuals, organizations, and society.		
Unit:2	**Cybercrime Investigation and Digital Evidence**	**7 Hours**
Phases of cybercrime investigation, Types of digital evidence: volatile vs. non-volatile, Collection, preservation, analysis, and presentation of evidence, Legal aspects of evidence: chain of custody and admissibility.		
Unit:3	**Cyber Laws and Legal Framework**	**7 Hours**
Overview of Indian IT Act 2000 and amendments, Relevant sections of IPC and CrPC for cyber offenses, International legal frameworks: GDPR, Budapest Convention, Case laws and recent judicial decisions.		
Unit:4	**Cybercrime Governance and Administration**	**6 Hours**
National cybercrime administration: MHA, CERT-In, NCIIPC,State cybercrime cells and police units,Public-private cooperation and cybercrime reporting portals,Cybersecurity policy frameworks (National Cyber Security Policy),		
Unit:5	**Digital Forensics and Tools**	**6 Hours**
Basics of digital forensics and investigation lifecycle,Forensic tools: EnCase, FTK, Autopsy, Wireshark,Email, network, mobile, and cloud forensics,Lab/demonstration sessions and hands-on assignments		
Unit :6	**Emerging Threats, Case Studies & Policy**	**6 Hours**
Current and future cybercrime trends: ransomware, deepfakes, cyber warfare, crypto crimes,Role of AI/ML in cyberattacks and defense,Famous Indian and international cybercrime case studies,Drafting cybercrime policy for institutions and best practices in prevention.		
	Total Lecture Hours	**39 Hours**

Textbooks	
1.	Cyber Security and Cyber Laws, 1st Edition, Alfred Basta, Nadine Basta, Mary Brown, Cengage Learning, 2017
2.	*Cyber Law in India,* 3rd Edition, Pavan Duggal, Universal Law Publishing Co., 2021
3.	Computer Forensics: Principles and Practices, 1st Edition, Linda Volonino, Reynaldo Anzaldua, Pearson Education, 2008.
Reference Books	
1	Cyber Law and Ethics, 1st Edition, R.K. Suri, T.N. Chhabra, Kalyani Publishers, 2016
2	Computer Forensics and Cyber Crime: An Introduction, 3rd Edition, Marjie T. Britz, Pearson Education, 2013.
3	Cyber Crime & Information Technology Control, 1st Edition, Dr. B.R. Sharma, Universal Law Publishing, 2012.
4	Introduction to Cybercrime: Computer Crimes, Laws and Policing in the 21st Century, 1st Edition, Joshua B. Hill, Nancy E. Marion, Praeger, 2016
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	https://link.springer.com/search?query=Cyber+Crime+Administration+
2	https://onlinelibrary.wiley.com/action/doSearch?AllField=Cyber+Crime+Administration
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.swayam2.ac.in/cec22_lw07/preview

V SEMESTER

Mandatory Learning Course (MLC)

MLC2125 : YCAP5

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

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

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Technology

SoE & Syllabus 2023

6th Semester

(Department of Computer Science & Engineering)

B. Tech in Computer Science and Engineering

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.TECH SCHEME OF EXAMINATION 2023

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

(Department of Computer Science & Engineering)

B. Tech. in Computer Science & Engineering

SoE No. 23CSE-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	CSE	23CSE1601	Machine Learning	T	3	0	0	3	3	30	20	50	3
2	6	PC	CSE	23CSE1602	**Lab :** Machine Learning	P	0	0	2	2	1		60	40	
3	6	PC	CSE	23CSE1603	Language Processors	T	3	0	0	3	3	30	20	50	3
4	6	PC	CSE	23CSE1604	Lab : Language Processors	P	0	0	2	2	1	60	40		
5	6	PC	CSE	23CSE1605	Design Thinking and Research Methodology	T	2	0	0	2	2	30	20	50	3
6	6	PE	CSE		**Professional elective-II**	T	3	0	0	3	3	30	20	50	3
7	6	PE	CSE		**Professional elective-III**	T	3	0	0	3	3	30	20	50	3
8	6	PE	CSE		**Professional elective-IV**	T	3	0	0	3	3	30	20	50	3
9	6	MDM	MDM		**MD Minor Course-IV**	T	3	0	0	3	3	30	20	50	3
10	6	**VSEC-4**	CSE	23CSE1606	**Lab :** Vocational & Skill Enhancement -Linux Administration and shell programming	P	0	0	2	4	2		60	40	
11	6	STR	CSE	23CSE1607	Project Phase-I	P	0	0	4	4	2		60	40	
					TOTAL		**20**	**0**	**10**	**32**	**26**				

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

Professional Elective - II					
1	6	PE-II	CSE	23CSE1621	**PE-II :** Big Data Analytics
2	6	PE-II	CSE	23CSE1622	**PE-II :** Computer Graphics
3	6	PE-II	CSE	23CSE1623	**PE-II :** Parallel computing
4	6	PE-II	CSE	23CSE1624	**PE-II :** Game Theory
5	6	PE-II	CSE	23CSE1625	**PE-II :** Real time system
6	6	PE-II	CSE	23CSE1626	**PE-II :** Cloud Computing
7	6	PE-II	CSE	23CSE1627	**PE-II :** Management Information system
8	6	PE-II	CSE	23CSE1628	**PE-II :** Digital Marketing Analytics

Professional Elective - III					
1	6	PE-III	CSE	23CSE1641	**PE-III :** Financial Data analysis
2	6	PE-III	CSE	23CSE1642	**PE-III :** Augmented Reality
3	6	PE-III	CSE	23CSE1643	**PE-III :** Information Retrieval System
4	6	PE-III	CSE	23CSE1644	**PE-III :** Optimization Techniques
5	6	PE-III	CSE	23CSE1645	**PE-III :** Human Computer interaction
6	6	PE-III	CSE	23CSE1646	**PE-III :** Blockchain Technology
7	6	PE-III	CSE	23CSE1647	**PE-III :** Bioinformatics
8	6	PE-III	CSE	23CSE1648	**PE-III :** Software Defined Network
9	6	PE-III	CSE	23CSE1649	**PE-III :** Soft Computing

Professional Elective - IV					
1	6	PE-IV	CSE	23CSE1661	**PE IV :** GPU architecture and Programming
2	6	PE-IV	CSE	23CSE1662	**PE IV :** Quantum Computing
3	6	PE-IV	CSE	23CSE1663	**PE IV :** Prompt Engineering
4	6	PE-IV	CSE	23CSE1664	**PE IV :** Nature Inspired Computing
5	6	PE-IV	CSE	23CSE1665	**PE IV :** Distributed Computing
6	6	PE-IV	CSE	23CSE1666	**PE IV :** Industry 4.0
7	6	PE-IV	CSE	23CSE1667	**PE IV :** Distributed Database Management System
8	6	PE-IV	CSE	23CSE1668	**PE IV :** Data Mining
9	6	PE-IV	CSE	23CSE1669	**PE-IV** : Product Development

Coursera Electives					
1	6	PE-IV	CSE	23CSE1670	PE-IV: IBM Deep Learning with PyTorch, Keras and Tensorflow Professional Certificate
		PE-IV	CSE	23CSE1671	PE-IV: **Lab.** IBM Deep Learning with PyTorch, Keras and Tensorflow Professional Certificate

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

VI Semester
23CSE1601: Machine Learning

Course Outcomes:

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

CO1. To understand the basic principles of supervised and unsupervised machine learning algorithms, and strategies for the design of ML experiments.
CO2. To apply supervised to the given dataset and predict the model outcome.
CO3. To apply unsupervised learning algorithms to the given dataset and predict the model outcome.
CO4.To analyse a given problem and classify it as supervised(regression or classification), or unsupervised learning and select the appropriate algorithm(s) to solve the problem
CO5. To evaluate the performance of ML models using appropriate performance measures.

Unit No.	Contents	Max. Hrs.
Unit:1	**Introduction to Machine learning:**	**6 Hours**
Overview of Machine Learning, Types of Machine Learning: Supervised, Unsupervised, Reinforcement learning, Classification, Regression, Supervised and Unsupervised Learning, Learning Associations, Machine Learning Workflow, Examples of Machine Learning Applications.		
Unit:2	**Supervised Learning-1:**	**7 Hours**
Linear and polynomial regression, classification with k-Nearest Neighbors, Naive Bayes Classifiers, Decision Trees, Generalization, Overfitting, and Underfitting.		
Unit:3	**Supervised Learning-2:**	**6Hours**
Random forests, Kernelized Support Vector Machines, Uncertainty in Multiclass Classification, feature engineering and selection, evaluation metrics for supervised learning.		
Unit:4	**Unsupervised Learning:**	**7 Hours**
k-Means Clustering , Choosing the Number of Clusters, Semi-Supervised Learning , Evaluationmetrics for unsupervised learning		
Unit:5	**Design and Analysis of Machine Learning Experiments** :	**6 Hours**
Factors, Response, and Strategy of Experimentation, Randomization, Hypothesis testing, Replication, and Blocking, Guidelines for Machine Learning Experiments , Cross-Validationand Resampling Methods, K-Fold Cross-Validation, Comparing, Two Classification Algorithms.		

Unit :6	Advances in Machine Learning :	7 Hours
Introduction to learning using Neural networks, types of artificial neuron and activation functions, Feedforward vs. Recurrent networks, multi-layer feedforward networks.		
	Total Lecture Hours	**39 Hours**

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

VI Semester
23CSE1602: Lab: Machine Learning

Course Outcomes:
Upon successful completion of the course the students will be able to: 1. Understand the basic principles of supervised and unsupervised machine learning algorithms, and strategies for the design of ML experiments. 2. Apply supervised to the given dataset and predict the model outcome. 3. Apply unsupervised learning algorithms to the given dataset and predict the model outcome. 4. Analyse a given problem and classify it as supervised(regression or classification), or unsupervised learning and select the appropriate algorithm(s) to solve the problem 5. valuate the performance of ML models using appropriate performance measures and Recursive Enumerable Language.

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

VI Semester
23CSE1603: Language processors

Course Outcomes:

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

CO1. Understand the structure, phases, and working of a compiler including lexical and syntax analysis.
CO2. Apply top-down and bottom-up parsing techniques, and construct parsing tables for LL(1) and LR parsers.
CO3. Implement syntax-directed translation schemes and generate intermediate code representations.
CO4. Analyze symbol table organization, and mechanisms for scope representation and error handling.
CO5. Evaluate and apply code optimization techniques and generate efficient target code.

Unit No.	Contents	Max. Hrs.
Unit:1	Introduction to Compilation Process, Compilers & Translators, Phase structure of Compiler, Design of Lexical Analysis.	**6 Hours**
Unit:2	Specifying Syntactic Structure of Programming Language using Context Free Grammars, The role of Parser, Top-down Parsing, Bottom Up Parsing, Predictive Parsers, and Recursive Decent Parser.	**7 Hours**
Unit:3	Construction of efficient LR Parsers (SLR, CLR & LALR), Canonical Collection of set of items and construction of Parsing table, Implementation of LR Parsing table.	**7 Hours**
Unit:4	Syntax Directed Translation: Intermediate Code, Postfix notation, Parse tree and Syntax Trees, Three address codes, quadruples, triples, Translation of Arithmetic Expression, Boolean expressions, Control Statements. Array references, Use of Compiler writing tools (LEX/ FLEX, YACC / BIASON).	**7 Hours**
Unit:5	Symbol Tables: Contents, Representing scope information. Error detection and Recovery: Error handling, Lexical-phase, Syntactic phase and semantic phase.	**5 Hours**
Unit :6	Introduction to Code Optimization, The principle sources of optimization, Loop optimization, The DAG representation, Introductory Data Flow analysis, Introduction to Code Generation: Object programs, Problems in Code Generation, Register allocation and assignment, Code generation from DAG, Peephole optimization.	**7 Hours**
	Total Lecture Hours	**39 Hours**

Textbooks	
1	Alfred V. Aho, Jeffrey D. Ullman & Ravi Sethi, Compilers Principles, Techniques & Tools Pearson Education
2	Alfred V. Aho, Jeffrey D. Ullman, Principles of Compiler Design, Addison Wesley Publication
Reference Books	
1	Dr. O.G. Kakde, Compiler Design, Laxmi Publication
2	J. P. Bennett, Introduction to Compiling Techniques: First Course Using ANSI C, LEX and YACC McGraw-Hill Publication
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	https://www.scribd.com/document/441141979/Compilers-Construction
MOOCs Links and additional reading, learning, video material -	
1	https://onlinecourses.nptel.ac.in/noc21_cs07/preview

VI Semester
23CSE1604: Lab: Language processors

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

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

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

VI Semester
23CSE1605: Design Thinking in CSE and Research Methodology

Course Outcomes:

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

CO1. Understand the principles and approach of design thinking.
CO2. Comprehend the foundational concepts of research methodology
CO3. Identify and formulate research problems and conduct effective literature reviews and adhere to ethical research practices
CO4. Collect and analyze data using appropriate methods.
CO5.Interpret research findings and write scientific reports.

Unit No.	Contents	Max. Hrs.
Unit:1	**Introduction to Design Thinking**	**6 Hours**
History and evolution of Design Thinking, Why Design Thinking for engineers? Overview of the 5 stages: Empathize, Define, Ideate, Prototype, Test, Case studies in tech and software.		
Unit:2	**Integration with Software Development**	**6 Hours**
Agile and Design Thinking, Design sprints in CSE projects, UX/UI and backend considerations, a real-world solution using the design thinking framework.		
Unit:3	**Research Fundamentals, Research Problem and Design, Literature Review**	**7 Hours**
Research Fundamentals: Definition, objectives, and significance of research, Types of research: Basic, Applied, Descriptive, Analytical, Quantitative, and Qualitative. **Research Problem and Design**: Criteria of good research, Techniques for defining and identifying a research problem, Features of good research problem/design, Necessity of defining the problem, Meaning of research design, Types of research design – Exploratory, Descriptive, Diagnostic, and Experimental **Literature Review:** Importance and methods of conducting a literature review, Sources of information: Journals, conferences, patents, etc., Technical reading strategies.		
Unit :4	**Sampling and Data Collection, Data Analysis and Interpretation, Technical Writing, Research Ethics**	**7 Hours**
Sampling and Data Collection: Sampling techniques: Probability and Non-probability sampling,		

Characteristics of a good sample, Sample size determination, Data types: Primary and Secondary, Methods of primary data collection: Observation, Interview, Questionnaire, Schedule, Secondary data sources

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

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

Total Lecture Hours	**26 Hours**

Textbooks	
1	H. S. Fogler and S. E. LeBlanc, Strategies for Creative Problem Solving, 2nd edition, Pearson, Upper Saddle River, NJ, 2008.
2	*Sprint* by Jake Knapp
3.	C.R. Kothari – *Research Methodology: Methods and Techniques*, New Age International
4.	Ranjit Kumar – *Research Methodology: A Step-by-Step Guide for Beginners*, Sage Publications.
Reference Books	
1	Activities for Teaching creativity and Problem Solving - By Arthur B Vangundy - Pfeiffer
2	Whimbey and J. Lochhead, Problem Solving & Comprehension, 6th edition, Lawrence Erlbaum,Mahwah, NJ, 1999.
4.	R. Panneerselvam – *Research Methodology*, PHI Learning
5.	Dawson, C. – *Practical Research Methods*, UBS Publishers.
6.	Trochim, W.M.K. – *Research Methods: The Concise Knowledge Base*.
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
MOOCs Links and additional reading, learning, video material	
1	www.nptelvideos.in
2	www.coursera.com
3	www.udemy.com
4	swayam.gov.in

VI Semester
23CSE1606: Lab : Vocational & Skill Enhancement -Linux Administration and shell programming

Course Outcomes:

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

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

Sr. No.	Experiment based on
1	1. Write a shell script that accept a file name starting and ending line numbers as arguments and display all the lines between given line no: 2. Write a shell script that delete all lines containing a specified word
2	1. Write a shell script that displays a list of all the files in the current directory 2. Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or a directory and reports accordingly. Whenever the argument is a file or directory.
3	1. Write a shell script that accept a list of file names as arguments count and report the occurrence of each word. 2. Write a shell script to find the factorial of given integer 3. Write a shell script that list the all files in a directory.
4	1. Write an awk script to find the number of characters, words and lines in a file? Linked list respectively. 2. Write a C Program that makes a copy of a file using standard I/O and system calls? 3. Implement in C the following Unix commands using system calls A) cat B)mv
5	1. Write a C program to emulate the Unix ls-l command? 2. Write a C program to list for every file in a directory, its inode number and file name.? 3. Write a C Program that demonstrates redirection of standard output to a file .EX:ls>f1.?

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

VI Semester
23CSE1621: PE-II : Big Data Analytics

Course Outcomes:

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

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

Unit No.	Contents	Max. Hrs.
Unit:1	**Introduction to Big Data**	**7 Hours**
Data, Characteristics of data and Types of digital data: Unstructured, Semi-structured and Structured, Sources of data, working with unstructured data, Evolution and Definition of big data, Characteristics and Need of big data, Challenges of big data, big data environment terminologies, Big Data Analysis Life Cycle. Overview of business intelligence, Characteristics and need of big data analytics, Classification of analytics, Challenges to big data analytics		
Unit:2	**Big data analytics and Analytical methods**	**6 Hours**
Analytical operations: Associations rules- Apriori algorithm, classifications- decision trees, naïve bayes clustering- K means.		
Unit:3	**Hadoop foundation for analytics**	**7Hours**
Features, key advantages of Hadoop , key aspects of Hadoop, versions of Hadoop , Hadoop ecosystem ,and Components, HDFS, HBase, Hadoop Technology Stack: Hive, Pig, Zookeeper, Swoop, oozie, flume, etc. Hadoop distributions, Hadoop vs SQL, , Hadoop Vs Spark, Spark architecture, SparkQL		
Unit:4	**MapReduce and YARN framework**	**7 Hours**
Introduction to MapReduce, Processing data with MapReduce, map reduce example, Introduction to YARN, YARN architecture , Data serialization and common serialization formats, Big data serialization formats.		
Unit:5	**NoSQL Databases**	**6 Hours**
Introduction to NoSQL, advantages of NoSQL, SQL vs NoSQL, types of NoSQL databases- Schema-less Models‖: Increasing Flexibility for Data Manipulation-KeyValue Stores- Document Stores - Tabular Stores - Object Data Stores - Graph Databases , Hive -- Sharding –- Hbase , Introduction to Cassandra		

Unit :6	Introduction to MongoDB key features	6 Hours
Introduction to MongoDB key features, data types in MongoDB, MongoDB Query Language.: update remove, insert methods, MongoDB through the JavaScript's Shell, Creating and Querying through Indexes, and Document searching, Constructing queries on Databases, documents.		
Total Lecture Hours		**39 Hours**
Textbooks		
1	Big Data and Analytics ,Seema Acharya, Subhashini Chhellappan , Willey 2nd edition	
2	Professional Hadoop Solutions, Boris lublinsky, Kevin T.Smith, Alexey Yakubovich ,Wiley ISBN: 978-1-118-61193-7 September 2013	
3	Understanding Big data , Chris Eaton,Dirk derooset al. , McGraw Hill 2011	
4	Big Data and Analytics, Seema Acharya Wiley, 2016	
Reference Books		
1	MongoDB in Action , Kyle Banker,Piter Bakkum, Shaun Verch, Dream tech Press	
2	Big Data Analytics with R and Hadoop , Vignesh Prajapati, Packet Publishing	
3	Tom White, HADOOP: The definitive Guide, O Reilly, 2012	
4	Learning Spark: Lightning-Fast Big Data Analysis Paperback , Holden Karau	

VI Semester
23CSE1622: PE-II : Computer Graphics

Course Outcomes:		
Upon successful completion of the course the students will be able to: **CO1:** Explore the applications of computer graphics in various domains such as design, visualization, and simulation. **CO2:** Understand and implement fundamental 2D geometric transformations and clipping algorithms. **CO3:** Apply 3D geometric transformations and viewing techniques for object representation and manipulation. **CO4:** Describe and construct 3D object representations, including curves, surfaces, polygon rendering methods, and color models. **CO5:** Analyze and design animation sequences and apply visible surface detection techniques in 3D graphics.		
Unit No.	**Contents**	**Max. Hrs.**
Unit:1	**Introduction to Computer Graphics & Graphics Systems**	**7 Hours**
Application areas of Computer Graphics, overview of graphics systems, video-display devices, raster-scan systems, random-scan systems, graphics monitors and work stations and input devices		
Unit:2	**Output Primitives & Polygon Filling**	**7 Hours**
Output primitives: Points and lines, line drawing algorithms (DDA and Bresenham's Algorithm) circle generating algorithms and ellipse - generating algorithms Polygon Filling: Scan-line algorithm, boundary-fill and flood-fill algorithms		
Unit:3	**2-D geometric transformations and viewing**	**6 Hours**
2-D geometric transformations: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems 2-D viewing: The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, clipping operations, point clipping, Line clipping-Cohen Sutherland algorithms, Polygon clipping-Sutherland Hodgeman polygon clipping algorithm.		
Unit:4	**3-D object representation**	**7 Hours**
3-D object representation: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces, Polygon rendering methods, color models and color applications.		

Unit:5	**3-D Geometric transformations and viewing**	**7 Hours**
3-D Geometric transformations: Translation, rotation, scaling, reflection and shear transformations, composite transformations. 3-D viewing: Viewing pipeline, viewing coordinates, projections, view volume and general projection transforms and clipping.		
Unit:6	**Computer animation and Visible surface detection methods**	**6 Hours**
Computer animation: Design of animation sequence, general computer animation functions, raster animations, computer animation languages, key frame systems, motion specifications. Visible surface detection methods: Classification, back-face detection, depth-buffer method, BSP tree method, area sub-division method and octree method.		
	Total Lecture Hours	**39 Hours**

Textbooks	
1	"Computer Graphics C version", Donald Hearn and M. Pauline Baker, Pearson Education
Reference Books	
1	Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.
2	Principles of Interactive Computer Graphics", Neuman and Sproul, TMH.
3	Principles of Computer Graphics, Shalini Govil, Pai, 2005, Springer.
4	"Computer Graphics Principles & practice", second edition in C, Foley, Van Dam, Feiner and Hughes, Pearson Education.
5	Computer Graphics, Steven Harrington, TMH.
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	https://math.hws.edu/graphicsbook/
MOOCs Links and additional reading, learning, video material	
1	https://elearn.nptel.ac.in/shop/nptel/computergraphics/?d

VI Semester
23CSE1623: PE-II : Parallel computing

Course Outcomes:

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

1. Strengthen understanding of parallel programming
2. Understand challenges in efficient execution of large-scale parallel applications
3. Massive parallelism entails significant hardware and software challenges
4. Implement research-based project component

Unit No.	Contents	Max. Hrs.
Unit:1	**Introduction**	**6 Hours**
Introduction: Why parallel computing? Shared memory and distributed memory parallelism, Amdahl's law, speedup and efficiency, supercomputers. Message Passing:MPI basics, point-to-point communication,collective communication, synchronous/asynchronous send/recv, algorithms for gather, scatter, broadcast, reduce		
Unit:2	**Parallel Communication**	**7 Hours**
Network topologies, network evaluation metrics, communication cost, routing in interconnection networks, static and adaptive routing, process-to-processor mapping.		
Unit:3	**Performance**	**6 Hours**
Scalability, benchmarking, performance modeling, impact of network topologies, parallel code analysis and profiling.		
Unit :4	**Designing Parallel Codes**	**7 Hours**
Domain decomposition, communication-to-computation ratio, load balancing, adaptivity, case studies: weather and material simulation codes.		
Unit:5	**Parallel I/O**	**6 Hours**
MPI I/O algorithms, contemporary large-scale I/O architecture, I/O bottlenecks, Job scheduling, RDMA, one-sided communication, NVM, extreme scale computing: issues and trends.		
Unit :6	**Parallel Algorithms: Basic Principles**	**7Hours**
Principles of Parallel Algorithm Design, Basic Communication Operations, Analytical Modeling of Parallel Programs		
Total Lecture Hours		**39 Hours**

Textbooks	
1	Peter S Pacheco, An Introduction to Parallel Programming, Morgan Kaufmann, 2011.
2	DE Culler, A Gupta and JP Singh, Parallel Computer Architecture: A Hardware/Software Approach Morgan-Kaufmann, 1998.
3	Marc Snir, Steve W. Otto, Steven Huss-Lederman, David W. Walker and Jack Dongarra, MPI - The Complete Reference, Second Edition, Volume 1, The MPI Core.
4	William Gropp, Ewing Lusk, Anthony Skjellum, Using MPI : portable parallel programming with the message-passing interface, 3rd Ed., Cambridge MIT Press, 2014
Reference Books	
1	JL Hennessy and DA Patterson, Computer Architecture: A Quantitative Approach, 4th Ed., Morgan Kaufmann/Els India, 2006.
2	MJ Quinn, Parallel Computing: Theory and Practice, Tata McGraw Hill, 2002.
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Technology/26-2018_Book_IntroductionToParallelComputin.pdf
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc21_ge20/preview
2	https://onlinecourses.nptel.ac.in/noc22_cs67/preview

VI Semester
23CSE1624: PE-II : Game Theory

Course Outcomes:

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

CO1: Understanding Game Theory Fundamentals

CO2: Applying Non-Cooperative Game Theory

CO3: Analyzing Games with Perfect Information

CO4: Exploring Games with Imperfect Information

CO5: Designing Mechanisms for Collective Decision-Making

Unit No.	Contents	Max. Hrs.
Unit:1	**Introduction**	**6 Hours**
Introduction – Making rational choices: basics of Games – strategy - preferences – payoffs – Mathematical basics - Game theory – Rational Choice - Basic solution concepts-noncooperative versus cooperative games - Basic computational issues - finding equilibria and learning in games- Typical application areas for game theory (e.g. Google's sponsored search, eBay auctions, electricity trading markets).		
Unit:2	**Games with Perfect Information**	**7 Hours**
Games with Perfect Information - Strategic games - prisoner's dilemma, matching pennies Nash equilibria-theory and illustrations - Cournot's and Bertrand's models of oligopoly- auctions mixed strategy equilibrium- zero-sum games- Extensive Games with Perfect Information repeated games (prisoner's dilemma)- subgame perfect Nash equilibrium; computational issues.		
Unit:3	**Games with Imperfect Information**	**7 Hours**
Games with Imperfect Information - Bayesian Games – Motivational Examples – General Definitions – Information aspects – Illustrations - Extensive Games with Imp erfect -Information - Strategies- Nash Equilibrium – Beliefs and sequential equilibrium – Illustrations - Repeated Games – The Prisoner's Dilemma – Bargaining		
Unit:4	**Non-cooperative Game Theory**	**6 Hours**
Non-cooperative Game Theory - Self-interested agents- Games in normal form - Analyzing games: from optimality to equilibrium - Computing Solution Concepts of Normal-Form Games – Computing Nash equilibria of two-player, zero-sum games -Computing Nash equilibria of twoplayer, general-sum games - Identifying dominated strategies		
Unit:5	**Game Theory and Collective Decision-Making**	**7 Hours**
Cournot's Oligopoly, Bertrand's Oligopoly, Electoral Competition, Median Voter Theorem, Auctions, role of knowledge, Decision making and Utility Theory, Mixed Strategy Equilibrium, Extensive Games with Perfect Information, Stackelberg's model of Duopoly, Buying Votes, Committee Decision making		

Unit :6	MECHANISM DESIGN	7 Hours
Aggregating Preferences-Social Choice – Formal Model- Voting - Existence of social functions - Ranking systems - Protocols for Strategic Agents: Mechanism Design - Mechanism design with unrestricted preferences- Efficient mechanisms - Vickrey and VCG mechanisms (shortest paths) - Combinatorial auctions - profit maximization Computational applications of mechanism design - applications in Computer Science - Google's sponsored search - eBay auctions		
	Total Lecture Hours	**39 Hours**

Textbooks	
1.	M. J. Osborne, "An Introduction to Game Theory", Oxford University Press, 2003.
2.	2. N. Nisan, T. Roughgarden, E. Tardos, and V. V. Vazirani, "Algorithmic Game Theory", Cambridge University Press, 2007
Reference Books	
1.	Thomas Ferguson, Game Theory, World Scientific, 2018.
2.	YoavShoham, Kevin Leyton-Brown, "Multi agent Systems: Algorithmic, Game- Theoretic, and Logical Foundations", Cambridge University Press, 2008.
3	Zhu Han, Dusit Niyato, Walid Saad, Tamer Basar and Are Hjorungnes, "Game Theory in Wireless and Communication Networks", Cambridge University Press, 2012
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS] –	
1	https://egyankosh.ac.in/bitstream/123456789/76109/1/Unit-6.pdf
2	
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc19_ge32/preview

VI Semester
23CSE1625: PE-II : Real time system

Course Outcomes:

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

1. Clearly differentiate the different issues that arise in designing soft and hard real-time, concurrent, reactive, safety-critical and embedded systems.
2. Explain the various concepts of time that arise in real-time systems.
3. Describe the design and implementation of systems that support real-time applications. Justify and critique facilities provided by real-time operating systems and networks.
4. Design, construct and analyze a small, concurrent, reactive, real-time system.
5. Select and use appropriate engineering techniques, and explain the effect of your design decisions on the behavior of the system.

Unit No.	Contents	Max. Hrs.
Unit:1	**Basic Real- Time Concepts, Computer Hardware, Language Issues**	**7 Hours**
Basic component Architecture, Real Time Design Issues, Input- Output, Other Devices Language Features, Survey of Commonly Used Programming Languages, Code Generation.		
Unit:2	**Software life cycle, Real Time Specification and Design Techniques**	**7 Hours**
software life cycle, Non-temporal Transition in the software life cycle, Spiral model, Natural languages, Mathematical Specification, Flow Charts, Structure Charts, Pseudocode and programmable Design Languages.		
Unit:3	**Intertask Communication and Synchronization, RealTime memory Management, SystemPerformance Analysis and Optimization**	**7 Hours**
Buffering Data, Mail boxes Critical Region, Semaphores, Event Flags and Signals, Deadlock, Process Stack Management, Dynamic Allocation, Static Schemes, Response Time Calculation, Interrupt Latency, Scheduling NP Complete, Relocating Response Times And time Loading, Analysis of Memory Requirements, Reducing Memory Loading, I/O Performance.		
Unit :4	**Queuing Models, Reliability, Testing, And Fault Tolerance, Multiprocessing Systems.**	**7 Hours**
Basic Buffer size Calculation, Classical Queuing Theory, Little's Law, Faults, Failures ,bugs AND effects. Reliability, Testing, Fault Tolerence, Classification of Architectures, Distributed Systems, Non Von Neumann Architectures.		
Unit:5	**Hardware/ Software Integration, Real Time Applications**	**7 Hours**
Goals of Real Time System Integration, Tools, Methodology, Real Time Systems As Complex System, First Real Time Application Real Time Databases, Real time Image Processing Real Time UNIX, building Real Time Applications with Real Time Programming Languages.		
Total Lecture Hours		**39 Hours**

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

Textbooks	
1	Real Time System, Jane W.S.Liu.
2	Real Time Systems Design and Analysis by Phillip A. Laplante,PHI
Reference Books	
1	Hard Real Time Computing Systems Predictable Scheduling Algorithms and applications by GiorgioC. Buttazzo
2	Real Time Design Patterns: Robust Scalable Architecture for Real Time System by BrucePowel Douglass
3	Real Time System: Scheduling, Analysis and Verification by Albert M.K. Change
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/e-opies%20of%20books/7.Information%20Technology/53.Book-Liu-%20Real%20Time%20Systems.pdf
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc21_cs98/preview

VI Semester
23CSE1626: PE-II : Cloud Computing

Course Outcomes:		
Upon successful completion of the course the students will be able to CO1: An ability to understand software and hardware support for enterprise and cloud computing CO2: An ability to Perform data modeling for enterprise and cloud knowledge bases. CO3: An ability to Design enterprise and cloud software applications. CO4: An ability to Implement and run distributed and cloud applications CO5: An ability to Ensure security and privacy in enterprise and cloud application while implementing cloud applications methodologies.		
Unit:1	**Introduction**	**06 Hours**
Defining Cloud Computing; Cloud Types and different models-The NIST model, The Cloud Cube Model, Examining the Characteristics of Cloud Computing; Benefits of cloud computing; Disadvantages of cloud computing; Assessing the Role of Open Standards		
Unit:2	**Cloud Delivery Models**	**07 Hours**
Exploring the Cloud Computing Stack, Connecting to the Cloud, Infrastructure as a Service, Platform as a Service, Saas Vs. Paas, Using PaaS Application Frame works, Software as a Service, Identity as a Service, Compliance as a Service		
Unit:3	**Virtualization**	**07 Hours**
Introduction to Virtualization Technologies, Load Balancing and Virtualization, Understanding Hypervisors, Understanding Machine Imaging, Porting Applications, Virtual Machines Provisioning and Manageability Virtual Machine Migration Services, Virtual Machine Provisioning and Migration in Action, Provisioning in the Cloud Context.		
Unit:4	**Cloud native Computing**	**07 Hours**
Introduction of Cloud native Computing , Containers in Cloud Computing and its benefits ,Dockers, Kubernetes Managing the Cloud-Administrating the Clouds, Management responsibilities, Lifecycle management Cloud Management Products, Emerging Cloud Management Standards,		
Unit:5	**Cloud Security**	**06Hours**
Securing the Cloud, Securing Data, the security boundary, Security service boundary, Security mapping, Brokered cloud storage access, Establishing Identity and Presence, Understanding Service Oriented Architecture- Introducing Service Oriented Architecture		
Unit :6	**Advance Clouds , AWS Architecture and Case Studies**	**06Hours**
Cloud Computing Cost Analysis, basic, Selecting an IaaS Provider, Capacity Planning and Disaster, Recovery in Cloud Computing, AWS Cloud architectural principles, basic/core characteristics of deploying and operating in the AWS Cloud, the key services on the AWS Platform and their common use cases, Define the billing, account management, and pricing models, Introduction to Amazon EC2. Case Studies: Microsoft Azure, Dropbox		
Total Lecture Hours		**39 Hours**

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

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

VI Semester
23CSE1627: PE-II : Management Information system

Course Outcomes:

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

CO1- This course introduces the students to existing and upcoming technologies, wide variety of their applications for business and e-Commerce, and issues involved in their management.
CO2- Study of types of IS, Decision Making Process, Models and approaches to IS
CO3- Outline the role of the ethical, social, and security issues of information systems.
CO4- To introduce the fundamental principles of computer-based information systems analysis & design

Unit No.	Contents	Max. Hrs.
Unit:1	**Basic Concepts of Information System**	**7 Hours**
Introduction to Management Information Systems: Types of MIS, Capabilities, Complements, CCR Framework; Role of manager with respect to IT in an organization.		
Unit:2	**Database management system**	**7 Hours**
Database management systems, Characters of database Management systems- Data processing system, Data Warehousing, Foundations of business intelligence, Data Mining and Text Mining.		
Unit:3	**Architecture & Design of IS**	**7 Hours**
Architecture, development and maintenance of Information Systems, Factors of success and failure. Centralized and Decentralized Information Systems, value and risk of IS.		
Unit :4	**Emerging Technologies**	**6Hours**
Cloud computing, Big Data Technologies, Internet of Things, Bring Your Own Device (BYOD,) Virtual Reality, Augmented Reality, Blockchain, Artificial Intelligence		
Unit :5	**Knowledge Management**	**6Hours**
Decision Support Systems, Expert Systems, Learning Management Systems, Executive Information Systems.		
Unit :6	**Strategic Enterprise Systems**	**6 Hours**
Business Process Reengineering, Total Quality Management and Enterprise Management System viz. ERP, SCM, CRM and Ecommerce.		
Total Lecture Hours		**39 Hours**

Textbooks	
1	Management Information System, Prasad L.M., Prasad Usha.
2	Textbook on Management Information Systems, D P Nagpal.
3	Management Information Systems best practices & Applications In business, Adikeshvan, T. A. Second Edition.
Reference Books	
1	Management Information System, W.S Jawadekar, Tata Mc Graw Hill Publication.
2	Management Information System, David Kroenke, Tata Mc Graw Hill Publication
3	MIS: Managing the digital firm, Kenneth C. Landon, Jane P. Landon, Pearson Education
4	Richard T. Watson: "Data Management ", WILEY INDIA Limited, New Delhi, 2008.
5	Kenneth C. Laudon & Jane P. Laudon. "Management Information Systems". Pearson Publishing.
6	Goyal, D.P.: "Management Information System", MACMILLAN India Limited, New Delhi, 2008
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	
MOOCs Links and additional reading, learning, video material -	
1	https://onlinecourses.nptel.ac.in/noc20_mg60/preview
2	http://www.digimat.in/nptel/courses/video/110105148/L01.html

VI Semester
23CSE1628: PE-II : Digital Marketing Analytics

Course Outcomes:

Upon successful completion of the course the students will be able

1. Understand the core concepts of Digital Marketing, Mobile Marketing and Online Marketing.
2. Understand the E-mail marketing techniques and Digital Marketing Key Performance Indicators
3. Comprehend the Social Media Analytics strategies and Apply Google Analytics for digital marketing
4. Apply the fundamental principles and concepts of Search Engine Optimization (SEO).
5. Apply strategic digital marketing tools.

Unit No.	Contents	Max. Hrs.
Unit:1	**Introduction to Digital marketing**	**6 Hours**
The Concept , Need & Evolution of Digital Marketing, Reason for growing importance of Digital Marketing in India, Digital Marketing: Types & Examples. Case Study on Digital Marketing		
Unit:2	**Mobile Marketing**	**6 Hours**
Meaning, types & Evolution, Mobile – market size and rate of growth, Mobile applications, Types of Mobile Marketing, Advantages and Disadvantages of Mobile marketing, Performance marketing: definition, benefits. Case Study on Mobile Marketing.		
Unit:3	**Online Marketing and Email Marketing**	**7 Hours**
The concept of Digital Marketing Mix, 7 P's of Online Marketing: Product, Price, Promotion, Place People, Process, Physical evidence, Methods of Online Marketing promotion. Case Study on Online Marketing Email Marketing: Need for Emails, Types of Emails, options in Email advertising, Do's and Don'ts of an email marketing campaign, Introduction to E-mail marketing tool- Mailchimp. Case Study on Email Marketing		
Unit:4	**Key Performance Indicators and Social Media Analytics**	**7 Hours**
Selecting and Preparing KPIs, Pages and Landing Pages, Event Tracking and AdSense, Site Search, Optimizing Your Search Engine Marketing. Types of Analytics in Social Media: Analytics, Listening, Advertising Analytics, Analytics from CMS and CRM, The Analytics Process, Metrics, Dashboards, and Reports.		
Unit:5	**Google Analytics and Search Engine Optimization(SEO)**	**7 Hours**
Google Analytics Features, Benefits, and Limitations, Google Analytics Reports, Creating custom reports, Dashboard and Segments. Search Engine Optimization Basics, Keyword Research, SEO Tool- SEMrush: Overview and Features, Top Search Engine Ranking Factors. Case Study: Dominos India: Building Traffic		

through content propagation.		
Unit :6	**DM tools**	**6 Hours**
Overview of Hootsuite: Dashboard and Features, Social Media Listening and Monitoring, Social Media Publishing and Scheduling. Campaign using Mailchimp: Overview of Mailchimp Features and Interface, Building Email Lists and Segmentation, Creating Email Campaigns: Templates and Content Design. Advertising tools: Google Ads, Canva Interface.		
	Total Lecture Hours	**45 Hours**

Textbooks	
1	Damian Ryan& Calvin Jones. Understanding DIGITAL Marketing, 2009, ISBN 9780749453893
2	Vandana Ahuja, Digital Marketing, Oxford University Press, New Delhi, 2015, ISBN: 9780199455447.
3	Jodie the Mom (2023) Email Marketing Planner: Organize and Track Your Emails, 2023, ASIN :B0C5KNF1BM
4	The digital marketing Handbook, A step by step guide, Mohit Pawar, 2015 Edition.
5	Advanced Web Metrics with Google Analytics, SYBEX, Brian Clifton, Second Edition
6	Social Media Analytics Strategy, Alex Goncalves, Apress
Reference Books	
1	Dave Evans., Susan Bratton, Social Media Marketing: The Next Generation of Business Engagement. Wiley , 2010, ISBN: 978-0-470-63403-5
2	George Pain(2019). Marketing Automation and Online Marketing: Automate Your Business through Marketing Best Practices such as Email Marketing and Search Engine Optimization, 2019, ISBN-10 1922301132
3	Ian Dodson, The art of Digital Marketing, 2016, Wiley, 978-1-119-26570-2
4	Vandana Ahuja, Digital Marketing,Oxford University Press,2015,ISBN-10. ISBN:0199455449.
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	
2	
MOOCs Links and additional reading, learning, video material	
1	https://skillshop.exceedlms.com/student/collection/648385-digital%20marketing
2	https://www.coursera.org/courses?query=digital%20marketing
3	https://www.coursera.org/courses?query=digital%20marketing

VI Semester
23CSE1641: PE-III : Financial Data analysis

Course Outcomes:		
Upon successful completion of the course the students will be able to **CO1**: Understand the structure and types of financial data and the methods used to acquire and preprocess it. **CO2**: Perform statistical analysis and visualization of financial data for trend identification. **CO3**: Apply time series models for forecasting financial metrics such as stock prices and interest rates. **CO4**: Use machine learning techniques to solve problems in risk analysis, fraud detection, and portfolio optimization. **CO5**: Evaluate and interpret financial models using appropriate performance metrics. **CO6**: Design and present a financial data analytics project using real-world datasets and tools.		
Unit No.	**Contents**	**Max. Hrs.**
Unit:1	**Introduction to Financial Data and Analytics**	**7Hours**
Types of financial data: market, accounting, economic, alternative data, Sources: Yahoo Finance, Bloomberg, Quandl, EDGAR, Data collection methods (APIs, web scraping), Data wrangling and cleaning using Python/R, Overview of the financial system and markets.		
Unit:2	**Exploratory Data Analysis (EDA) in Finance**	**6 Hours**
Descriptive statistics (mean, volatility, skewness, kurtosis),Visualization techniques for financial data, Correlation analysis, Data normalization and transformation, Case study: Analysis of historical stock prices		
Unit:3	**Financial Time Series Analysis**	**6Hours**
Characteristics of time series data, Stationarity and differencing, ARIMA and SARIMA models, GARCH models for volatility modeling, Forecasting techniques and model validation.		
Unit:4	**Predictive Modeling and Machine Learning in Finance**	**7Hours**
Regression models for financial forecasting, Classification models: logistic regression, decision trees, random forests, Clustering and anomaly detection for fraud detection, Sentiment analysis using news and social media data, Model evaluation: RMSE, AUC, confusion matrix		
Unit:5	**Portfolio Analysis and Risk Management**	**7Hours**
Modern Portfolio Theory (MPT), Risk-adjusted return metrics: Sharpe Ratio, VaR, Capital Asset Pricing Model (CAPM), Portfolio optimization with constraints, Stress testing and scenario analysis		
Unit :6	**Financial Analytics Applications and Projects**	**6Hours**
Real-time analytics and dashboards (Power BI/Tableau), Case study: Algorithmic trading and strategy backtesting, Case study: Credit scoring models, Ethics and regulations in financial data usage		
	Total Lecture Hours	**39 Hours**

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

Textbooks
1.Financial Analytics with R , Mark J. Bennett, Dirk L. Hugen, Cambridge University Press
2.Python for Finance: Mastering Data-Driven Finance, Yves Hilpisch, O'Reilly Media
Reference Books
1 Quantitative Financial Analytics, Kenneth L. Grant, Wiley
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]
1
MOOCs Links and additional reading, learning, video material
1 https://onlinecourses.nptel.ac.in/noc25_mg01/preview

VI Semester
23CSE1642: PE-III : Augmented Reality

Course Outcomes:

After completion of this course, students will be able to

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

Unit No.	Contents	Max. Hrs.
Unit:1	**Introduction to Augmented Reality (A.R)**	**7Hours**

What Is Augmented Reality - Defining augmented reality, history of augmented reality, The Relationship Between Augmented Reality and Other Technologies-Media, Technologies, Other Ideas Related to the Spectrum Between Real and Virtual Worlds, applications of augmented reality Augmented Reality Concepts- How Does Augmented Reality Work? Concepts Related to Augmented Reality, Ingredients of an Augmented Reality Experience.

Unit:2	**Augmented Reality Hardware**	**7 Hours**

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

Unit:3	**Computer Vision for Augmented Reality & A.R. Software**	**7Hours**

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

Unit :4	**AR Techniques- Marker based & Markerless tracking**	**6Hours**

Marker-based approach- Introduction to marker-based tracking, types of markers, marker camerapose and identification, visual tracking, mathematical representation of matrix multiplicationMarker types- Template markers, 2D barcode markers, imperceptible markers.Marker-less approach- Localization based augmentation, real world examples Tracking methods- Visual tracking, feature based tracking, hybrid tracking, and initialisation and recovery.

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

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

VI Semester
23CSE1643: PE-III: Information Retrieval System

Course Outcomes:

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

1. Understand the fundamental principles of Information Retrieval (IR), Understand different Information retrieval models.
2. Apply Tolerant Retrieval techniques.
3. Evaluate the performance of IR systems and its challenges.
4. Implement advanced IR techniques in web and XML retrieval.

Unit No.	Contents	Max. Hrs.
Unit:1	**Introduction to Information retrieval**	**6 Hours**
Introduction to Information retrieval: Information retrieval process, Indexing, Information retrieval model, Boolean retrieval model Dictionary and Postings: Tokenization, Stop words, Stemming, Inverted, index, Skip pointers, Phrase queries		
Unit:2	**Tolerant Retrieval**	**7 Hours**
Tolerant Retrieval : Wild card queries, Permuterm index, Bigram index, Spelling correction, Edit distance, Jaccard coefficient, Soundex Term Weighting and Vector Space Model: Wild card queries, Permuterm index, Bigram index, Spelling correction, Edit distance, Jaccard coefficient, Soundex.		
Unit:3	**Evaluation**	**6 Hours**
Evaluation: Precision, Recall, F-measure, E-measure, Normalized recall, Evaluation problems Latent Semantic Indexing: Eigen vectors, Singular value decomposition, Low rank approximation, Problems with Lexical Semantics.		
Unit:4	**Query Expansion**	**7 Hours**
Query Expansion : Relevance feedback, Rocchio algorithm, Probabilistic relevance feedback, Query Expansion and its types, Query drift Probabilistic Information Retrieval: Probabilistic relevance feedback, Probability ranking principle, Binary Independence Model, Bayesian network for text retrieval		
Unit:5	**XML Indexing and Search**	**6 Hours**
XML Indexing and Search: Data vs. Text-centric XML, Text-Centric XML retrieval, Structural terms.		

Unit :6	Web Information Retrieval	7 Hours
Web Information Retrieval:Hypertext, web crawling, search engines, ranking, link analysis, PageRank, HITS.		
	Total Lecture Hours	**39 Hours**

TEXTBOOK

1. Introduction to Information Retrieval , Christopher D. Manning, Raghavan and Schutze, Cambridge University Press,2008

Reference Books

2. Natural Language Processing And Information Retrieval, Tanveer Siddiqui and U. S. Tiwary, Oxford Higher Education,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

VI Semester
23CSE1644: PE-III : Optimization Techniques

Course Outcomes:

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

1 Achieve Knowledge of design and development of problem solving skills.
2 Understand the principles of optimization.
3 Design and develop analytical skills.
4 Summarize the Linear, Non-linear and Geometric Programming
5 Understands the concept of Dynamic programming and Genetic Algorithms.

Unit No.	Contents	Max. Hrs.
Unit:1	**Introduction**:	**6Hours**

Introduction to optimization, engineering applications of optimization, Formulation of structural optimization problems as programming problems. Optimization
Techniques: Classical optimization techniques, single variable optimization, multivariable optimization with no constraints, unconstrained minimization techniques and algorithms constrained optimization solutions by penalty function techniques, Lagrange multipliers techniques and feasibility techniques..

Unit:2	**Linear Programming**:	**7 Hours**

Linear programming, standard form of linear programming,
geometry of linear programming problems, solution of a system of linear simultaneous equations, pivotal production of general systems of equations, simplex algorithms, revised simpler methods, duality in linear programming..

Unit:3	**Non-linear programming**:	**7 Hours**

Non-linear programming, one dimensional minimization methods, elimination methods, Fibonacci method, golden section method, interpolation methods, quadratic and cubic methods, Unconstrained optimization methods, direct search methods, random search methods, descent methods.

Unit:4	**Constrained optimization techniques**:	**7 Hours**

Direct methods, the complex methods, cutting plane method, exterior penalty function methods for structural engineering problems. Formulation and solution of structural optimization problems by different technique

Unit:5	Geometric programming & Dynamic programming	6 Hours
Geometric programming: Geometric programming, conversion of NLP as a sequence of LP/ geometric programming. **Dynamic programming**: Dynamic programming conversion of NLP as a sequence of LP/ Dynamic programming		
Unit :6	**Genetic Algorithm**:	**6 Hours**
Introduction to genetic Algorithm, working principle, coding of variables, fitness function, GA operators; Similarities and differences between Gas and traditional methods; Unconstrained and constrained optimization using genetic Algorithm, real coded gas, Advanced Gas, global optimization using GA, Applications to power system.		
	Total Lecture Hours	**39 Hours**

Textbooks	
1	S.S. Rao, "Engineering Optimization – Theory and Practice", John Wiley & Sons, Inc.,2009.
2	Hamdy A. Taha, Operations Research: An Introduction, 10th Edition, Pearson, 2016.
3	David G. Luenberger, "Introduction to Linear and Nonlinear Programming", Addison- Wesley, 1973.
Reference Books	
1	Richard Bronson, "Operation Research"- Schaum's Outline Series
2	Bhavikatti S.S.- "Structural optimization using sequential linear programming"- Vikas publishing house
3	Spunt, "Optimum Structural Design"- Prentice Hall

VI Semester
23CSE1645: PE-III : Human Computer Interaction

Course Outcomes:		
Upon successful completion of the course the students will be able to 1. Understand the basics of Human Computer Interaction. 2. Demonstrate the Understanding of Interaction between human and computer Components using screen designing concepts. 3. Apply the knowledge of human and computer components for interaction. 4. Evaluate System using different tools and techniques.		
Unit No.	**Contents**	**Max. Hrs.**
Unit:1	**The human**	**7 Hours**
The human: Human memory, Thinking reasoning and problem solving, Individual differences, Psychology and the design of interactive systems ,Interaction and paradigms: Models of interaction, Frame work and HCI, Ergonomics, Interaction styles, Elements of the WIMP(windows, icons, menus, pointers) interface, interactivity, The context of the interaction, paradigms for interaction.		
Unit:2	**Interaction Design**	**7 Hours**
Interaction Design: What is interaction design, Good and poor design, The process of design, User focus, Scenarios, Navigation design, Understanding the problem space, Conceptualizing the design space, Theories, models and frameworks, Screen design and layout, Interaction and prototyping.		
Unit:3	**HCI in software process and Design rules**	**6 Hours**
HCI in software process and Design rules: The software life cycle, Usability engineering, Iterative design and prototyping, Design rationale, Principles to support usability, Standards, Guidelines, Golden rules and heuristics, HCI patterns.		
Unit:4	**Implementation supports and Evaluation techniques**	**7 Hours**
Implementation supports and Evaluation techniques: Elements of windowing system, Programming application, Using toolkits, User interface management systems, What is evaluation? Goals of evaluation, Evaluation through expert analysis, Evaluation through user participation, choosing evaluation methods, analytical evaluation.		
Unit:5	**Universal Design and User Support**	**6 Hours**
Universal Design and User Support: Universal design principles, Multi-modal interaction, Design for diversity, Requirements of user support, Approach to user support, Adaptive help systems, Design user		

support systems.		
Unit :6	**Cognitive Models and Distributed Cognition**	**6 Hours**
Cognitive Models and Distributed Cognition: Goal and task hierarchies, Linguistics models, Challenges of display-based systems, Physical models, Cognitive architectures, Scientific Foundation, Description, Case Study.		
	Total Lecture Hours	**39 Hours**

Textbooks	
1	Human - Computer Interaction, Alan Dix, Janet Fincay, Gregory D. Abowd and Russell Bealg, Pearson Education, 2003.
2	Designing the user interface, Ben Shneiderman, Pearson Education Asia, 2004
Reference Books	
1	Interaction Design, Preece and Rogers, Sharp, Wiley-India, 2008.
2	The essential guide to user interface design, Wilbert O Galitz, Wiley DreamTech, 2009
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/25.BOOK1 Human_computer_interaction.pdf
MOOCs Links and additional reading, learning, video material -	
1	https://onlinecourses.nptel.ac.in/noc19_cs86/preview

VI Semester
23CSE1646: PE-III : Blockchain Technology

Course Outcomes:

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

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

CO2: Implement cryptographic hashing techniques required in blockchain systems

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

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

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

Unit No.	Contents	Max. Hrs.
Unit:1	**Introduction to Block chain**	**7 Hours**

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

Unit:2	**Cryptocurrency & Bitcoin blockchain**	**7 Hours**

Cryptocurrency: Cryptocurrency: Bitcoin, Altcoin, and Tokens (Utility and Security), Cryptocurrency wallets: Hot and cold wallets, Cryptocurrency usage, Transactions in Blockchain, UTXO and double spending problem.

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

Unit:3	**Programming for Blockchain & Introduction to Programming**	**7 Hours**

Programming for Blockchain: Introduction to Smart Contracts, Types of Smart Contracts, Structure of a Smart Contract, Smart Contract Approaches, Limitations of Smart Contracts.

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

Unit:4	**Public Blockchain**	**6 Hours**

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

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

Textbooks	
1	Blockchain Technology, Chandramouli Subramanian, Asha A. George, Abhillash K. A and Meena Karthikeyen Universities Press
2	Mastering Ethereum, Building Smart Contract and Dapps, Andreas M. Antonopoulos Dr. Gavin Wood, O'reilly
Reference Books	
1	Blockchain for Beginners, Yathish R and Tejaswini N, SPD
2	Blockchain with Hyperledger Fabric, Luc Desrosiers, Nitin Gaur, Salman A. Baset, Venkatraman Ramakrishna Packet Publishing
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Science%20and%20Engineering/
MOOCs Links and additional reading, learning, video material	
1	https://nptel.ac.in/courses/106105235
2	https://onlinecourses.nptel.ac.in/noc22_cs44/preview

VI Semester
23CSE1647: PE-III : Bioinformatics

Course Outcomes:

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

1. **Explain** the fundamental concepts of bioinformatics including sequencing, genome projects, pattern recognition, and the folding problem.
2. **Utilize** biological databases and protein information resources to retrieve and interpret sequence and structure data.
3. **Analyze** DNA sequence data and gene structures using genome information resources and EST analysis techniques.
4. **Evaluate** sequence alignment techniques including pairwise and multiple sequence alignment to determine identity, similarity, and consensus.
5. **Design** a basic drug discovery framework by integrating tools and approaches from bioinformatics to solve case-based problems.

Unit No.	Contents	Max. Hrs.
Unit:1		**7 Hours**
Introduction: Definitions, Sequencing, Biological sequence/structure, Genome Projects, Pattern recognition an prediction, Folding problem, Sequence Analysis, Homology and Analogy, conversion process in prokaryotes and eukaryotes.		
Unit:2		**7 Hours**
Over-view of protein structure Protein Information Resources Biological databases, Primary sequence databases, Protein Sequence databases, Secondary databases, Protein pattern databases, and Structure classification databases.		
Unit:3		**7 Hours**
Genome Information Resources DNA sequence databases, specialized genomic resources DNA Sequence analysis Importance of DNA analysis, Gene structure and DNA sequences, Features of DNA sequence analysis, EST (Expressed Sequence Tag) searches, Gene hunting, Profile of a cell, EST analysis, Effects of EST data on DNA databases.		
Unit:4		**6 Hours**
Pair wise alignment techniques Database searching, Alphabets and complexity, Algorithm and programs, Comparing two sequences, sub-sequences, Identity and similarity, The Dotplot, Local and global similarity, working with BLAST and FASTA.		
Unit:5		**6 Hours**
Multiple sequence alignment Definition and Goal, The consensus, computational complexity, Manual		

methods, Simultaneous methods, Progressive methods, Databases of Multiple alignments and searching Working with DNA microarray, Gene Clustering.		
Unit :6		**6 Hours**
Drug Discovery Technologies, Drug Designing Approaches, Important Parameter In Drug Discovery, And Case Study of Various Tools.		
	Total Lecture Hours	**39 Hours**

Textbooks	
1.	Introduction to Bioinformatics - by T K Attwood & D J Parry ,Smith Addison Wesley Longman Publication
2.	Bioinformatics Methods And Applications: Genomics Proteomics And Drug Discovery ,S. C. Rastogi, Parag Rastogi, Namita Mendiratta ,PHI Learning Pvt. Ltd
3.	Bioinformatics- A Beginner's Guide ,Jean-Michel Claveriw, Cerdric Notredame ,WILEY dreamlech India Pvt. Ltd
Reference Books	
1.	Bioinformatics ,David Mount ,Cold Spring Harbor Laboratory Press
2.	Introduction to Bioinformatics ,M. Lesk ,OXFORD publishers (Indian Edition
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	
MOOCs Links and additional reading, learning, video material	
1	

VI Semester
23CSE1648: PE-III : Software Defined Networking

Course Outcomes:

Upon successful completion of the course the students will be able

CO1 Examine the challenges and opportunities associated with adopting SDN compared to traditional approaches to networking
CO2 Analyse the functions and components of the SDN architecture
CO3 Discuss the major requirements of the design of an SDN protocol.
CO4 Design and create an SDN network consisting of SDN switches and a centralized controller.
CO5 Analyse the performance of the SDN network by using verification and troubleshooting techniques.

Unit No.	Contents	Max. Hrs.
Unit:1	**INTRODUCTION TO SDN**	**7 Hours**
Overview; History and evolution of SDN; Architecture of SDN; SDN Flavours; Scalability (Data Centres, Service provider networks, ISP Automation); Reliability (QoS, and Service Availability); Consistency (Configuration management, and Access Control Violations); Opportunities and Challenges		
Unit:2	**ARCHITECTURE**	**5 Hours**
Network Operating System (NOS). SDN Architecture. Planes - data, management and control. Interfaces - northbound and southbound.		
Unit:3	**PROTOCOLS**	**7 Hours**
Languages and functions available for programming SDNs, northbound API. Mininet. Software vs. Hardware SDN switch implementations - Open vSwitch, WhiteBox, ONL. Controller implementations - POX, NOX, Beacon, Floodlight. Special Purpose controllers - Flowvisor, RouteFlow.		
Unit:4	**DESIGN AND DEVELOPMENT**	**7 Hours**
Network Programmability - Network Function Virtualization - NetApp Development, Network Slicing, SDX; Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs.		
Unit:5	**PROGRAMMING**	**7 Hours**
Network Virtualization, Network Topology and Topological Information Abstraction, Data Centric Traffic Management, Wide Area Traffic Management, Wireless networks		

Unit :6	SDN APPLICATIONS AND USE CASES	6 Hours
SDN in the Data Center - SDN in Other Environments - SDN Applications - SDN Use Cases - The Open Network Operating System 3		
	Total Lecture Hours	**39 Hours**

Textbooks

1	Goransson, Paul, Chuck Black, and Timothy Culver. Software defined networks: a comprehensive approach, 1st edition, Morgan Kaufmann, 2016.

Reference Books

1	Stallings, William. Foundations of modern networking: SDN, NFV, QoE, IoT, and Cloud, 1st edition, Addison-Wesley Professional, 2015.
2	Oswald Coker, Siamak Azodolmolky. Software-Defined Networking with OpenFlow - Second Edition, Packt Publishing, 2017

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS

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

MOOCs Links and additional reading, learning, video material

1	nptel.ac.in/courses/106105183
2	https://www.bing.com/videos/riverview/relatedvideo?q=Software+Defined+Networking+NPTELO&mid=780940A801AE71CDD241780940A801AE71CDD241&mcid=2159391F7A2C47D39F9F65FF83FDED8E&FORM=VIRE

VI Semester
23CSE1649: PE-III : Soft Computing

Course Outcomes:

Upon successful completion of the course the students will be able

CO1: Learn about soft computing techniques and their applications
CO2: Analyze various neural network architectures
CO3: Apply concepts of fuzzy relations and fuzzification techniques to real-world problems.
CO4: Design and apply Genetic Algorithms for multi-level optimization problems in diverse application domains.
CO5: Evaluate and compare the performance of different types of hybrid systems in diverse application areas.
CO6: Understand the concept of LR-type fuzzy numbers and their role in fuzzy neural networks.

Unit No.	Contents	Max. Hrs.
Unit:1	**Introduction to Soft Computing:** What is Soft Computing? Difference between Hard and Soft computing, Requirement of Soft computing, Major Areas of Soft Computing, Applications of Soft Computing.	7 Hours
Unit:2	**Neural Networks:** What is Neural Network, Learning rules and various activation functions, Single layer Perceptron's, Back Propagation networks, Architecture of Back propagation (BP) Networks, Back propagation Learning, Variation of Standard Back propagation Neural Network, Introduction to Associative Memory, Adaptive Resonance theory and Self Organizing Map, Recent Applications.	7 Hours
Unit:3	**Fuzzy Systems:** Fuzzy Set theory, Fuzzy versus Crisp set, Fuzzy Relation, Fuzzification, Min max Composition, Defuzzification Method, Fuzzy Logic, Fuzzy Rule based systems, Predicate logic, Fuzzy Decision Making, Fuzzy Control Systems, Fuzzy Classification	7 Hours
Unit:4	**Genetic Algorithm:** History of Genetic Algorithms (GA), Working Principle, Various Encoding methods, Fitness function, GA Operators- Reproduction, Crossover, Mutation, Convergence of GA, Bit wise operation in GA, Multi-level Optimization.	6 Hours
Unit:5	**Hybrid Systems:** Sequential Hybrid Systems, Auxiliary Hybrid Systems, Embedded Hybrid Systems, Neuro-Fuzzy Hybrid Systems, Neuro-Genetic Hybrid Systems, Fuzzy-Genetic Hybrid Systems.	7 Hours
Unit :6	**GA based Back propagation Networks:** GA based Weight Determination, K - factor determination in Columns. **Fuzzy Back Propagation Networks:** LR type Fuzzy numbers, Fuzzy Neuron, Fuzzy BP Architecture, Learning in Fuzzy BP, Application of Fuzzy BP Networks.	6 Hours
	Total Lecture Hours	**39 Hours**

Textbooks	
1	S.N. Sivanandam & S.N. Deepa, Principles of Soft Computing, Wiley Publications, 2nd Edition, 2011.
2	S, Rajasekaran & G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & applications, PHI Publication, 1st Edition, 2009.
Reference Books	
1	Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, S.Rajasekaran, G. A. Vijayalakshami, PHI.
2	Genetic Algorithms: Search and Optimization, E. Goldberg.
3	Neuro-Fuzzy Systems, Chin Teng Lin, C. S. George Lee, PHI.
4	Build Neural Network With MS Excel sample by Joe choong.
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_cs54/preview
2	https://onlinecourses.swayam2.ac.in/ntr25_ed63/preview

VI Semester
23CSE1661: PE IV : GPU architecture and Programming

Course Outcomes:

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

1. Understand CPU vs. GPU architectures and the basics of GPU parallel processing with CUDA.
2. Understand OpenCL for heterogeneous computing and its use in high-performance applications like neural networks.
3. Analyze CUDA kernel performance, identify bottlenecks (divergence, memory), and apply basic optimizations.
4. Evaluate and apply advanced CUDA optimizations (kernel fusion, thread/block config) for better performance.
5. Develop basic parallel CUDA algorithms using GPU threads, blocks, and synchronization.

Unit:1	**Fundamentals of Parallel Computer Architecture**	**6 Hours**
Fundamentals of Parallel Computer Architecture : Review of Traditional Computer Architecture: Basic five-stage RISC Pipeline, Cache Memory, Register File, SIMD instructions , Introduction to GPU Architectures: Streaming Multiprocessors (SMs), Cache Hierarchy.		
Unit:2	**The GPU Programming Model**	**6 Hours**
The GPU Programming Model : The Graphics Pipeline: Understanding its evolution and relevance to general-purpose GPU computing , Introduction to CUDA Programming: Core concepts and execution model.		
Unit:3	**CUDA Programming Basics**	**6 Hours**
CUDA Programming Basics : Multi-dimensional Mapping of Dataspace to GPU threads and blocks, Synchronization in CUDA: Thread and Block level synchronization mechanisms.		
Unit:4	**CUDA Kernel Optimization- Part 1**	**7 Hours**
CUDA Kernel Optimization - Part 1: Warp Scheduling and Handling Divergence in CUDA kernels , Memory Access Optimization: Understanding and implementing Memory Access Coalescing.		
Unit:5	**CUDA Kernel Optimization-- Part 2**	**7 Hours**
CUDA Kernel Optimization - Part 2 :Optimization Examples: Detailed analysis and optimization of Reduction Kernels, Optimization Techniques: Kernel Fusion strategies for improved performance, Thread and Block Level Optimizations: Choosing optimal configurations for different scenarios.		
Unit :6	**Heterogeneous Computing and Applications**	**7 Hours**
Heterogeneous Computing and Applications : OpenCL Basics: Platform, Device, Context, Command Queue, Kernel, OpenCL for Heterogeneous Computing: Leveraging CPUs, GPUs, and other accelerators, Application Design: Exploring efficient Neural Network Training and/or Inferencing strategies using parallel computing concepts (potentially touching upon both CUDA and OpenCL).		
	Total Lecture Hours	**45 Hours**

Textbooks	
1	Professional CUDA C Programming, John Cheng
2	An Introduction to General-Purpose GPU Programming,Jason Sanders
Reference books	
1	CUDA by Example: An Introduction to General-Purpose GPU Programming ,1st Edition,by Jason Sanders (Author), Edward Kandrot (Author)
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc20_cs41/preview
2	https://enccs.github.io/cuda/3.01_ParallelReduction/

VI Semester
23CSE1662: PE IV : Quantum Computing

Course Outcomes:

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

1. Understand the basic concepts in Quantum Computing.
2. Study and apply various Quantum Algorithms.
3. Understand Quantum noise and errors, Fault- tolerance and Cryptography.
4. Implement Quantum Algorithms and circuits.

Unit No.	Contents	Max. Hrs.
Unit:1	**Introduction to Quantum Computing**	**6 Hours**
Quantum bits, Bloch sphere representation of a qubit, multiple qubits.		
Unit:2	**Background Mathematics and Physics**	**7 Hours**
Hilbert space, Probabilities and measurements, entanglement, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis.		
Unit:3	**Quantum Circuits**	**7 Hours**
Classical boolean circuits, Arithmetic circuits, quantum circuits, single qubit gates, multiple qubit gates, design of quantum circuits, Ordering of qubits in quantum circuits.		
Unit:4	**Quantum Information and Cryptography**	**7 Hours**
Comparison between classical and quantum information theory. Bell states. Introduction to Shannon Entropy, Quantum teleportation. Quantum Cryptography, no cloning theorem.		
Unit:5	**Quantum Algorithms**	**6 Hours**
Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor factorization, Grover search		
Unit :6	**Noise and error correction**	**7 Hours**
Graph states and codes, Qubit channels, Decoherence, Quantum error correction, the quantum-Chernoff bound, fault-tolerant computation.		
	Total Lecture Hours	**39 Hours**

Textbooks	
1	"Quantum Computation and Quantum Information", Nielsen M. A.,Cambridge University Press.
2	"Quantum Computing For Everyone", Chris Bernhardt, MIT Press.
Reference Books	
1	"Principles of Quantum Computation and Information" Benenti G., Casati G. and Strini G., , Vol. I: Basic Concepts, Vol II: Basic Tools and Special Topics, World Scientific., 2004.
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/noc21_cs103/preview
2	https://onlinecourses.nptel.ac.in/noc19_cy31/preview

VI Semester
23CSE1663: PE IV : Prompt Engineering

Course Outcomes

CO-1: Explain the fundamentals of large language models (LLMs), types of prompting, and associated challenges.

CO-2: Design effective prompts using optimization techniques and appropriate tools for various NLP tasks.

CO-3: Demonstrate advanced prompting strategies such as CoT, ReAct, and Tree of Thoughts to enable multi-step reasoning.

CO-4: Develop prompt-based solutions for specialized applications like creative writing, coding, and data analysis using appropriate tools and techniques.

CO-5: Evaluate prompt effectiveness and apply ethical considerations to mitigate bias, hallucination, and adversarial risks.

Unit No.	Contents	Max. Hrs.
Unit 1	**Introduction to Prompt Engineering (Basics of LLMs)**	7 Hrs
Evolution of Large Language Models (LLMs): GPT, BERT, T5, What is a Prompt? How LLMs Interpret Prompts, Types of Prompting: Zero-shot, One-shot, Few-shot, Basics of Tokenization, Context Windows, Challenges: Bias, Hallucination, Length Constraints, Tools: OpenAI Playground, Hugging Face models		
UNIT 2	**Prompt Design and Optimization Techniques**	7 Hrs
Components of a Good Prompt: Clarity, Context, Instructions, Techniques: Instruction-based Prompting, Role Prompting, Context Setting, Methods for prompt refinement and optimization, Prompt Iteration, Evaluation, and Debugging, Case Studies: Crafting prompts for different tasks (Summarization, Translation, QA)		
UNIT 3	**Advanced Prompting Strategies**	6 Hrs
Chain-of-Thought (CoT) Prompting, Self-Consistency Prompting, Tree of Thoughts (ToT) prompting, ReAct (Reasoning + Acting) framework,Meta-Prompting and Automatic Prompt Generation, Multi-step Reasoning and Planning		
UNIT 4	**Specialized Prompting Applications**	7 Hrs
Prompting for: Creative Writing (Story generation, Poetry), Coding and Code Generation (Codex, Copilot), Data Extraction and Analysis, Image Generation (using DALL-E, MidJourney prompts), Fine-tuning vs		

Prompt-tuning: Differences and Practical Considerations, Using Retrieval-Augmented Generation (RAG) with Prompts		
UNIT 5	**Evaluation, Bias, and Ethics in Prompt Engineering**	6 Hrs
Evaluation Metrics for Prompt Effectiveness: Accuracy, Fluency, Factuality, Coherence, Detecting Bias and Hallucination in LLM outputs, Mitigation strategies for safe prompt design, Adversarial Prompting and Jailbreaking, Ethical Considerations: Plagiarism, Misinformation		
UNIT 6:	**Future of Prompt Engineering and Hands-on Project**	7 Hrs
Trends: Agents, Tool Use, Plugins (e.g., OpenAI Plugins, LangChain), AutoGPT, BabyAGI: Automating Prompt Chaining, Designing Prompt-based Workflows (Marketing, HR, Legal, etc.)		
	Total No.Of Lectures	**39 Hr**

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

VI Semester
23CSE1664: PE IV : Nature Inspired Computing

Course Outcomes:

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

CO1: Understand the foundational principles and characteristics of nature-inspired computing including emergence, self-organization, and complexity.
CO2: Apply evolutionary, swarm-based, and immune-inspired algorithms to optimization and problem-solving scenarios.
CO3: Analyze the structure and functioning of DNA computing models and their application to complex computational problems.
CO4: Examine and compare the principles and computational capabilities of natural intelligent computing systems such as cellular automata, biological, and quantum computers.

Unit No.	Contents	Max. Hrs.
Unit:1	**Introduction to Nature Computing**	**6 Hours**
INTRODUCTION: From Nature to Nature Computing , Philosophy , Three Branches: A Brief Overview, Individuals, Entities and agents - Parallelism and Distributivity Interactivity ,Adaptation- Feedback-Self-Organization-Complexity, Emergence and ,Bottom-up Vs Top-Down- Determination, Chaos and Fractals.		
Unit:2	**Computing Inspired by Nature**	**7 Hours**
Computing Inspired by Nature: Evolutionary Computing, Hill Climbing and Simulated Annealing, Darwin's Dangerous Idea, Genetics Principles, Standard Evolutionary Algorithm -Genetic Algorithms , Reproduction-Crossover, Mutation, Evolutionary Programming, Genetic Programming		
Unit:3	**SWARM INTELLIGENCE**	**6 Hours**
Swarm Intelligence: Introduction - Ant Colonies, Ant Foraging Behavior, Ant Colony Optimization, SACO and scope of ACO algorithms, Ant Colony Algorithm (ACA), Swarm Robotics, Foraging for food, Social Adaptation of Knowledge , Particle Swarm Optimization (PSO)		
Unit:4	**IMMUNOCOMPUTING**	**7 Hours**
Immunocomputing: Introduction- Immune System, Physiology and main components, Pattern Recognition and Binding , Immune Network Theory- Danger Theory, Evaluation Interaction- Immune Algorithms , Introduction – Genetic algorithms , Bone Marrow Models , Forest's Algorithm, Artificial Immune Networks		
Unit :5	**COMPUTING WITH NEW NATURAL MATERIALS**	**7 Hours**
Computing With New Natural Materials: DNA Computing: Motivation, DNA Molecule , Adleman's experiment , Test tube programming language, Universal DNA Computers , PAM Model , Splicing Systems , Lipton's Solution to SAT Problem , Scope of DNA Computing , From Classical to DNA Computing		

Unit:6	NIC COMPUTERS	6 Hours
Introduction to NIC Computers, Cellular automata, Biological computers, Quantum computers. Examples of Case Studies and Applications: How local search helps you develop a personalized portfolio. How DNA computes a path for a traveling salesman		
Total Lecture Hours		**39Hours**

Textbooks	
1	Leandro Nunes de Castro, " Fundamentals of Natural Computing, Basic Concepts, Algorithms and Applications", Chapman & Hall/CRC, Taylor and Francis Group, 2007.
Reference Books	
1	Floreano D. and Mattiussi C., "Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies", MIT Press, Cambridge, MA, 2008.
2	Albert Y.Zomaya, "Handbook of Nature-Inspired and Innovative Computing", Springer, 2006.
3	Marco Dorrigo, Thomas Stutzle," Ant Colony Optimization", PHI,2005
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc21_me43/preview
2	

VI Semester
23CSE1665: PE IV : Distributed Computing

Course Outcomes:

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

CO1: Understand the fundamental concepts and architecture of distributed systems, including communication models, execution types, and system components.

CO2: Apply logical time concepts and global state detection techniques such as vector clocks, leader election algorithms, and snapshot algorithms in distributed environments.

CO3: Analyze and evaluate distributed mutual exclusion and deadlock detection algorithms, including token-based and quorum-based methods.

CO4: Demonstrate knowledge of consensus protocols and fault recovery mechanisms like checkpointing and rollback in both synchronous and asynchronous systems.

CO5: Explore and assess the design and working of distributed shared memory, distributed file systems, and cloud computing technologies with real-world case studies.

Unit No.	Contents	Max. Hrs.
Unit:1	**Introduction**	**7 Hours**

Introduction: Definition-Relation to Computer System Components – Motivation – Message -Passing Systems versus Shared Memory Systems – Primitives for Distributed Communication – Synchronous versus Asynchronous Executions – Design Issues and Challenges; A Model of Distributed Computations: A Distributed Program – A Model of Distributed Executions – Models of Communication Networks – Global State of a Distributed System.

Unit:2	**LOGICAL TIME AND GLOBAL STATE**	**7 Hours**

Logical time – A framework for a system of logical clocks, Scalar time, Vector time. Leader election algorithm – Bully algorithm, Ring algorithm. Global state and snapshot recording algorithms – System model and definitions, Snapshot algorithm for FIFO channels – Chandy Lamport algorithm. Termination detection – System model of a distributed computation, Termination detection using distributed snapshots, Termination detection by weight throwing, Spanning-tree-based algorithm.

Unit:3	**DISTRIBUTED MUTEX AND DEADLOCK**	**7 Hours**

Distributed mutual exclusion algorithms – System model, Requirements of mutual exclusion algorithm. Lamport's algorithm, Ricart–Agrawala algorithm, Quorum-based mutual exclusion algorithms – Maekawa's algorithm. Token-based algorithm – Suzuki–Kasami's broadcast algorithm. Deadlock detection in distributed systems – System model, Deadlock handling strategies, Issues in deadlock detection, Models of deadlocks.

Unit:4	CONSENSUS AND RECOVERY	7 Hours
Consensus and Agreement Algorithms: Problem Definition – Overview of Results – Agreement in a Failure-Free System (Synchronous and Asynchronous) – Agreement in Synchronous Systems with Failures; Checkpointing and Rollback Recovery: Introduction – Background and Definitions – Issues in Failure Recovery – Checkpoint-based Recovery – Coordinated Checkpointing Algorithm – – Algorithm for Asynchronous Checkpointing and Recovery		
Unit:5	**DISTRIBUTED SHARED MEMORY AND FILE SYSTEM**	**6 Hours**
Distributed shared memory – Abstraction and advantages. Shared memory mutual exclusion – Lamport's bakery algorithm. Check pointing and rollback recovery – System model, consistent and inconsistent states, different types of messages, Issues in failure recovery, checkpoint-based recovery, log-based roll back recovery. Distributed file system – File service architecture, Case studies: Sun Network File System, Andrew File System, Google File System.		
Unit :6	**CLOUD COMPUTING**	**6 Hours**
Definition of Cloud Computing – Characteristics of Cloud – Cloud Deployment Models – Cloud Service Models – Driving Factors and Challenges of Cloud – Virtualization – Load Balancing – Scalability and Elasticity – Replication – Monitoring – Cloud Services and Platforms: Compute Services – Storage Services – Application Services		
Total Lecture Hours		**39 Hours**

Textbooks	
1	Ajay D. Kshemkalyani and Mukesh Singhal, Distributed Computing: Principles, Algorithms, and Systems, Cambridge University Press, 2011.
2	Mukesh Singhal, Niranjan G Shivaratri, "Advanced Concepts in Operating systems", McGraw Hill Publishers, 1994.
Reference Books	
1	George Coulouris, Jean Dollimore, Time Kindberg, "Distributed Systems Concepts and Design", Fifth Edition, Pearson Education, 2012.
2	Pradeep L Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, 2007.
3	Tanenbaum A S, Van Steen M, "Distributed Systems: Principles and Paradigms", Pearson Education, 2007.
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
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2	https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in /noc21_cs87/preview

VI Semester
23CSE1666: PE IV : Industry 4.0

Course Outcomes:

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

CO1: Understand the Fundamentals of Industry 4.0 and IIoT

CO2: Analyze IIoT Architectures and Business Models

CO3: Implement Data Analytics and Machine Learning in Industrial Applications

CO4: Assess Security Challenges and Implement Solutions in IIoT Systems

CO5: Design and Evaluate IIoT Applications Across Various Industries

Unit No.	Contents	Max. Hrs.
Unit:1	**Introduction**	**7 Hours**
Introduction to Sensing & Actuation, IoT Connectivity, IoT Networking, Industry 4.0: Globalization and Emerging Issues, The Fourth Revolution, LEAN Production Systems, Smart and Connected business perspective, smart factories.		
Unit:2	**Basics of Industry 4.0**	**7 Hours**
Cyber Physical Systems and Next Generation Sensors, Collaborative Platform and Product Lifecycle Management, Augmented Reality and Virtual Reality, Artifical Intelligence, Big Data and Advanced Analysis, Cyber-Security in Industry 4.0, Industrial Processes, Industrial Sensing & Actuation, Industrial Internet Systems.		
Unit:3	**Business Model and Reference Ture**	**6 Hours**
Business Model and Reference Architecture: IIoT-Business Models, IIoT Reference Architecture, Industrial IoT- Layers: IIoT Sensing, IIoT Processing, IIoT Communication, IIoT Networking.		
Unit:4	**Business issues in Industry 4.0**	**6 Hours**
Business issues in Industry 4.0:IIoT case studies, Opportunities and Challenges, Future of Works and Skills for Workers in the Industry 4.0 Era, Strategies for competing in an Industry 4.0 world.		
Unit:5	**Security and Fog Computing**	**7 Hours**
Cloud Computing in IIoT**,** Fog Computing in IIoT, Security in IIoT, Industrial IoT- Application Domains: Factories and Assembly Line, Food Industry, Healthcare, Power Plants, Inventory Management & Quality Control, Plant Safety and Security (Including AR and VR safety applications), Facility Management.		
Unit :6	**Industrial IOT Case Studies**	**7 Hours**
Industrial IOT- Application domain: Milk Processing and Packaging Industries, Manufacturing Industries, Virtual Reality Lab, Steel Technology Lab, Oil, chemical and pharmaceutical industry, Applications of UAVs in Industries.		
	Total Lecture Hours	**39 Hours**

Textbooks	
1.	"Industry 4.0: The Industrial Internet of Things", by Alasdair Gilchrist (Apress)
2.	"Industrial Internet of Things: Cybermanufacturing Systems" by Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer)
Reference Books	
1.	Introduction to IOT Latest S.Misra , A. Mukherjee, A.Roy, 2020
2.	Introduction to Industrial Internet of Things and Industry S. Misra, C. Roy, and A. Mukherjee, 2020.
3.	Industry 4.0 Sustainable Industrial Approach, Bansal Dr. Vikram, Deepthi B., 2025
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS] –	
1	http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/21.405352151-Industry-4-0-The-Industrial-Internet-of-Things-Apress-2016.pdf
2	
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc20_cs69/preview
2	https://onlinecourses.nptel.ac.in/noc21_ee85/preview
3	

VI Semester
23CSE1667: PE IV : Distributed Database Management System

Course Outcomes:

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

1. Describe the fundamental concepts and architectural models of distributed database systems.
2. Compare various data distribution strategies and apply fragmentation and allocation techniques in distributed database design.
3. Analyze and decompose distributed queries considering localization and optimization techniques.
4. Demonstrate the ability to manage distributed transactions with appropriate concurrency control and deadlock handling mechanisms.
5. Evaluate fault tolerance and recovery techniques in distributed and parallel database systems.

Unit No.	Contents	Max. Hrs.
Unit:1	**Introduction**	**7 Hours**

Distributed Data Processing, Distributed Database System, Promises of DDBSs, Problem areas. **Distributed DBMS Architecture**:-Architectural Models for Distributed DBMS, DDMBS Architecture. **Distributed Database Design**:-Alternative Design Strategies, Distribution Design issues, Fragmentation, Allocation.

Unit:2	**Data Distribution Alternatives, Fragmentation** and **Distribution transparency**	**7 Hours**

Data Distribution Alternatives:-Design Alternatives – localized data, distributed data **Fragmentation** – Vertical, Horizontal (primary & derived), hybrid, general guidelines, correctness rules
Distribution transparency – location, fragmentation, replication, Impact of distribution on user queries – No Global Data, Dictionary(GDD), GDD containing location information, Example on fragmentation

Unit:3	**Query processing and decomposition and Distributed query Optimization**	**7 Hours**

Query processing and decomposition:-Query processing objectives, characterization of query processors, layers of query processing, query decomposition, localization of distributed data**.**
Distributed query Optimization:-Query optimization, centralized query optimization, distributed query optimization algorithms

Unit:4	**Transaction Management**	**7 Hours**

Definition, properties of transaction, types of transactions, distributed concurrency control: serializability, concurrency control mechanisms & algorithms, time - stamped & optimistic concurrency control Algorithms, deadlock Management.

Unit:5	**Distributed DBMS Reliability and Parallel Database Systems**	**6 Hours**

Distributed DBMS Reliability:-Reliability concepts and measures, fault-tolerance in distributed systems, failures in Distributed DBMS, local & distributed reliability protocols, site failures and network partitioning. **Parallel Database Systems:-**Parallel database system architectures, parallel data placement, parallel query processing, load balancing, database clusters.		
Unit :6	**Distributed Deadlock & Recovery and Recovery in DBMS**	**6 Hours**
Distributed Deadlock & Recovery:- Deadlock concept, Deadlock in Centralized systems, Deadlock in Distributed Systems – Detection, Prevention, Avoidance, Wait-Die Algorithm, Wound-Wait algorithm **Recovery in DBMS** - Types of Failure, Methods to control failure, Different techniques of recoverability, Write- Ahead logging Protocol.		
	Total Lecture Hours	**39 Hours**

Textbooks	
1	M. Tamer OZSU and Patuck Valduriez: Principles of Distributed Database Systems, Pearson Edn. Asia, 2001.
2	Stefano Ceri and Giuseppe Pelagatti: Distributed Databases, McGraw Hill.
Reference Books	
1	Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom: "Database Systems: The Complete Book", Second Edition, Pearson International Edition

VI Semester
23CSE1668: PE IV : Data Mining

Course Outcomes:

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

1. Define **data mining** and understand its significance in business, research, and technology.
2. Gain skills in data cleaning, normalization, and transformation, and will learn to perform exploratory data analysis using visualization techniques.
3. Apply data mining algorithms on sample datasets.
4. Evaluate and validate models using techniques like cross-validation, confusion matrices, and performance metrics such as precision, recall, and F1 score..

Unit No.	Contents	Max. Hrs.
Unit:1	**Data Mining Introduction**	**7 Hours**
Introduction to data mining, Process of data mining, Data Mining Functionalities, Data Pre-processing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation, Classification of Data Mining systems, Data Mining Task primitives, Major issues in Data Mining, Applications of Data Mining		
Unit:2	**Mining Frequent Patterns and Association Rules**	**5 Hours**
Market Basket Analysis, Frequent Item sets and Association rules, APriori Algorithm, Improving the efficiency of Apriori, FP- growth Algorithm		
Unit:3	**Classification and prediction**	**6 Hours**
Classification: Introduction, decision tree, building a decision tree- the tree induction algorithm, split algorithm based on information theory, gini index, over fitting and pruning, Bayesian Classification – Rule Based Classification –Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods.		
Unit:4	**Clustering**	**7 Hours**
Types of data in cluster analysis, Categorization of major clustering methods:Partitioning methods, Hierarchical methods, Applications of clustering.		
Unit:5	**Mining Web Data,Text mining , Spatial data**	**7Hours**
Mining the World Wide Web: Web Content Mining, Web Structure Mining, Web UsageMining, introduction to Text Mining and Spatial Data Mining		

Unit :6	**Sequence Mining & Visualization**:.	**7 Hours**
Pattern discovery and data representation ,Identifying frequent sequences in data , time series data mining, visualization techniques: Methods like heatmaps, timelines, and network graphs to represent sequential data.		
	Total Lecture Hours	**39 Hours**
Textbooks		
1.	Introduction to Data Mining, Tan, Steinbach and Vipin Kumar, Pearson Education, 2016	
2.	Data Mining: Concepts and Techniques, Pei, Han and Kamber, Elsevier, 2011	
Reference Books		
1	Data Mining: Practical Machine Learning Tools and Techniques *Ian H. Witten & Eibe Frank, latest edition*	
2	Mining the Social Web, *Matthew A. Russell, O'relly publication , latest edition*	
3		
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS] –		
1		
MOOCs Links and additional reading, learning, video material -		
1	https://onlinecourses.nptel.ac.in/noc21_cs06/preview	

VI Semester
23CSE1669: PE IV : Product Development
(Industry Aligned)

VI Semester
MDM4CSE104: Programming Framework for Computer Vision

Course Outcomes:

Upon successful completion of the course the students will be able

CO1 Understand the role of computer vision and the use of various programming frameworks.
CO2 Apply image processing techniques using OpenCV to manipulate and analyze images.
CO3 Implement object tracking and motion detection in real-time applications.
CO4 Develop deep learning-based solutions for image classification and object detection.
CO5 Evaluate real-world vision applications and assess ethical implications in deploying solutions.

Unit No.	Contents	Max. Hrs.
Unit:1	**Introduction to Computer Vision and Tools**	**7 Hours**
Overview of computer vision tasks and applications Software frameworks: OpenCV, TensorFlow, PyTorch – comparison and use cases Introduction to Python for CV: NumPy, Matplotlib, and basic image handling Setting up OpenCV and Jupyter Notebook/Colab environment		
Unit:2	**Image Processing with OpenCV**	**7 Hours**
Reading, writing, and displaying images and videos, Image transformations: resize, rotate, crop, flip Color spaces and conversions (RGB, HSV, Grayscale),Image enhancement: filters (blur, sharpen), thresholding, histograms		
Unit:3	**Feature Detection and Object Tracking**	**6 Hours**
Edge detection (Sobel, Canny),Corner and keypoint detection: Harris, Shi-Tomasi, Object tracking: color-based tracking, contour detection,Motion detection using frame differencing		
Unit :4	**Deep Learning Frameworks for Vision**	**7Hours**
Basics of deep learning for vision: CNNs overview,Introduction to TensorFlow and Keras, Using pre-trained models (e.g., MobileNet, ResNet),Transfer learning for image classification		
Unit :5	**Object Detection and Face Recognition**	7Hours
Object detection frameworks: Haar cascades, YOLO (intro level), SSD,Real-time object detection with OpenCV + pre-trained models,Face detection and recognition basics using Dlib or OpenCV Hands-on mini-projects using OpenCV and deep learning		
Unit:6	**Case Studies and Applications**	**6 Hours**
Applications in manufacturing, healthcare, surveillance, transportation,Deploying CV applications on mobile/embedded platforms (overview),Introduction to CV ethics, bias, and privacy		
Total Lecture Hours		**39 Hours**

Textbooks	
1	Gary Bradski & Adrian Kaehler – Learning OpenCV 4 (O'Reilly)
2	Pradeep Singh – Hands-On Computer Vision with TensorFlow 2 (Packt)
Reference Books	
1	Joseph Howse – OpenCV 4 for Secret Agents (Practical projects with OpenCV)
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/54.NLP_Language_processing_jurafsky_ BOOK.pdf
2	
MOOCs Links and additional reading, learning, video material	
1	https://www.youtube.com/live/FbOCV344iLA?si=IQdy1JM1b4z-Evww

VI Semester
MDM4CSE204: Cryptography

Course Outcomes:

Upon successful completion of the course the students will be able

CO1: Explain the basic concepts and need for cryptography in secure communication.
CO2: Analyse and apply classical and modern symmetric encryption techniques.
CO3: Demonstrate understanding and application of asymmetric encryption and key exchange protocols.
CO4: Evaluate cryptographic hash functions and digital signature algorithms for data integrity and authentication.
CO5: Apply cryptographic techniques to design secure communication systems and identify potential vulnerabilities.

Unit No.	Contents	Max. Hrs.
Unit:1	**Introduction to Cryptography**	**7 Hours**
Basics of Cryptography: Definition, Objectives, Importance,Security services and mechanisms, Cryptanalysis and types of attacks, Historical ciphers: Caesar cipher, Monoalphabetic cipher, Playfair, Hill cipher Substitution and transposition techniques		
Unit:2	**Mathematical Foundations for Cryptography**	**7 Hours**
Number theory: modular arithmetic, GCD, Euler's phi function, Prime numbers and primality testing, Euclidean and Extended Euclidean Algorithm, Finite fields and polynomial arithmetic, Discrete logarithms		
Unit:3	**Symmetric Key Cryptography**	**6 Hours**
Block ciphers vs. Stream ciphers, DES: structure, modes of operation (ECB, CBC, CFB, OFB), Advanced Encryption Standard (AES): architecture, key expansion, rounds, Modern symmetric ciphers (brief overview)		
Unit :4	**Asymmetric Key Cryptography**	**6 Hours**
Public key cryptography principles, RSA algorithm: key generation, encryption, decryption, Diffie-Hellman key exchange, ElGamal encryption, Comparison of symmetric and asymmetric cryptography		
Unit :5	**Cryptographic Hash Functions and Digital Signatures**	6 Hours
Hash functions: MD5, SHA family, Message authentication codes (MAC), HMAC, Digital signatures: DSS, RSA-based, Authentication protocols		
Unit:6	**Applications and Recent Trends in Cryptography**	**7 Hours**
Email and web security: PGP, S/MIME, SSL/TLS, Cryptography in Blockchain and Cryptocurrency Public Key Infrastructure (PKI), Introduction to Quantum cryptography , Legal, ethical, and policy issues		
Total Lecture Hours		**39 Hours**

Textbooks	
1	Cryptography and Network Security, William Stallings – Principles and Practice",Pearson Education.
2	Cryptography and Network Security**,** Behrouz A. Forouzan and Debdeep Mukhopadhyay, McGraw Hill
Reference Books	
1	Introduction to Modern Cryptography, Jonathan Katz and Yehuda Lindell, 3rd Edition, CRC Press, Taylor & Francis Group
2	Bruce Scheneir: "Applied Cryptography", John Wiley.
3	Network Security and Cryptography, Bernard Menezes, Cengage Learning
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
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2	
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc22_cs90/preview

VI Semester
MDM4CSE304: Software Design Patterns

Course Outcomes:

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

CO1 -Identify the appropriate design patterns to solve object oriented design problems.
CO2 -Develop design solutions using creational patterns.
CO3 -Apply structural patterns to solve design problems.
CO4 -Construct design solutions by using behavioral patterns.

Unit No.	Contents	Max. Hrs.
Unit:1	**Introduction**	**7 Hours**
Introduction: What is a Design Pattern?, Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.		
Unit:2	**Creational Design Pattern**	**7 Hours**
Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton.		
Unit:3	**Structural Design Pattern**	**7 Hours**
Structural Patterns: Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy.		
Unit :4	**Behavioral Design Pattern**	**7 Hours**
Behavioral Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, Strategy, Template Method, Visitor.		
Unit 5	**A Case Study**	**6 Hours**
Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations, Spelling Checking and Hyphenation		
Unit 6	**Complexity Analysis**	**6 Hours**
Complexity Analysis of Design Patterns, Methods to analyze the complexity of design patterns, Implementation techniques and applications of design pattern in game design, product design		
	Total Lecture Hours	**39 Hours**

Textbooks	
1	Design Patterns By Erich Gamma, Pearson Education
2	Design Patterns Explained By Alan Shalloway, Pearson Education.
3	Meta Patterns designed by Wolf gang , Pearson

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

Reference Books	
1	Head First Design Patterns By Eric Freeman-Oreilly-spd
2	JAVA Enterprise Design Patterns Vol-III By Mark Grand ,Wiley DreamTech.
3	Pattern‟s in JAVA Vol-I By Mark Grand ,Wiley DreamTech.
4	Pattern‟s in JAVA Vol-II By Mark Grand ,Wiley DreamTech.
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1	
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2	https://onlinecourses.nptel.ac.in/noc24_cs40/preview

VI SEMESTER

Mandatory Learning Course (MLC)

MLC2126 : YCAP6