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 3.25)

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Technology

SoE & Syllabus 2022

1st to 8th Semester

(Department of Computer Science and Engineering

B.Tech in CSE (AIML)

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.TECH SCHEME OF EXAMINATION 2022

(Scheme of Examination w.e.f. 2022-23 onward)

(Department of Computer Science & Engineering)

CSE (AIML)

SoE No. 22AML-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															
1	1	BS	GE/MTH	22AML101	Calculus, Sequence and Series	**T**	3	1	0	3	4	30	20	50	3 Hrs
2	1	HS	GE/HUM	22AML102	Technical Communication	**T**	3	0	0	3	3	30	20	50	3 Hrs
3	1	HS	GE/HUM	22AML103	**Lab:** Technical Communication	**P**	0	0	2	2	1		60	40	
4	2	BES	CSE/CSE	22AML104	Computer Workshop	**P**	0	0	2	4	2		60	40	
5	1	BES	CSE/CSE	22AML105	Programming for Problem Solving	**T**	3	0	0	3	3	30	20	50	3 Hours
6	1	BES	CSE/CSE	22AML106	Lab: Programming for Problem Solving	**P**	0	0	2	2	1		60	40	
7	1	BS	GE/CHE	22AML107	Engineering Chemistry	**T**	3	0	0	3	3	30	20	50	3 Hours
8	1	BS	GE/CHE	22AML108	**Lab.:** Engineering Chemistry	**P**	0	0	2	2	1		60	40	
					TOTAL FIRST SEM		**12**	**1**	**8**	**22**	**18**				
List of Mandatory Learning Course (MLC)															
1	1	HS	GE/HUM	GE2131	Universal Human Value	**A**	2	0	0	2	0				
2	1	HS	GE/T&P	MLC2121	YCAP1-Get Set Go	**A**	2	0	0	2	0				
SECOND SEMESTER															
1	2	BS	GE/MTH	22AML201	Probability and Statistics	**T**	3	1	0	3	4	30	20	50	3 Hours
2	2	BS	GE/PHY	22AML202	Engineering Physics	**T**	3	0	0	3	3	30	20	50	3 Hours
3	2	BS	GE/PHY	22AML203	**Lab:** Engineering Physics	**P**	0	0	2	2	1		60	40	
4	2	BES	EE/EE	22AML204	Digital Electronics	**T**	3	0	0	3	3	30	20	50	3 Hours
5	2	BES	EE/EE	22AML205	**Lab:** Digital Electronics	**P**	0	0	2	2	1		60	40	
6	2	BES	CSE/CSE	22AML206	Object Oriented Programming	T	3	0	0	3	3	30	20	50	3 Hours
7	2	BES	CSE/CSE	22AML207	**Lab:** Object Oriented Programming	P	0	0	2	2	1		60	40	
8	2	BES	CSE/CSE	22AML208	Web Technology Lab	**P**	0	0	0	2	1		60	40	
9	2	HS	GE/HUM	22AML209	Social Science	**T**	3	0	0	3	3	30	20	50	3 Hours
					TOTAL SECOND SEM		**15**	**1**	**6**	**23**	**20**				
List of Mandatory Learning Course (MLC)															
3	2	HS	GE/T&P	MLC2122	YCAP2 -Functional English	**A**	2	0	0	2	0				
4	2	BES	GE/CHE	GE2132	Environmental Science	**A**	2	0	0	2	0				

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

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

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

		June 2022	**1.00**
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**

Applicable for AY 2022-23 Onwards

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 2022

(Scheme of Examination w.e.f. 2022-23 onward)

(Department of Computer Science & Engineering)

CSE (AIML)

SoE No. 22AML-101

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
THIRD SEMESTER															
1	3	BS	GE	22AML301	Discrete Mathematics and Graph theory	**T**	3	1	0	3	4	30	20	50	3 Hours
2	3	PC	CSE	22AML302	Formal Language & Automata Theory	**T**	3	1	0	3	4	30	20	50	3 Hours
3	3	PC	CSE	22AML303	**Lab:** Formal Language & Automata Theory	**P**	0	0	2	2	1		60	40	
4	3	PC	CSE	22AML304	Data Structures	**T**	3	1	0	3	4	30	20	50	3 Hours
5	3	PC	CSE	22AML305	**Lab:** Data Structures	**P**	0	0	2	2	1		60	40	
6	3	PC	CSE	22AML306	Computer Architecture & Organisation	T	3	0	0	3	3	30	20	50	3 Hours
7	3	PC	CSE	22AML307	Software Engineering	T	3	0	0	3	3	30	20	50	3 Hours
8	3	PC	CSE	22AML308	**Lab:** Software Engineering	**P**	0	0	2	2	1		60	40	
9	3	PC	CSE	22AML309	**Lab:** Software Lab.	**P**	0	0	2	2	1		60	40	
					TOTAL		**15**	**3**	**8**	**23**	**22**				
List of Mandatory Learning Course (MLC)															
1	3	HS	T&P	MLC2123	YCCE Communication Aptitude Preparation (YCAP3)	**A**	3	0	0	3	0				
2	3	BSE	AIML	MLC123	Introduction to Haskell Programming	**A**	2	0	0	2	0				
FOURTH SEMESTER															
1	4	BS	GE	22AML401	Linear Algebra	**T**	3	0	0	3	3	30	20	50	3 Hours
2	4	PC	CSE	22AML402	Operating Systems	**T**	3	0	0	3	3	30	20	50	3 Hours
3	4	PC	CSE	22AML403	**Lab:** Operating Systems	**P**	0	0	2	2	1		60	40	
2	4	PC	CSE	22AML404	Foundation of Artificial Intelligence	**T**	3	0	0	3	3	30	20	50	3 Hours
3	4	PC	CSE	22AML405	**Lab:** Foundation of Artificial Intelligence	**P**	0	0	2	2	1		60	40	
6	4	PC	CSE	22AML406	Design & Analysis of Algorithms	**T**	3	1	0	3	4	30	20	50	3 Hours
7	4	PC	CSE	22AML407	**Lab:** Design & Analysis of Algorithms	**P**	0	0	2	2	1		60	40	
8	4	PC	CSE	22AML408	Database Management Systems	**T**	3	0	0	3	3	30	20	50	3 Hours
9	4	PC	CSE	22AML409	**Lab:** Database Management Systems	**P**	0	0	2	2	1		60	40	
10	4	PC	CV/CSE	22AML410	Environmental Sustainability, Pollution and Management	**T**	3	0	0	3	3	30	20	50	3 Hrs
					TOTAL		**18**	**1**	**8**	**26**	**23**				
List of Mandatory Learning Course (MLC)															
1	4	HS	T&P	MLC2124	YCCE Communication Aptitude Preparation (YCAP4)	**A**	3	0	0	3	0				
2	4	BSE	AIML	MLC124	Computational Sanskrit	**A**	2	0	0	2	0				

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

		June 2022	**1.00**
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**

Applicable for AY 2022-23 Onwards

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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B.TECH SCHEME OF EXAMINATION 2022

(Scheme of Examination w.e.f. 2022-23 onward)

(Department of Computer Science & Engineering)

CSE (AIML)

SoE No. 22AML-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	HS	GE	22AML501	Fundamentals of Management and Economics	**T**	3	0	0	3	3	30	20	50	3 Hours
2	5	PC	CSE	22AML502	Machine Learning Essentials	**T**	3	0	0	3	3	30	20	50	3 Hours
3	5	PC	CSE	22AML503	**Lab:** Machine Learning Essentials	**P**	0	0	2	2	1		60	40	
4	5	PE			**Professional Elective-I**	**T**	3	0	0	3	3	30	20	50	3 Hours
5	5	PE			**Lab: Professional Elective-I**	**P**	0	0	2	2	1		60	40	
6	5	OE			**Open Elective - I ***	**T**	3	0	0	3	3	30	20	50	3 Hours
7	5	OE			**Open Elective - II ***	**T**	3	0	0	3	3	30	20	50	3 Hours
8	5	**STR**		22AML504	Industrial training, Seminar & Report	**P**	**0**	**0**	**1**	**1**	**1**		60	40	
						TOTAL	**15**	**0**	**5**	**20**	**18**				

List of Professional Electives-I

1	5	PE-I	CSE	22AML511	PE-I: Design Patterns
2	5	PE-I	CSE	22AML512	PE-I: **Lab:** Design Patterns
3	5	PE-I	CSE	22AML513	PE-I: Embeded AI
4	5	PE-I	CSE	22AML514	PE-I: **Lab:** Embeded AI
5	5	PE-I	CSE	22AML515	PE-I: Business Intelligence
6	5	PE-I	CSE	22AML516	PE-I: **Lab:** Business Intelligence
7	5	PE-I	CSE	22AML517	PE-I: Advanced Web Technologies
8	5	PE-I	CSE	22AML518	PE-I: **Lab:** Advanced Web Technologies

Open Elective-I

1	5	OE-I	CSE	22AML531	OE I: Introduction to Artificial Intelligence
2	5	OE-I	CSE	22AML532	OE I: Software Testing

Open Elective-II

1	5	OE-II	CSE	22AML551	OE II: Introduction to Machine Learning
2	5	OE-II	CSE	22AML552	OE II: Problem solving Techniques and Statistical methods

List of Mandatory Learning Course (MLC)												
1	5	HS	T&P	MLC2125	YCAP5: YCCE Communication Aptitude Preparation	**A**	3	0	0	3	0	
2	5	BSE	R&D	MLC125	Design Thinking	**A**	2	0	0	2	0	

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		June 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**	

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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(Department of Computer Science & Engineering)

CSE (AIML)

SoE No. 22AML-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	22AML601	Advanced Artificial Intelligence	**T**	3	0	0	3	3	30	20	50	3 Hours
2	6	PC	CSE	22AML602	**Lab:** Advanced Artificial Intelligence	**P**	0	0	2	2	1		60	40	
3	6	PC	CSE	22AML603	Computer Networks	**T**	3	0	0	3	3	30	20	50	3 Hours
4	6	PC	CSE	22AML604	**Lab:** Computer Networks	**P**	0	0	2	2	1		60	40	
5	6	PC	CSE	22AML605	Digital Image Processing	**T**	3	0	0	3	3	30	20	50	3 Hours
6	6	PC	CSE	22AML606	**Lab:** Digital Image Processing	**P**	0	0	2	2	1		60	40	
10	6	PC	STR	22AML607	Project Phase-I	**P**	0	0	10	10	5		60	40	
7	6	PE	CSE		**Professional Elective-II**	**T**	3	0	0	3	3	30	20	50	3 Hours
8	6	PE	CSE		**Lab: Professional Elective-II**	**P**	0	0	2	2	1		60	40	
9	6	OE	CSE		**Open Elective - III**	**T**	3	0	0	3	3	30	20	50	3 Hours
10	6	OE	CSE		**Open Elective - IV**	**T**	3	0	0	3	3	30	20	50	3 Hours
					TOTAL		**18**	**0**	**18**	**36**	**27**				

List of Professional Electives-II

1	6	PE-II	CSE	22AML611	PE II: Blockchain Technology
2	6	PE-II	CSE	22AML612	PE II: **Lab:** Blockchain Technology
3	6	PE-II	CSE	22AML613	PE II: Internet of Things
4	6	PE-II	CSE	22AML614	PE II: **Lab:** Internet of Things
5	6	PE-II	CSE	22AML615	PE II: Cloud computing
6	6	PE-II	CSE	22AML616	PE II: **Lab:** Cloud Computing
Coursera Electives					
1	6	PE-II	CSE/CSE	22AML617	PE-II: Deep Learning with PyTorch, Keras and Tensorflow
		PE-II	CSE/CSE	22AML618	PE-II: **Lab.** Deep Learning with PyTorch, Keras and Tensorflow

Open Elective-III

1	6	OE-III	CSE	22AML631	OE III: Introduction to Artificial Intelligence
2	6	OE-III	CSE	22AML632	OE III: Software Testing

Open Elective-IV

1	6	OE-IV	CSE	22AML651	OE IV: Introduction to Machine Learning
2	6	OE-IV	CSE	22AML652	OE IV: Problem solving Techniques and Statistical methods

List of Mandatory Learning Course (MLC)												
1	6	HS	T&P	MLC2126	YCAP6 : YCCE Communication Aptitude Preparation	**A**	3	0	0	3	0	

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

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

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

		June 2022	**1.00**	**Applicable for AY 2022-23 Onwards**
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(Department of Computer Science & Engineering)

CSE (AIML)

SoE No. 22AML-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	
SEVENTH SEMESTER															
1	7	7	PC	22AML701	Computer Vision	**T**	3	0	0	3	3	30	20	50	3 Hours
2	7	7	PC	22AML702	**Lab:** Computer Vision	**P**	0	0	2	2	1		60	40	
3	7	7	PC	22AML703	Shallow & Deep Learning	**T**	3	0	0	3	3	30	20	50	3 Hours
4	7	7	PC	22AML704	**Lab:** Shallow & Deep Learning	**P**	0	0	2	2	1		60	40	
5	7	7	HS	22AML705	Cyber laws & Ethics in IT	**T**	3	0	0	3	3	30	20	50	3 Hours
6	7	7	PE		**Professional Elective-III**	**T**	3	0	0	3	3	30	20	50	3 Hours
7	7	7	PE		**Professional Elective-IV**	**T**	3	0	0	3	3	30	20	50	3 Hours
8	7	7	PE		**Lab:Professional Elective-IV**	**P**	0	0	2	2	1		60	40	
9	7	7	PE		**Professional Elective-V**	**T**	3	0	0	3	3	30	20	50	3 Hours
10	7	7	STR	22AML706	Project Phase-II	**P**	0	0	10	10	5		60	40	
11	7	7	STR	22AML707	Campus Recruitment Training (CRT)	**P**	0	0	0	0	2		100		
						TOTAL	**18**	**0**	**16**	**34**	**28**				

List of Professional Electives-III

1	7	PE-III	CSE	22AML711	PE III: Big Data Analytics
2	7	PE-III	CSE	22AML712	PE III: Nature Inspired Computing
3	7	PE-III	CSE	22AML713	PE III: Information Retrival System
4	7	PE-III	CSE	22AML714	PE III: Data Mining

List of Professional Electives-IV

1	7	PE-IV	CSE	22AML731	PE IV: Cyber Forensic
2	7	PE-IV	CSE	22AML732	PE IV: **Lab:** Cyber Forensic
3	7	PE-IV	CSE	22AML733	PE IV: AI for Medical Domain
4	7	PE-IV	CSE	22AML734	PE IV: **Lab:** AI for Medical Domain
5	7	PE-IV	CSE	22AML735	PE IV: Cognitive System
6	7	PE-IV	CSE	22AML736	PE IV: **Lab:** Cognitive System
7	7	PE-IV	CSE	22AML737	PE IV: Natural Language Processing
8	7	PE-IV	CSE	22AML738	PE IV: **Lab:** Natural Language Processing

List of Professional Electives-V

1	7	PE-V	CSE	22AML751	PE V: Robotics and its Applications
2	7	PE-V	CSE	22AML752	PE V: Augumented / Virtual reality
3	7	PE-V	CSE	22AML753	PE V: Game theory
4	7	PE-V	CSE	22AML754	PE V: Human Computer Interaction

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

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

		June 2022	**1.00**	**Applicable for AY 2022-23 Onwards**
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**	

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B.TECH SCHEME OF EXAMINATION 2022

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(Department of Computer Science & Engineering)

CSE (AIML)

SoE No. 22AML-101

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
Eighth Semester															
1	**8**	**STR**	AML	22AML801	Internship - training / Seminar & Report	**P**	0	0	12	12	3		60	40	
2	**8**	**STR**	AML	22AML802	Extra Curricular Activity Evaluation	**P**	0	0	0	0	2		100		
TOTAL EIGHTH SEM							**0**	**0**	**12**	**12**	**5**				
GRAND TOTAL							**111**	**6**	**81**	**196**	**161**				

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

TA ** = for Theory : 12 marks on lecture quizzes, 12 marks on two TA2 activitied decided by course teacher, 2 marks on class attendance and 4

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

		June 2022	**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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(Accredited 'A++' Grade by NAAC with a score of 3.25)

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Technology

SoE & Syllabus 2022

1st Semester

(Department of Computer Science and Engineering

B.Tech in CSE (AIML)

28 June 2019

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 2022

(Scheme of Examination w.e.f. 2022-23 onward)

(Department of Computer Science & Engineering)

CSE (AIML)

SoE No. 22AML-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															
1	1	BS	GE/MTH	22AML101	Calculus, Sequence and Series	T	3	1	0	3	4	30	20	50	3 Hrs
2	1	HS	GE/HUM	22AML102	Technical Communication	T	3	0	0	3	3	30	20	50	3 Hrs
3	1	HS	GE/HUM	22AML103	**Lab:** Technical Communication	P	0	0	2	2	1		60	40	
4	2	BES	CT/CT	22AML104	Computer Workshop	P	0	0	2	4	2		60	40	
5	1	BES	CSE/CSE	22AML105	Programming for Problem Solving	T	3	0	0	3	3	30	20	50	3 Hours
6	1	BES	CSE/CSE	22AML106	Lab: Programming for Problem Solving	P	0	0	2	2	1		60	40	
7	1	BS	GE/CHE	22AML107	Engineering Chemistry	T	3	0	0	3	3	30	20	50	3 Hours
8	1	BS	GE/CHE	22AML108	**Lab.:** Engineering Chemistry	P	0	0	2	2	1		60	40	
					TOTAL FIRST SEM		**12**	**1**	**8**	**22**	**18**				
List of Mandetory Learning Course (MLC)															
1	1	HS	GE/HUM	GE2131	Universal Human Value	A	2	0	0	2	0				
2	1	HS	GE/T&P	MLC2121	YCAP1-Get Set Go	A	2	0	0	2	0				
SECOND SEMESTER															
1	2	BS	GE/MTH	22AML201	Probability and Statistics	T	3	1	0	3	4	30	20	50	3 Hours
2	2	BS	GE/PHY	22AML202	Engineering Physics	T	3	0	0	3	3	30	20	50	3 Hours
3	2	BS	GE/PHY	22AML203	**Lab:** Engineering Physics	P	0	0	2	2	1		60	40	
4	2	BES	EE/EE	22AML204	Digital Electronics	T	3	0	0	3	3	30	20	50	3 Hours
5	2	BES	EE/EE	22AML205	**Lab:** Digital Electronics	P	0	0	2	2	1		60	40	
6	2	BES	CSE/CSE	22AML206	Object Oriented Programming	T	3	0	0	3	3	30	20	50	3 Hours
7	2	BES	CSE/CSE	22AML207	**Lab:** Object Oriented Programming	P	0	0	2	2	1		60	40	
8	2	BES	CSE/CSE	22AML208	Web Technology Lab	P	0	0	0	2	1		60	40	
9	2	HS	GE/HUM	22AML209	Social Science	T	3	0	0	3	3	30	20	50	3 Hours
					TOTAL SECOND SEM		**15**	**1**	**6**	**23**	**20**				
List of Mandetory Learning Course (MLC)															
3	2	HS	GE/T&P	MLC2122	YCAP2 -Functional English	A	2	0	0	2	0				
4	2	BES	GE/CHE	GE2132	Environmental Science	A	2	0	0	2	0				

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

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

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

		June 2022	**1.00**
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**

Applicable for AY 2022-23 Onwards

I SEMESTER

22AML101: Calculus, Sequence and Series

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Apply the knowledge of differentiation, sequence and series to solve engineering problems. 2. Determine the expansion and derivatives of functions of several variables and use it to find extreme values of functions. 3. Evaluate the improper integrals, multiple integrals and apply it to compute the area and volume of various structures. 4. Solve higher order differential equations and its applications.

Unit I: Sequence and Series	**(6 Hrs.)**
Sequence, types of sequence, test of convergence of sequences, Cauchy sequence, infinite series, power series, Alternating series, tests of convergence and absolute convergence of series. **(Contemporary Issues related to Topic)**	
Unit II: Ordinary Differentiation	**(7 Hrs.)**
Successive differentiation; Leibnitz theorem, Taylor's and Maclaurin's series for functions of single variable and its applications. **(Contemporary Issues related to Topic)**	
Unit III: Partial Differentiation	**(7 Hrs.)**
First and higher order derivatives of Functions of several variables, Euler's theorem, Chain Rule, Jacobians, Maxima and minima and saddle point of functions of two variables. **(Contemporary Issues related to Topic)**	
Unit IV: Curve Tracing and Improper Integrals	**(6 Hrs.)**
Tracing of curves, Beta, Gamma functions and its applications. **(Contemporary Issues related to Topic)**	
Unit V: Multiple integrals	**(7 Hrs.)**
Elementary double integrals, Change of variables (simple transformations), Coordinate Transformation, Change of order of integration (Cartesian and polar), Elementary triple integrals and Applications to find area, volume. **(Contemporary Issues related to Topic)**	
Unit VI: Differential Equations	**(7 Hrs.)**
Higher order differential equations with constant coefficients. Cauchy's and Legendre's homogeneous differential equations, Applications of differential equations. **(Contemporary Issues related to Topic)**	
Total Lecture	**40 Hours**

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

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.	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

I SEMESTER

22AML102: Technical Communication

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Apply different modes for effective communication 2. competently use the phonology of English language 3. Apply nuances of LSRW skills 4. Communicate through different channels

Unit I: Basics of Communication	**(6Hrs.)**
Language as a tool of communication & characteristics of language Process of Communication, Levels of Communication, Flow of Communication, Networks of Communication, Classification of Barriers (Intrapersonal, Interpersonal, Organizational). **(Contemporary Issues related to Topic)**	
Unit II: English Phonetics	**(6 Hrs.)**
Speech Mechanism, Organs of speech, Consonant and Vowels sounds, Word stress rules. **(Contemporary Issues related to Topic)**	
Unit III: Interview Skills	**(7Hrs.)**
Purpose , expectations of employer and preparation for Interview, Types, Types of Questions & Answering Techniques, Telephonic Interviews – preparation and guidelines, Reading Techniques (Exercise based on Complex Unseen passages **(Contemporary Issues related to Topic)**	
Unit IV: Oral Skills	**(7 Hrs.)**
Group Communication- (Purpose, Different types of Group Communication, Organizational GD, GD as a part of selection process), Meeting (purposes, preparation, procedure and minutes of meeting), Listening Skills -definition types and traits **(Contemporary Issues related to Topic)**	
Unit V: Presentation & Visual Communication	**(6 Hrs.)**
Presentation and audience analysis, Organizing content, Nuances of presentation, Visual Communication – Introduction & importance, Role & Psychology of color in visual communication. **(Contemporary Issues related to Topic)**	
Unit VI: Technical Written Communication	**(7 Hrs.)**
Memo, Email, Report -Types, Characteristics, prewriting aspects of report and preparing writing aspects of report), Types of paragraphs.. **(Contemporary Issues related to Topic)**	
Total Lecture	**39 Hours**

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

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

Reference Books:	
1.	Public Speaking, Dale Carnegie, How to Develop Self – Confidence & Influence People.
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-superior-vocabulary-e157841139.html
3	https://www.pdfdrive.com/improve-your-communication-skills-present-with-confidence-write-with-style-learn-skills-of-persuasion-e156963640.html
4	https://www.pdfdrive.com/21-days-of-effective-communication-everyday-habits-and-exercises-to-improve-your-communication-skills-and-social-intelligence-e158273760.html

I SEMESTER

22AML103: Lab.: Technical Communication

Course Outcomes
Upon successful completion of the course the students will be able to
1. Apply different modes for effective communication
2. competently use the phonology of English language
3. Apply nuances of LSRW skills
4. Communicate through different channels

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

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

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

MOOCs Links and additional reading, learning, video material	
1.	https://youtu.be/XoVLa6Dqd5I
2.	https://youtu.be/45uNWLmAZR8

I SEMESTER

22AML104: Computer Workshop

Objective	Course Outcome
The student should be able to 1) To impart basic knowledge of Computer Hardware and Networking Components. 2) To impart operational knowledge of Linux/UNIX System features and Shell commands 3) To introduce useful software tools such as Excel and JSON format	**On completion of this course, the student will be able to** 1) To understand the Computer Hardware and networking components and their interconnection 2) To work with Linux/UNIX System using shell commands 3) To learn to use software tools such as Excel, JSON format, etc.

List of Practical's

Sr.No.	Problem Statements
1	Study of Personal Computer Hardware: PC Hardware Components Assembling a Personal Computer Study of BIOS and its working
2	Introduction to Networking Networking Devices Communication Channels Networking Topologies Types of Computer Networks
3	Installation of Linux operating system Introduction to LINUX/UNIX Operating System with its important features and directory structure
4	Introduction to Linux shell commands with pipes and redirection
5	Write a Shell program: a. To write a shell program to concatenate two strings. b. To write a shell program to compare the two strings. c. To write a shell program to find greatest of three numbers

6	Write a Shell program a. Write a menu driven shell script which will print the following menu and execute the given task. Display calendar of current month Display today's date and time Display usernames those are currently logged in the system Display your terminal number b. Write a shell script which will generate first n fibonnacci numbers like: 1, 1, 2, 3, 5, 13…
7	Working with Excel and creating useful work sheets
8	Create Chart in Excel and apply various charts option
9	Introduction to Mind Maps using tools such as Mindmeister
10	Introduction to JSON format and its applications

I SEMESTER

22AML105: Programming for Problem Solving

Course Outcomes :

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

1. Describe the basics of computer system components, operation and basic of algorithms and flowcharts.
2. Understand C language syntax and their usage and to understand the given piece of code.
3. To develop logic to solve given problem and write a working C program for the same.
4. Write useful programs for solving real world problems using suitable features of C programming language.

Unit I: Computer System Basics:	**(6 Hrs.)**

Introduction to components of a computer system (disks, memory, processor), how program is executed, understanding of concepts such as operating system, compilers, source and object programs, etc. Introduction to algorithms and flowcharts.

Basic building blocks of C: Character set, variables, identifiers & keywords, Data types, Operators: arithmetic, logical and relational operators, precedence of operators

(Contemporary Issues related to Topic)

Unit II:	**(6 Hrs.)**

Expressions, sizeof () operator, constants, typedef statement, basic input/output statements and functions (scanf, printf, getch, putch, gets, puts), Introduction to library functions, writing straight line programs. Decision control statements: if, if - else and nested if-else statements, else-if ladder statement, switch-case control statement.

(Contemporary Issues related to Topic)

Unit III: Loop Structures:	**(6 Hrs.)**

While, do while and for loops, break and continue statement, "goto" statement, real life programming examples based on these loop structures, bitwise operators, real life programming examples.

(Contemporary Issues related to Topic)

Unit IV: Modular programming:	**(7 Hrs.)**

Concept of functions, user defined functions, function prototypes, formal parameters, actual parameters, return types, call by value , C programs using functions, Recursive functions, comparing recursion against iteration, C programs using recursive functions, Concepts of a pointer, call by reference, types of programming errors, real life programming examples

(Contemporary Issues related to Topic)

Unit V: Arrays:	**(7 Hrs.)**

One dimensional array, array manipulation, insertion, deletion of an element, searching techniques- Linear and binary search, sorting techniques – Bubble sort , and selection sort. Two-dimensional arrays: matrix representation, programs for basic matrix operations such as addition, multiplication and transpose, Array as function arguments. Strings: string representation and string handling functions, real life programming examples

(Contemporary Issues related to Topic)

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Unit VI: Structure and Union, Concepts of files:	(7 Hrs.)
Introduction to Structure and Union, Types of files, file opening in various modes, file opening and closing, fseek(), reading and writing text files, concept of pre-processor directives and macros, command line arguments, real life programming examples **(Contemporary Issues related to Topic)**	
Total Lecture	**39 Hours**

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

Reference Books:	
1.	Problem Solving And Program Design In C, Jeri. R. Hanly, Elliot B. 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/e-copies%20of%20books/7.Information%20Technology/27.c.pdf
2	http://103.152.199.179/YCCE/DTEL%20Material/7.Information%20Technology/DTEL%20PPTs/11.ITCP_E_SSG.pdf

MOOCs Links and additional reading, learning, video material	
1.	https://archive.nptel.ac.in/courses/106/104/106104128/

I SEMESTER

22AML106: Lab: Programming for Problem Solving

Course Outcomes
Upon successful completion of the course the students will be able to
1) Describe the basics of computer system components and operation, basics of algorithms and flowcharts (L2)
2) Develop programs using conditional statements and loops user defined functions, and pointers.(L3)
3) Analyze single and multi-dimensional arrays as a data structure and its use in problem solving.(L4)
4) Describe the basics of Strings, Structures, Unions, and File handling and its use for problem solving.(L2)

SN	**Experiments based on**
1(A)	Introduction to Linux Operating system & it's different commands.
1(B)	Introduction to Vi editor, Compilation and Execution of a program in Linux.
2	Practical based on Arithmetic and Conditional operators.
3(A)	Practical based on Decision Control statements
3(B)	Practical based on Case Control statements (switch)
4	Practical based on Looping Statements. (for/while/do-while)
5	Practical based on Functions and Recursion.
6(A)	Practical based on 1-D Array. (Searching)
6(B)	Practical based on 1-D Array. (Sorting)
7	Practical based on 2-D Array.
8	Practical based on Strings
9	Practical based on Structures.
10	Practical based on Files.

I SEMESTER

22AML107 : Engineering Chemistry

Course Outcomes :
Upon successful completion of the course the students will be able to 1. Illustrate different thermodynamic functions and chemical reaction rates. (L3) 2. Apply concepts of electrochemistry for energy storage devices. (L3) 3.Explain basic principles and applications of spectroscopy(L2) 4. Establish insight into engineering materials. (L3)

Unit I : Energetics	**(7 Hrs.)**
Introduction, Internal energy, enthalpy, Gibb's free energy, Free energy change and chemical equilibrium. Spontaneous and non-spontaneous processes. I and II law of thermodynamics. Entropy and its significance. Numerical on Internal energy and enthalpy change. Thermodynamic applications to physical and chemical equilibrium. **(Contemporary Issues related to Topic)**	
Unit II: Electrochemistry	**(6 Hrs.)**
Introduction, metallic and electrolytic conductance, resistance, specific resistance, conductance, specific conductance, equivalent and molar conductance. Variation of conductance with dilution. Electrode and electrode potentials. Nernst Equation. Faraday's laws and Numerical. Industrial applications: Electroforming, Electro winning, Electrolytic refining. **(Contemporary Issues related to Topic)**	
Unit III: Energy Storage Devices Basic concepts	**(6 Hrs.)**
Primary and secondary battery. Energy density, power density, energy efficiency, cycle life, shelf life. Secondary battery: Ni-metal hydride battery, Lithium-ion battery. H2-O2 Fuel cell: Principle, working, advantages, disadvantages, applications. Differences between battery and a fuel cell. Supercapacitors: Definition, types, characteristics, and application. **(Contemporary Issues related to Topic)**	
Unit IV: Chemical Kinetics	**(6 Hrs.)**
Introduction, Rate of reaction and factors influencing rate of reaction, order & molecularity of reaction. Kinetic equations of different orders: Zero Order, First Order, Second Order and numerical **(Contemporary Issues related to Topic)**	
Unit V: Spectroscopic Techniques and Applications	**(7 Hrs.)**
Fundamentals of spectroscopy, types of spectroscopy, aim of spectroscopy. **UV-Visible spectroscopy**: Basic principle, Lamberts Beers law, applications. **IR spectroscopy**: Introduction and Application **NMR**: Basic principle, chemical shift, Application Fundamentals of X-Ray Diffractions (XRD) spectroscopy **(Contemporary Issues related to Topic)**	
Unit VI: Advanced Materials	**(7 Hrs.)**
Nanomaterials: Definition of nanomaterial, Nano scale, Carbon Nanotubes and types. **Application of Nanomaterials**: Applications of nanomaterials in medicine, environment, and electronics. Nanotechnology for waste reduction and improved energy efficiency. Elementary ideas and applications of Nano biopolymers, Nano fertilizers and Nano ceramics. Threats of Nanomaterials. **Silicon Chips:** Introduction. Physical, chemical, electrical & mechanical properties and applications. **Chemical sensors**: Types and application. **(Contemporary Issues related to Topic)**	
Total Lecture	**39 Hours**

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Textbooks:	
1.	S S. Dara , A Text book 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	B.Sivasankar ,Engineering Chemistry ,Tata McGraw-Hill.

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.	Silicon Chips: What is Computer Chips Made Of? https://www.intel.com/content/www/us/en/history/museum-making-silicon.html
2.	https://www.youtube.com/watch?v=XTt3gXB0a84
3.	https://www.youtube.com/watch?v=iihYXx79QiE
4.	https://www.youtube.com/watch?v=JfJ7MlP9Dco
5.	https://www.youtube.com/watch?v=L2VSOccUrSk

I SEMESTER

22AML108 : Lab.: Engineering Chemistry

Course Outcomes
Upon successful completion of the course the students will be able to
1. Illustrate different thermodynamic functions and chemical reaction rates. (L3)
2. Apply concepts of electrochemistry for energy storage devices. (L3)
3.Explain basic principles and applications of spectroscopy(L2)
4. Establish insight into engineering materials. (L3)

Total 10 experiments are to be performed
(4 each from Phase I and Phase II and two demonstration experiments)

SN	Experiments based on
	List of Experiments-Phase I
1	Determination of total hardness of water sample.
2	Determination of alkalinity present in the water sample.
3	Estimation of Fe^{2+} ions by redox titration
4	Determination of copper by iodometric titration
5	Estimation of Nickel.
6	To determine the strength of a given potassium dichromate solution with N/20 sodium thiosulphate solution
7	Determination of COD of water sample.
8	Synthesis of polyaniline.
9	Determination of rate of the reaction of hydrolysis of ethyl acetate at room temperature and analysis of experimental data using Computational Software.
	List of Experiments-Phase II
1	Determination of viscosity of lubricating oil by Redwood Viscometer I or II
2	Determination of Cation exchange capacity of an ion exchange resin
3	Determination of molecular weight of a polymer.
4	Oil Testing for Flash Point / Cloud Point/Pour Point/Aniline Point
5	Proximate analysis of coal
6	Determination of surface tension of liquids using stalagmometer.
7	Determination of electrochemical equivalence of Copper using Faradays Law
8	To determine the heat of solution of potassium nitrate calorimetrically.
9	Determination of conductivity of water sample by conductivity meter.
10.	To verify Beer-Lambert law for KMnO4 and determine the concentration of the given solution of KMnO4

	List of Demonstration Experiments
1	Determination of pH of water sample by pH meter
2	Synthesis of urea formaldehyde resin.
3	Determination of consistency of grease sample by using penetrometer.
4	Determination of Drop Point of grease sample.

I SEMESTER

Audit Course

GE2131 : Universal Human Value

Course Outcomes
Upon successful completion of the course the students will be able to 1.Experiential validation through the way to verify right or wrong. 2. Practice living in harmony with natural acceptance. 3. Realize the importance of relationships**.** 4. Recognize the importance of sustainable co-existence in existence.

Unit I: Course Introduction Need, Basic Guidelines, Content and Process for Value Education	**(4 Hrs.)**
Understanding the need, basic guidelines, content and process for Value Education Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration Continuous Happiness and Prosperity- A look at basic Human Aspirations	
Unit II: Understanding Harmony in the Human Being - Harmony in Myself!	**(4 Hrs.)**
Understanding human being as a co-existence of the sentient 'I' and the material 'Body' Understanding the needs of Self ('I') and 'Body' Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) Understanding the characteristics and activities of 'I' and harmony in 'I'	
Unit III: Understanding Harmony in the Family	**(4 Hrs.)**
Understanding Harmony in the family – the basic unit of human interaction Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship Understanding the meaning of Vishwas; Difference between intention and competence Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship	
Unit IV: Understanding Harmony in the Society-	**(4 Hrs.)**
Difference between intention and competence, Understanding the meaning of Samman, Difference between respect and ,differentiation; the other salient values in relationship ,Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sahasttva as comprehensive Human Goals,Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhauma Vyavastha)- from family to world family! ,Practice Exercises and Case Studies will be taken up in Practice Sessions	

Unit V: Understanding Harmony in the Nature -	**(4Hrs)**
Whole existence as Co-existence, Understanding the harmony in the Nature Interconnectedness and mut Practice Exercises and Case Studies will be taken up in the Practice Sessions.ual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Practice Exercises and Case Studies will be taken up in the Practice Sessions.	
Unit VI :Understanding Harmony in the Existence -	**(4Hrs)**
Understanding Existence as Coexistence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence ,Practice Exercises and Case Studies will be taken up in the Practice Sessions.	
Total Lecture	**24 Hours**

Textbooks:	
1.	**The primary resource material for teaching this course consists of text book** A foundation course in Human Values and professional Ethics, Excel books, 1st Edition 2011, R.R Gaur, R Sangal, G P Bagaria

Reference Books:	
1.	**The teacher's manual** A foundation course in Human Values and professional Ethics, Excel books,1st Edition 2011, R.R Gaur, R Sangal, G P Bagaria

I SEMESTER
Audit Course
MLC2121 : YCAP1-Get Set Go

Objective	Outcomes
Get Set Go program is designed to introduce students to the real world. It gives them the skills they need to reach their goals and live up to their full potential at college, home and work. The program was developed with feedback from students; it consists of interactive sessions that include real-life scenarios and role-playing. It can help young adults become more confident and better able to cope with the pressure and stress they face.	The students gain more confidence and skills required to deal with the challenges they will face in college and at home. Their interpersonal and intrapersonal skills are enhanced pushing them to think towards their future and aim for their goals.

Syllabus Subject: Communication Skills – 1st Year, No. of hours - 18

Unit No.	Topic	Duration
1	Topic: Build a foundation for success - 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	2.5 Hours
2	Topic: 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	3.5 Hours
	Practice Conversations, Activity – Pause-Part-Punch, Group Activity	

Unit No.	Topic	Duration
3	Topic: Increase Self Confidence -• Use our experiences to communicate more confidently • Communicate with clarity and conciseness • Discover how past experiences influence behavior	2.5 Hours
4	Topic: 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	4 Hours
	Individual Activity – Sharing of defining moment, Skit to demonstrate Leadership Principles, Stranded on Island	

Unit No.	Topic	Duration
5	Topic: Fundamentals of Communication (Earn the right – Excite -Eagerness) ♣ Elevator Pitch ♣ Develop more Flexibility, ♣ Recap and Summarize	3.5 Hours
6	Activities - – Individual Presentation, Flexibility Drills, Individual Presentations – My Vision Assignment	2 Hours

Reference Books:

1. How to win friends & influence people – Dale Carnegie

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 3.25)

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Technology

SoE & Syllabus 2022

2nd Semester

(Department of Computer Science and Engineering

B.Tech in CSE (AIML)

28 June 2019

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 2022

(Scheme of Examination w.e.f. 2022-23 onward)

(Department of Computer Science & Engineering)

CSE (AIML)

SoE No. 22AML-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															
1	1	BS	GE/MTH	22AML101	Calculus, Sequence and Series	T	3	1	0	3	4	30	20	50	3 Hrs
2	1	HS	GE/HUM	22AML102	Technical Communication	T	3	0	0	3	3	30	20	50	3 Hrs
3	1	HS	GE/HUM	22AML103	**Lab:** Technical Communication	P	0	0	2	2	1		60	40	
4	2	BES	CT/CT	22AML104	Computer Workshop	P	0	0	2	4	2		60	40	
5	1	BES	CSE/CSE	22AML105	Programming for Problem Solving	T	3	0	0	3	3	30	20	50	3 Hours
6	1	BES	CSE/CSE	22AML106	Lab: Programming for Problem Solving	P	0	0	2	2	1		60	40	
7	1	BS	GE/CHE	22AML107	Engineering Chemistry	T	3	0	0	3	3	30	20	50	3 Hours
8	1	BS	GE/CHE	22AML108	**Lab.:** Engineering Chemistry	P	0	0	2	2	1		60	40	
					TOTAL FIRST SEM		**12**	**1**	**8**	**22**	**18**				
List of Mandetory Learning Course (MLC)															
1	1	HS	GE/HUM	GE2131	Universal Human Value	A	2	0	0	2	0				
2	1	HS	GE/T&P	MLC2121	YCAP1-Get Set Go	A	2	0	0	2	0				
SECOND SEMESTER															
1	2	BS	GE/MTH	22AML201	Probability and Statistics	T	3	1	0	3	4	30	20	50	3 Hours
2	2	BS	GE/PHY	22AML202	Engineering Physics	T	3	0	0	3	3	30	20	50	3 Hours
3	2	BS	GE/PHY	22AML203	**Lab:** Engineering Physics	P	0	0	2	2	1		60	40	
4	2	BES	EE/EE	22AML204	Digital Electronics	T	3	0	0	3	3	30	20	50	3 Hours
5	2	BES	EE/EE	22AML205	**Lab:** Digital Electronics	P	0	0	2	2	1		60	40	
6	2	BES	CSE/CSE	22AML206	Object Oriented Programming	T	3	0	0	3	3	30	20	50	3 Hours
7	2	BES	CSE/CSE	22AML207	**Lab:** Object Oriented Programming	P	0	0	2	2	1		60	40	
8	2	BES	CSE/CSE	22AML208	Web Technology Lab	P	0	0	0	2	1		60	40	
9	2	HS	GE/HUM	22AML209	Social Science	T	3	0	0	3	3	30	20	50	3 Hours
					TOTAL SECOND SEM		**15**	**1**	**6**	**23**	**20**				
List of Mandetory Learning Course (MLC)															
3	2	HS	GE/T&P	MLC2122	YCAP2 -Functional English	A	2	0	0	2	0				
4	2	BES	GE/CHE	GE2132	Environmental Science	A	2	0	0	2	0				

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

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

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

		June 2022	**1.00**
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**

Applicable for AY 2022-23 Onwards

II SEMESTER

22AML201: Probability and Statistics

Course Outcomes
Upon successful completion of the course the students will be able to
1. Identify an appropriate probability distribution for a given discrete or continuous random variable and compute probabilities.
2. Make use of probability distributions to solve real life problems.
3. Apply concepts of sampling theory to find probabilities and estimate parameters of various problems.
4. Inspect scientific data, use proper curve fitting and find correlation, regression of variables.

Unit I:Random Variables & Probability Distributions	**(7 Hrs.)**
Conditional probability, Baye's theorem. Random variables: Discrete and Continuous random variables, Probability function and Distribution function, Joint distributions. Independent Random variables, Conditional Distribution. **(Contemporary Issues related to Topic)**	
Unit II: Mathematical Expectation	**(7 Hrs.)**
Mathematical Expectation, Variance & Standard Deviation, Moments, Moment generating function, Skewness and Kurtosis. **(Contemporary Issues related to Topic)**	
Unit III: Special Probability Distributions	**(6 Hrs.)**
Binomial, Geometric, Poisson, Exponential, Normal distributions, Central Limit theorem. **(Contemporary Issues related to Topic)**	
Unit IV: Sampling Theory	**(6 Hrs.)**
Population and sample. Statistical inference. Sampling with and without replacement. Population parameters, sample statistics. Sampling distribution of means. Sampling distribution of proportions. **(Contemporary Issues related to Topic)**	
Unit V: Estimation	**(7 Hrs.)**
Unbiased and efficient estimates. Point estimates and interval estimates. Confidence interval for means, Confidence interval for proportions, Confidence interval for differences and sums of mean and proportions. **(Contemporary Issues related to Topic)**	
Unit VI: Curve Fitting	**(6 Hrs.)**
Fitting of straight line, $y = a + bx$, a parabola $y = a + bx + cx^2$, exponential curves and power curves by method of least squares; Lines of regression and correlation; Rank correlation. **(Contemporary Issues related to Topic)**	
Total Lecture	**39 Hours**

Textbooks:	
1.	The theory and problems of probability and Statistics, 5rd edition, M. R. Spiegel, Schaum series,McGraw Hill
2.	Basic Statistics for Business and economics , 3rd edition,E. K.Bowen, M.K Star,McGraw Hill
3.	Engineering Mathematics, 43rd edition, Dr. B. S. Grewal, Khanna Publisher
4.	Probability and Statistics, 2nd edition, Michael J. Evans and Jeffrey S.

Reference Books:	
1.	A First course in probability,Sixth Edition, Sheldon Ross, Pearson Education
2.	Fundamentals of Mathematical statistics ,3rd Edition, S. C.Gupta and V.K.Kapoor,Sultan Chand and sons
3.	Probability and Statistics for Engineering, 6th edition, Miller Freund and Johnson, Richard A. Johnson

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://youtu.be/UftY0e2ilM4
2.	https://youtu.be/bwga7Pnv30c
3.	https://youtu.be/WUCMavXbJo4

II SEMESTER

22AML202: Engineering Physics

Course Outcomes :
1. Co-relate fundamentals of quantum mechanics to solve problems dealing with quantum particle.
2. Assess the characteristics of semiconductor materials in terms of crystal structures, charge carriers and energy bands.
3. Illustrate working principle of lasers and optical fibres for their use in the field of industry.
4. Identify the requirements of sensor material for technological application.
5. Analyze the motion of charged particle in electric and magnetic field and its applications to electron optic devices.

Unit:1 Quantum Physics	**(6 Hrs.)**
Wave-particle duality, Electron Diffraction, Wavepacket, Heisenberg uncertainty principle, thought experiment, Significance, Applications. **(Contemporary Issues related to Topic)**	
Unit II: Basics of Quantum Computing	**(7 Hrs.)**
Introduction of complex numbers, operators, eigen values, eigen functions. Wavefunction 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	**(7 Hrs.)**
Formation of energy bands in solids, Classification and energy band diagrams, Structure of semiconductor with band diagram, Intrinsic and extrinsic semiconductors, Law of mass action, Carrier transport, conductivity, Hall Effect. **(Contemporary Issues related to Topic)**	
Unit IV: Optical Radiations & Communication	**(7 Hrs.)**
Interaction of radiation with matter, Population Inversion and Optical resonance cavity, diode laser, Properties and engineering applications of laser. Optical Fibre: Principle, structure and classification, Acceptance angle, Numerical aperture, Losses. **(Contemporary Issues related to Topic)**	
Unit V: Sensors	**(6 Hrs.)**
Introduction, classification of sensors, performance characteristics, selection criteria, Requirement of sensor material, Role of sensors in industry, Examples: thermal, optical, Pressure and acoustic sensors. **(Contemporary Issues related to Topic)**	
Unit VI: Electron ballistics and Optics	**(7Hrs.)**
Motion of a charged particle in uniform electric and magnetic field, Cross field configuration; Electron refraction, Electron lens, CRO. **(Contemporary Issues related to Topic)**	
Total Lecture	**40 Hours**

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

Textbooks:	
1.	M. N. Avadhanulu, P. G. Kshirsagar, A Textbook of Engineering Physics, Revised 14th Edition, S. Chand & Company, 2014.
2.	John Allision, Electronic Engineering Materials and Devices, TMH edition, 10th reprint, Tata McGraw Hill.

Reference Books:	
1.	David Halliday, Robert Resnick and Jeryle Walker, Fundamentals of Physics,10th edition, John-Wiley India, 2013.
2.	Subramanyam, Brijlal, M N Avadhanulu, Text Book of Optics, S. Chand & Company, 2006.
3.	M N Avadhanulu, An Introduction to Lasers: Theory & Applications, First Edition 2001, S. Chand & Company Pvt. Ltd, 2017.
4.	Arthur Beiser, Concept of Modern Physics, 6th edition, Tata McGraw - Hill Education, 2002.
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.
9.	B. K. Pandey, S. Chaturvedi, Engineering Physics, 1st Edition, Cengage Learning.
10	Hitendra K Malik, A K Singh, Engineering Physics, 2nd Edition, Tata McGraw Hill Education Private Limited, 2015.

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	chrome-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.	http://nptel.iitm.ac.in- Quantum Physics
2.	http://nptel.ac.in- CRO
3.	www.digimat.in/nptel/courses/video/115102124/L36.html - LASER

II SEMESTER

22AML203: Lab.: Engineering Physics

Course Outcomes
Upon successful completion of the course the students will be able to
1. Co-relate fundamentals of quantum mechanics to solve problems dealing with quantum particle. 2. Assess the characteristics of semiconductor materials in terms of crystal structures, charge carriers and energy bands. 3. Illustrate working principle of lasers and optical fibres for their use in the field of industry. 4. Identify the requirements of sensor material for technological application. 5. Analyze the motion of charged particle in electric and magnetic field and its applications to electron optic devices.

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

SN	**Experiments based on**
1.	Determination of Hall coefficient and density of charge carriers using Hall effect.
2.	Dependence of Hall coefficient on temperature.
3.	The study of V-I characteristics of a semiconductor diode (germanium and silicon) in forward and reverse bias mode.
4.	Determination of Band gap in a semiconductor by four probe method.
5.	Determination of Band gap in a semiconductor using reverse biased p-n diode .
6.	Determination of wavelength of laser using diffraction grating.
7.	Determination of divergence of laser beam.
8.	Determination of Acceptance angle and numerical aperture of a given optical fiber
9.	Determination of attenuation of a given optical fibre.
10.	Determination of the velocity of Ultrasonic waves in a non –electrolytic liquid by ultrasonic interferometer.
11.	Study of magnetic field sensing by varying the gap between pole pieces of electromagnet.
12.	To measure the phase shift introduced by a phase shift network using Dual beam CRO.
13.	Determination of amplitude and frequency of sinusoidal signal using C.R.O.

II SEMESTER

22AML204: Digital Electronics

Course Outcomes:
Students will be able to: 1) Simplify combination logic circuits using Boolean algebra. 2) Understand and demonstrate the various codes andillustrate their addition subtraction. 3) Simply and exhibit the methods to solve logical functions using K- map and Quine Mc-Cluskey methods and apply it to implement combinational logic circuits. 4) Design and analyze Synchronous and Asynchronoussequential Circuits.

Unit:1	**Number system and codes**	**6 Hours**
Binary: octal, hexadecimal and decimal Number systems and their inter conversion, BCD numbers (8421-2421), gray code, excess–3 code, ASCII codes. Binary addition and subtraction, signed and unsigned binary numbers, 1's and 2's complement representation. **(Contemporary Issues related to Topic)**		
Unit:2	**Boolean Algebra**	**6 Hours**
Basic logic circuits: Logic gates (AND, OR, NOT, NAND, NOR, Ex- OR, Ex-NOR and their truth tables), Universal Gates, Laws of Boolean algebra, De- Morgan's theorem. Introduction to Logic Family. **(Contemporary Issues related to Topic)**		
Unit:3	**Minimization Techniques**	**6 Hours**
Min term, Max term, POS, SOP, K-Map, Simplification by Boolean theorems, don't care condition. **(Contemporary Issues related to Topic)**		
Unit:4	**Combinational Logic**	**6 Hours**
The Half adder, The Full adder, Subtractor circuit. Multiplxer demultiplexer, decorder, BCD to seven segment Decoder, encoders. **(Contemporary Issues related to Topic)**		
Unit:5	**Sequential Circuits**	**7 Hours**
Flip flop, set-reset laches, R-S flip-flop, D-flip flop, J-K Flip-flop, Master slave Flip flop, T flip-flop, excitation table of flip-flops. **(Contemporary Issues related to Topic)**		
Unit :6	**Registers & Counters**	**7 Hours**
Serial in/Serial out shift register, Serial in/parallel out shift register, parallel in/ parallel out shift register, parallel in/Serial out shift register, Bi- directional register, Synchronous/Asynchronous counter, Structure of RAM. **(Contemporary Issues related to Topic)**		
Total Lecture Hours		**38 Hours**

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Textbooks	
1	Modern Digital Electronics , RP Jain, Tata McGraw Hill, 3rd Edition
2	M. Morris Mano, Digital Design, 3rd Edition, Prentice Hall of India Pvt. Ltd., 2003 Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.
3	Donald P.Leach and Albert Paul Malvino, Digital Principles and Applications, 6thEdition, TMH, 2003.
4	Anandkumar- fundamental of digital circuit. 3rd edition. PHI

Reference Books	
1	Fundamentals of Logic Design, C.H.Roth, Public Work & Services, 3rd edition 2007.
2	Engg Approach to Digital Design, Fletcher, Prentice Hall of India 1993.
3	Digital Circuits & Microprocessors, Hebert Taub, Mc Graw Hill, 1988.

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/yccelibrary.html

MOOCs Links and additional reading, learning, video material	
1	https://www.digimat.in/nptel/courses/video/108105132/L01.html
2	https://www.digimat.in/nptel/courses/video/108105113/L01.html
3	https://www.coursera.org/learn/digital-systems

II SEMESTER

22AML205: Lab.: Digital Electronics

Course Outcomes:
Students will be able to: 1) Simplify combination logic circuits using Boolean algebra. 2) Understand and demonstrate the various codes andillustrate their addition subtraction. 3) Simply and exhibit the methods to solve logical functions using K- map and Quine Mc-Cluskey methods and apply it to implement combinational logic circuits. 4) Design and analyze Synchronous and Asynchronoussequential Circuits.

Sr. No..	Problem Statements
1.	Introduction to LogicAid software and commands. Verifications of functions using Logic Aid and comparing the results with manual results.
2.	Introduction to Bread Board and Verify Truth Tables of basic Logic gates using BreadBoard.
	On Experimental Kit (Hardware) / Virtual Lab: **An Initiative of Ministry of Human Resource Development Under the NationalMission onEducation through ICT**
3.	Construction of half/ full adder using XOR and NAND gates and verification of itsoperation.
4.	Verify Binary to Gray and Gray to Binary conversion using NAND gates only.
5.	Implementation of 4x1 multiplexer and 1x4 demultiplexer using logic gates.
6.	Verify the truth table of D-flip-flops and JK- flip-flops.
7.	Design and verify the 2- Bit Synchronous up Counter.
	Using SPICE
8.	Introduction to SPICE Digital model and commands. Verify Truth Tables of basic Logic gates &Universal Gates **using SPICE.**
9.	Design & verify Truth Table of Half adder & Full adder circuits **using SPICE.**
10.	Design & verify Truth Table of 4:1 Multiplexer & 1: 4 Demultiplexer circuits **using SPICE.**

II SEMESTER

22AML206: Object Oriented Programming

Course Outcomes:

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

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

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

Textbooks:	
1	Thinking in Java, Bruce Eckel , 4th EDITION, Prentice Hall

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

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

MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc20_cs58/preview
2.	https://archive.nptel.ac.in/courses/106/105/106105224/

II SEMESTER

22AML207: Lab.: Object Oriented Programming

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

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

II SEMESTER

22AML208: Web Technology Lab

Course Outcomes:
On completion of this course, the students will able to:
1) Understand various internet technologies
2) To design the web pages using some basic techniques
3) To design and implement the interactive web pages
4) To use the XML technology to store the data
5) To design and develop the interactive web pages using the advanced technique

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

II SEMESTER
22AML209: Social Science

Course Outcomes
Upon successful completion of the course the students will be able to
1. Explain the basic concepts of social sciences.
2. Describe the development of various Civilizations and their culture.
3. Explain the basic idea of Constitution of India and aware about their rights & Duties.
4. Analyze the Impact of Industrialization on Society and discuss the Fundamental Concepts of Society.

Unit I: Social Sciences & Its Utility	**(6 Hrs.)**
Meaning & Scope of Social Science, General Utility of Social Sciences to Engineers, Applied Humanities, Social Engineering, Society its types & Characteristics. **(Contemporary Issues related to Topic)**	
Unit II: Human Civilization	**(7 Hrs.)**
Development of human civilization with specific reference to monumental studies of engineering skill, Ancient Indian Civilization:- a) Indus Valley Civilization b) Vedic Civilization, c) Indian Art & Architecture. **(Contemporary Issues related to Topic)**	
Unit III: Fundamental Concept in Social Science	**(7 Hrs.)**
Social Structure and Social System, Socialization, Social Control and Social Change, Culture: Characteristics and Features. **(Contemporary Issues related to Topic)**	
Unit IV: Introduction to Constitution of India	**(7 Hrs.)**
Significance of Preamble, Fundamental Rights and Duties, Directive principles of state policy. Federal System Concept of industrial Democracy. **(Contemporary Issues related to Topic)**	
Unit V: Industrial Organization & Society	**(6 Hrs.)**
Industrialization and its impact on society, Selection, Training & Motivation of workers, Industrial Psychology, Industrial sociology, Work Organization, Power, Authority and Status system. **(Contemporary Issues related to Topic)**	
Unit VI: Industrial Management	**(6 Hrs.)**
Labour Union Organization, Discipline in Industry, Labour Turnover, Industrial Fatigue of workers, Health and Safety of Workers. **(Contemporary Issues related to Topic)**	
Total Lecture	**39 Hours**

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Textbooks:	
1.	S. Shabbir & Sheikh, A New Look Into Social Sciences, S.Chand , New Delhi,1993.
2.	C N Shankar Rao, Sociology Principles of Sociology With An Introduction To Social Thought, S. Chand, New Delhi, 2010.
3.	O P Khanna, Industrial Engineering And Management, Dhanpat Rai Publication, New Delhi, 2010.
4.	Dr. G. N. Nimbarte, Social Science, Sankalp Publications, Nagpur.

Reference Books:	
1.	C. N. Shankar Rao, Sociology: Principal of Sociology with an introduction to social thought, Publication: S. Chand, New Delhi.
2.	O. P. Khanna, Industrial Engineering and Management, Dhanpat Rai Publication, New Delhi.
3.	Reader's Digest Vanished Civilizations, The Reader's Digest Association Limited, New York.
4.	Constitution of India: Dr B. R. Ambedkar: Government of India, Government of India.
5.	B. L. Kayastha, Recent trends in Humanities and Social Sciences, 1st Ed., Akinik Publications, New Delhi.

MOOCs Links and additional reading, learning, video material	
1.	https://mobidrive.com/sharelink/r/4I2bDsxN9YrVI03vMZaInJ5VBpojBmR9EqKv7nin9pkN
2.	https://mobidrive.com/sharelink/r/4I2bDsxN9YrVI03vMZaInJ2sUn37wK4V3CpGhemYRKnz

II SEMESTER

Audit Course

MLC2122 : YCAP2-Functional English

MLC2122 YCAP-II	**No of Evaluations**	**Result of successful completion of YCAP II shall be calculated based on the basis of evaluations.** **To pass the exam a students must score 50% marks**
Evaluation Scheme	EVAL-I	
	100 marks	

Objective	**Objective**
The aim of this course is to get the students to a common level in spoken English. The majority of the target group is expected to know English as a foreign/official language. Thus the objective of the course is to make the students comfortable in using it as a spoken language when the situation demands	Students will heighten their awareness of correct usage of English grammar in writing and speaking.

Syllabus Subject: Functional English – 2nd Sem , No. of hours - 20

Unit No.	**Topic**	**Duration**
1	Introduction to Functional English - 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	2 hours
2	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	2 hours
	Practice exercises, Practice Conversations, Script Activity	1.5 Hours
	Quiz on the above Topics, Exercises for Evaluation	0.5 Hours

Unit No.	Topic	Duration
3	Topic: Internet & Social Media Communication Introduction & Basics to Social Networking, Texting & Instant messaging, Blogs & Discussion Board- discussion with examples, Ethics of Social media & communication	3 Hours
	Topic: Introduction to Creative Ads Why Ads, Whats in it for me?, Characteristics of ads, Assignment	
4	Topic: Tenses -1 Introduction & Basics, Simple Tense (Past, Present, Future), Continuous Tense (Past, Present, Future) – discussion with examples	4 Hours
	Assignment Presentation on Mad Ads, Quiz on Tenses and Social Media-Internet Communication	

Unit No.	Topic	Duration
5	Topic: Tenses -2 Introduction & Basics, Perfect Tense (Past, Present, Future), Perfect Continuous Tense (Past, Present, Future) – discussion with examples	3.5 Hours
	Topic: Introduction to Movie Magic Learn English with films, Film Vocabulary, Describing a film, Types of Films,	
6	Topic: Written Communciation 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	3.5 Hours
	Assessment – Letter and Email Writing, Tenses - Quiz	

Reference Books:	
1.	Soft Skills and Professional Communication, Francis Peters SJ, Mcgraw Hill Education
2.	Bringing out the best in People, Aubrey Daniels, Mcgraw Hill

MOOCs Links and additional reading, learning, video material	
1.	https://www.youtube.com/channel/UCLsI5-B3rIr27hmKqE8hi4w
2.	https://www.youtube.com/channel/UC1Y1I4shF84scQ4HBThahcg

II SEMESTER
Audit Course
GE2132 : Environmental Science

Course Outcome :

Upon successful completion of the course the students will be able

1. To understand the basic concepts and problems and follow sustainable development practices
2. To enhance knowledge skills and attitude towards environment
3. To understand natural environment and its relationship with human activities.
4. To evaluate local, regional and global environmental topics related to resource use and management.

Unit I: : Introduction	**(2Hrs.)**
Definition, scope and importance; Need for public awareness – institutions in environment, people in environment.	

Unit II: : Natural Resources	**(2 Hrs.)**
Renewable and non-renewable and associated problems; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.	

Unit III: Ecosystems	**(4 Hrs.)**
Concept of an ecosystem – understanding ecosystems, ecosystem degradation, resource utilization. Structure and functions of an ecosystem – producers, consumers and decomposers. Energy flow in the ecosystem – water, carbon, oxygen, nitrogen and energy cycles, integration of cycles in nature. Ecological succession; Food chains, food webs and ecological pyramids; Ecosystem types – characteristic features, structure and functions of forest, grassland, desert and aquatic ecosystems.	

Unit IV: Bio-diversity	**(4 Hrs.)**
Introduction – biodiversity at genetic, species and ecosystem levels Bio-geographic classification of India. Value of biodiversity – Consumptive use value, productive use value, social, ethical, moral, aesthetic and optional vlue of biodiversity. India as a mega-diversity nation; hotspots of biodiversity.Threats to bio-diversity – habitat loss, poaching of wildlife, man-wild life conflicts. Common endangered and endemic plant and animal species of India. Insitu and Exsitu conservation of biodiversity. Role of individual and institutions in prevention of pollution.Disaster management – Floods, earthquake, cyclone, landslides.	

Unit V: Pollution	**(4 Hrs.)**
Definition; Causes, effects and control measures of air, water, soil, marine, noise and thermal pollutions and nuclear hazards. Solid waste management – Causes, effects and control measures of urban and industrial waste.	

Unit VI: Social Issues and the Environment	**(4 Hrs.)**
Unsustainable to sustainable development; Urban problems related to energy; Water conservation, rainwater harvesting, watershed management; Problems and concerns of resettlement and rehabilitation of affected people. Environmental ethics – issues and possible solutions – Resource consumption patterns and need for equitable utilization; Equity disparity in Western and Eastern countries; Urban and rural equity issues; need for gender equity. Preserving resources for future generations. Te rights of animals; Ethical basis of environment education and awareness; Conservation ethics and traditional value systems of India. Climate change, global warming, acid rain, Ozone layer depletion, nuclear accidents and holocasts. Wasteland Reclamation; Consumerism and Waste products. Environment legislations – The Environment (Protection) Act; The water (Prevention and Control of Pollution) Act; The Wildlife Protection Act; Forest Conservation Act; Issues involved in enforcement of environmental legislations – environment impact assessment (EIA), Citizens actions and action groups. Public awareness – Using an environmental calendar of activities, self-initiation.	
Unit VII : Human Population and the Environment	**(4Hrs.)**
Global population growth, variation among nations. Population explosion; Family Welfare Programmes – methods of sterilization; Urbanization. Environment and human health – Climate and health, infectious diseases, water-related diseases, risk due to chemicals in food, Cancer and environment. Human rights – equity, Nutrition and health rights, Intellectual property rights (IPRS), Community Biodiverstity registers (CBRs). Value education – environmental values, valuing nature, valuing cultures, social justice, human heritage, equitable use of resources, common property resources, ecological degradation. HIV / AIDS; Women and Child Welfare; Information technology in environment and human health.	
Total Lecture	**24 Hours**

Textbooks:	
1.	Perspectives in environmental studies by A. Kaushik and C. P. Kaushik.
2.	Textbook for Environmental studies by Erach Bharucha for UGC
3.	Textbook of Environmental studies by Shanta Satyanarayan, Dr. Suresh Zade, Dr. Shashikant Sitre & Dr. Pravin Meshram.
4.	Fundamental concepts in Environmental studies by Dr. D.D. Mishra. S. Chand publications

Reference Books:	
1.	Essentials of Ecology and Environmental Science by Dr. S .V .S. Rana,PHI Learning Pvt. Ltd, Delhi
2.	Environmental Chemistry by Anil Kumar De, Wiley Eastern Limited
3.	Environmental Science by T.G. Miller, Wadsworth Publishing Co, 13th edition.
4.	Ecology and Environment by P. D. Sharma, Rastogi publications

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 3.25)

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Technology

SoE & Syllabus 2022

3rd Semester

(Department of Computer Science and Engineering

B.Tech in CSE (AIML)

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.TECH SCHEME OF EXAMINATION 2022

(Scheme of Examination w.e.f. 2022-23 onward)

(Department of Computer Science & Engineering)

CSE (AIML)

SoE No. 22AML-101

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
THIRD SEMESTER															
1	3	BS	GE	22AML301	Distrete Mathematics and Graph theory	**T**	3	1	0	3	4	30	20	50	3 Hours
2	3	PC	CSE	22AML302	Formal Language & Automata Theory	**T**	3	1	0	3	4	30	20	50	3 Hours
3	3	PC	CSE	22AML303	**Lab:** Formal Language & Automata Theory	**P**	0	0	2	2	1		60	40	
4	3	PC	CSE	22AML304	Data Structures	**T**	3	1	0	3	4	30	20	50	3 Hours
5	3	PC	CSE	22AML305	**Lab:** Data Structures	**P**	0	0	2	2	1		60	40	
6	3	PC	CSE	22AML306	Computer Architecture & Organisation	T	3	0	0	3	3	30	20	50	3 Hours
7	3	PC	CSE	22AML307	Software Engineering	T	3	0	0	3	3	30	20	50	3 Hours
8	3	PC	CSE	22AML308	**Lab:** Software Engineering	**P**	0	0	2	2	1		60	40	
9	3	PC	CSE	22AML309	**Lab:** Software Lab.	**P**	0	0	2	2	1		60	40	
					TOTAL		**15**	**3**	**8**	**23**	**22**				
List of Mandatory Learning Course (MLC)															
1	3	HS	T&P	MLC2123	YCCE Communication Aptitude Preparation (YCAP3)	**A**	3	0	0	3	0				
2	3	BSE	AIML	MLC123	Introdcuction to Haskell Programming	**A**	2	0	0	2	0				
FOURTH SEMESTER															
1	4	BS	GE	22AML401	Linear Algebra	**T**	3	0	0	3	3	30	20	50	3 Hours
2	4	PC	CSE	22AML402	Operating Systems	**T**	3	0	0	3	3	30	20	50	3 Hours
3	4	PC	CSE	22AML403	**Lab:** Operating Systems	**P**	0	0	2	2	1		60	40	
2	4	PC	CSE	22AML404	Foundation of Artificial Intelligence	**T**	3	0	0	3	3	30	20	50	3 Hours
3	4	PC	CSE	22AML405	**Lab:** Foundation of Artificial Intelligence	**P**	0	0	2	2	1		60	40	
6	4	PC	CSE	22AML406	Design & Analysis of Algorithms	**T**	3	1	0	3	4	30	20	50	3 Hours
7	4	PC	CSE	22AML407	**Lab:** Design & Analysis of Algorithms	**P**	0	0	2	2	1		60	40	
8	4	PC	CSE	22AML408	Database Management Systems	**T**	3	0	0	3	3	30	20	50	3 Hours
9	4	PC	CSE	22AML409	**Lab:** Database Management Systems	**P**	0	0	2	2	1		60	40	
10	4	PC	CV/CSE	22AML410	Environmental Sustainability, Pollution and Management	**T**	3	0	0	3	3	30	20	50	3 Hrs
					TOTAL		**18**	**1**	**8**	**26**	**23**				
List of Mandatory Learning Course (MLC)															
1	4	HS	T&P	MLC2124	YCCE Communication Aptitude Preparation (YCAP4)	**A**	3	0	0	3	0				
2	4	BSE	AIML	MLC124	Computational Sanskrit	**A**	2	0	0	2	0				

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

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

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

		June 2022	1.00
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**

Applicable for AY 2022-23 Onwards

III Semester
22AML301 : Discrete Mathematics & Graph Theory

Course Outcomes:
Upon successful completion of the course the students will be able to
1. Identify the importance of statements in deriving valid inferences.
2.Use relations and ordering methods to identify the relationship among the inferences.
3.Select suitable algebraic systems to find solution for real time problems.
4.Find the suitable computing methods and applying graph theory concepts to solve complex problems.

Unit:1	**Mathematical Logic and Set Theory**	**6 Hours**
Statement and Notation: Negation, Conjunction, Disjunction, Tautologies, Truth Tables, Basic Concepts of Set Theory, Inclusion & equality of set, Power Set, Ordered Pairs and n-tuples, Operations on Sets, mathematical induction. Propositions, Predicate logic. **Contemporary Issues related to Topic**		

Unit:2	**Relations and Functions**	**6 Hours**
Relations and Ordering, Relation Matrix and Graphs, Partition and Covering of a set, Equivalence relation, Partial order relation, Partially Ordered sets, Functions, Composition of functions, Inverse Functions, Characteristics function of a set. **Contemporary Issues related to Topic**		

Unit:3	**Group Theory**	**7 Hours**
Groups, Subgroups and Homomorphism, Cosets and Lagrange's theorem, Normal subgroups. Semi groups and Monoids Homomorphism of semigroups and monoids, Sub semi groups and monoids. **Contemporary Issues related to Topic**		

Unit:4	**Rings**	**6 Hours**
Definitions and Examples, sub ring, Integral domain, ring homomorphism, ideal of ring polynomial. **Contemporary Issues related to Topic**		

Unit:5	**Field and Lattices**	**7 Hours**
Definitions and Examples, Finite Field, Ordered sets, Hasse Diagrams of partially Ordered sets. Lattices, Bounded Latices, Complements Latices, Definitions and Examples of Finite Field, Ordered sets, Hasse Diagrams of partially Ordered sets. Lattices, Bounded Latices, Complements Latices. **Contemporary Issues related to Topic**		

Unit :6	Graph Theory	7 Hours
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. **Contemporary Issues related to Topic**		
	Total Lecture Hours	**39 Hours**

Text books	
1	J. P. Tremblay & R. Manohar, Discrete Mathematics Structure with application to Computer Science, 23rd re-print,2005,Tata McGraw-Hills Publication Company Limited, New Delhi.
2	Lipschutz Schaums's , Outline series ,Discrete Mathematics, 2nd edition, Tata McGraw-Hills Publication Company Limited, New Delhi.

Reference Books	
1	Bernard Kolman ,Robert C.Busby, Sharon Ross, Discrete Mathematical structures, 3rd edition, 2001 Prentice Hall of India, New Delhi.

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://onlinecourses.nptel.ac.in/noc22_ma10/preview
2	https://onlinecourses.nptel.ac.in/noc20_cs82/preview
3	https://nptel.ac.in/courses/111106102

III Semester
22AML302 : Formal Language & Automata Theory

Outcomes

1. Apply basic properties of formal languages and to design finite automata for regular expression and Regular Grammar.
2. Construct context free grammar for various languages.
3. Solve various problems of push down automata for context free language
4. Design Turing Machines for given any computational problem.

UNIT I:	**7**
Alphabet, Symbols, Sets, Strings, Language, Operations, Relations, Design of Finite State Machines, Acceptance of strings and languages, Non Deterministic Finite Automata, Deterministic Finite Automata, Equivalence between NFA and DFA, NFA with ε-transition, Minimization of FA. **Contemporary Issues related to Topic**	
UNIT II:	**7**
Regular sets, Regular expressions, Manipulation of regular expressions, Equivalence between RE and FA. Pumping Lemma, closure properties of regular sets (Proofs not required), 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. **Contemporary Issues related to Topic**	
UNIT III:	**6**
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. **Contemporary Issues related to Topic**	
UNIT IV:	**6**
Push down automata, definition, and model, acceptance of CFL by empty Stack and by final state, equivalence CFL and PDA, Inter-conversion, Closure properties of CFL, DPDA & NDPDA. **Contemporary Issues related to Topic**	
UNIT V:	**7**
Turing machine, Definition, Model of TM, Design of Turing Machine, Computable functions, Recursive Language, Recursive enumerable language, Properties of Recursive enumerable language, Church's hypothesis, Chomsky hierarchy of language, Linear bounded automata , context sensitive language, Universal Turing Machine **Contemporary Issues related to Topic**	

UNIT VI:	6
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 preemptive μ recursive function ,unbounded minimization and recursive function **Contemporary Issues related to Topic**	
Total Lectures	**39**

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

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/

III Semester
22AML303 : Lab. Formal Language & Automata Theory

Outcomes
1. Apply basic properties of formal languages and to design finite automata for regular expression and Regular Grammar. 2. Construct context free grammar for various languages. 3. Solve various problems of push down automata for context free language 4. Design Turing Machines for given any computational problem.

List of Experiment

Sr. No.	Experiments based on
1	Study of JFLAP tool.
2	Study of other FLAT tools.
3	Design NFA for a string starting with '0' over the alphabet Σ = {0,1} using JFLAP.
4	Using JFLAP, construct NFA for a string ending with 'b' over the alphabet Σ = {a,b}.
5	Construct a DFA for a string containing '00' over the alphabet Σ = {0,1} using any tool.
6	Construct a DFA for a string having second last symbol as 'a' over the alphabet Σ = {a,b} using JFLAP.
7	Build a PDA for a palindrome of even length over the alphabet Σ = {0, 1}.
8	Build a PDA for a palindrome of odd length over the alphabet Σ = {a, b}.
9	Enter the following CFG into JFLAP S → T T S → U T → 0T T → T0 T → # U → 0U00 U → #
10	Design a Turing Machine that concatenates the following strings on the input tape '...□001□110□100□'.

III Semester
22AML304 : 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 **Contemporary Issues related to Topic**	
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 **Contemporary Issues related to Topic**	
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. **Contemporary Issues related to Topic**	
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 **Contemporary Issues related to Topic**	
UNIT V:	6
Balanced trees: Height-balanced (AVL) trees, Splay tree, Red-black trees, Multi-way trees-B and B+ and applications **Contemporary Issues related to Topic**	

UNIT VI:	6
Graphs: Representation & traversals: Spanning trees, topological sort, shortest path algorithm, all-pairs shortest paths **Contemporary Issues related to Topic**	
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
22AML305 : Lab. 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.

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
22AML306 : Computer Architecture & 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:	6
Basic Structure of Computer Hardware and Software: 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. **Contemporary Issues related to Topic**	
UNIT II:	6
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. **Contemporary Issues related to Topic**	
UNIT III:	7
Processor Design, hardwired control, Microprogrammed Control: Microinstructions, Grouping of control signals, Microprogram sequencing, Micro Instructions with next Address field, prefetching microinstructions. **Contemporary Issues related to Topic**	
UNIT IV:	7
Arithmetic (Fixed and Floating point): Number Representation, Addition of Positive numbers, Logic Design for fast adders, Addition and Subtraction, Arithmetic and Branching conditions, Multiplications of positive numbers, Signed- Operand multiplication, Booth's Algorithm , fast Multiplication, Integer Division algorithms, Floating point numbers and operations, IEEE floating point standards **Contemporary Issues related to Topic**	

UNIT V:	7
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. **Contemporary Issues related to Topic**	
UNIT VI:	6
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. **Contemporary Issues related to Topic**	
Total Lectures	**39**

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

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

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

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

III Semester
22AML307 : Software Engineering

Course Outcome
Upon successful completion of the course, the student will be able to: 1. Choose appropriate software engineering process model, requirement engineering principles and software designing fundamentals for a given project. 2. Select appropriate testing strategy and apply testing principles for testing a given application. 3. Apply basics of software configuration management, version control and change control in software development. 4. Evaluate cost estimation, effort and severity of software risk for given application. 5. Perform basic operations on Sub-version for software version control.

UNIT I:	6
Introduction to Software Engineering, A Generic View of process, Process models: Water fall Model, RAD Model, Prototyping Model, Component Development Model, Agile Model, Requirement Engineering: Requirement Engineering Task Initialization Eliciting Requirement, Developing Use Case, Analysis Model, Negotiation, Validation. **Contemporary Issues related to Topic**	
UNIT II:	6
Building the Analysis mode: Requirement Analysis, Analysis Modeling Approaches, Data Modeling Concept, Object Oriented Analysis, Types of Modeling, Design Engineering: Design Concept, Design Model. **Contemporary Issues related to Topic**	
UNIT III:	7
Testing Strategies : Strategic Approach, Strategic issues, Strategies for conventional Software, Strategies for Object Oriented Software, Validation Testing, Testing Tactics: White-Box Testing, Basis Path testing: Flow Graph Notation, Independent Program Paths, Control Structure Testing, Black Box Testing, Introduction to object oriented testing. **Contemporary Issues related to Topic**	
UNIT IV:	7
Configuration Management: Base lines, Software Configuration items, The SCM Process, Identification of Objects in the Software Configuration, Version Control, Change Control, Configuration Audit, Status Reporting, SCM Standards. **Contemporary Issues related to Topic**	

UNIT V:	7
Project Management, Metrics for Process and Projects, Project Estimation, Risk Management: Reactive vs. Proactive Risk Strategies, Software Risks, Risk Identification, Risk Projection. **Contemporary Issues related to Topic**	
UNIT VI:	6
Advanced Topics in Software Engineering: Re engineering Computer aided software engineering, Open source SE tools introduction, Example-Subversion: Overview, Typical subversion usage and work flow. **Contemporary Issues related to Topic**	
Total Lectures	**39**

Text Books	
1.	Software Engineering–A Practitioner's Approach , 6th Edition, Roger S. Pressman,McGraw Hill
2.	Software Engineering, 9th Edition, Ian Sommerville, Pearson

Reference Books	
1.	Object Oriented Software Engineering, 6th Edition, Leth Bridge, TATA McGraw Hill

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/45.Object_Oriented_Software_Engineering__Practical_Software_Development_using_UML_and_Java%20hal%2056.pdf
2	http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/17.2017_Book_Concise%20Guide%20to%20SE.pdf

MOOCs Links and additional reading, learning, video material	
1.	https://archive.nptel.ac.in/courses/106/105/106105182/

III Semester
22AML308: Lab. Software Engineering

Course Outcome
Upon successful completion of the course, the student will be able to: 1. Choose appropriate software engineering process model, requirement engineering principles and software designing fundamentals for a given project. 2. Select appropriate testing strategy and apply testing principles for testing a given application. 3. Apply basics of software configuration management, version control and change control in software development. 4. Evaluate cost estimation, effort and severity of software risk for given application. 5. Perform basic operations on Sub-version for software version control.

List of Experiment

Sr. No.	Experiments based on
1	Introduction to software engineering fundamentals UML, RATIONAL ROSE Interface/ *Star UML (open Source*)
2	To study and create Software Requirement Specification document for given case study
3	To study and draw UML Use Case diagram for the given case study.
4	To study and draw UML Class diagram for given Case Study.
5	To study and draw UML Activity diagram for given Case Study.
6	To study and draw UML Sequence Diagram for given Case Study.
7	To study and draw State Diagram for given Case Study.
8	Write a Program to find out the Estimation (cost and effort) by using COCOMO OR http://vlabs.iitkgp.ernet.in/se/2/
9	To perform manual and Automated testing using USE- CASE tool using sample GUI OR http://vlabs.iitkgp.ernet.in/se/10/
10	To Study and execute Version Control using Subversion

III Semester

22AML309 : Software Lab.

Course Outcome
After learning 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. Understand the concepts of functions, modules and packages and write complex programs using them. 3. Understand defining and handling Python objects and develop classes required for the given application 4. Develop a useful application in Python.

UNIT I: Introduction	4
Build-in Data types: Data type & Variables, Python Strings, Python built in data structures: Lists, Dictionaries, Tuples, Sets, Arrays. Datatype conversion. Statements: Assignment statement, import statement, print statement, input statement, Python Control Statements: if, if – else, statements, Loop statements: For, while, continue and break, try and except statement, raise, with statements.	
UNIT II: Python Functions, Modules and Packages	3
The def statement, returning values, parameters, arguments, local variables, global variables and global statement, doc strings for functions, Mathematical Function, Generating Random numbers, File Handling.	
UNIT III: Python Object and Classes	2
defining classes and creating classes, member variables, Doc strings for classes, Private members, Python Operator Overloading, Python inheritance and polymorphism, Exception Handling, Python Modules and packages.	
UNIT IV: Developing applications in Python	1
Developing applications in Python using built in and customized modules and packages.	

Text Books:	
1	Learn Python Programming ,Fabrizio Romano, Heinrich Kruger ,Third Edition, 2020,PACKT Publishing
2	Introduction to Computation and Programming Using Python, John V. Guttag, Second Edition,2016 PHI EEE(MIT Press)

MOOCs Links and additional reading, learning, video material	
1.	https://nptel.ac.in/courses/106106145

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

III Semester

Audit Course

MLC2123 - YCCE Communication Aptitude Preparation (YCAP3)

III Semester

Department Specific Audit Course

MLC123- Introduction to Haskell Programming

Course Outcome
1. Reason about the correctness of programs.
2. Think in terms of higher-order functions.
3. Use data encapsulation and parametric polymorphism.
4. Give importance to the 'type checking' of values/functions and therefore develop programs relatively faster.

UNIT I:	**6**
Types and Values, Functions, Type Inference, Recursion	
UNIT II:	**7**
Higher-order Functions, Polymorphic Types, Lambda Functions, Algebraic Data Types, Type Classes	
UNIT III:	**6**
Recursive Data Types, I/O	
UNIT IV:	**5**
Advanced Concepts: Functors, Monads	
TOTAL	**24**

Text Books:	
1	Real World Haskell, 1st Edition, Brian O'Sullivan, John Goerzen and Don Stewart, O'Reilly Media

Reference Books	
1	Learn You a Haskell for Great Good! , Miran Lipovača, No Starch Pres
2	Programming in Haskell, 2nd Edition, Graham Hutton, Cambridge University Press

MOOCs Links and additional reading, learning, video material	
1.	https://nptel.ac.in/courses/106106137

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 3.25)

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Technology

SoE & Syllabus 2022

4th Semester

(Department of Computer Science and Engineering

B.Tech in CSE (AIML)

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.TECH SCHEME OF EXAMINATION 2022

(Scheme of Examination w.e.f. 2022-23 onward)

(Department of Computer Science & Engineering)

CSE (AIML)

SoE No. 22AML-101

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
THIRD SEMESTER															
1	3	BS	GE	22AML301	Distrete Mathematics and Graph theory	**T**	3	1	0	3	4	30	20	50	3 Hours
2	3	PC	CSE	22AML302	Formal Language & Automata Theory	**T**	3	1	0	3	4	30	20	50	3 Hours
3	3	PC	CSE	22AML303	**Lab:** Formal Language & Automata Theory	**P**	0	0	2	2	1		60	40	
4	3	PC	CSE	22AML304	Data Structures	**T**	3	1	0	3	4	30	20	50	3 Hours
5	3	PC	CSE	22AML305	**Lab:** Data Structures	**P**	0	0	2	2	1		60	40	
6	3	PC	CSE	22AML306	Computer Architecture & Organisation	T	3	0	0	3	3	30	20	50	3 Hours
7	3	PC	CSE	22AML307	Software Engineering	T	3	0	0	3	3	30	20	50	3 Hours
8	3	PC	CSE	22AML308	**Lab:** Software Engineering	**P**	0	0	2	2	1		60	40	
9	3	PC	CSE	22AML309	**Lab:** Software Lab.	**P**	0	0	2	2	1		60	40	
					TOTAL		**15**	**3**	**8**	**23**	**22**				
List of Mandatory Learning Course (MLC)															
1	3	HS	T&P	MLC2123	YCCE Communication Aptitude Preparation (YCAP3)	**A**	3	0	0	3	0				
2	3	BSE	AIML	MLC123	Introdcuction to Haskell Programming	**A**	2	0	0	2	0				
FOURTH SEMESTER															
1	4	BS	GE	22AML401	Linear Algebra	**T**	3	0	0	3	3	30	20	50	3 Hours
2	4	PC	CSE	22AML402	Operating Systems	**T**	3	0	0	3	3	30	20	50	3 Hours
3	4	PC	CSE	22AML403	**Lab:** Operating Systems	**P**	0	0	2	2	1		60	40	
2	4	PC	CSE	22AML404	Foundation of Artificial Intelligence	**T**	3	0	0	3	3	30	20	50	3 Hours
3	4	PC	CSE	22AML405	**Lab:** Foundation of Artificial Intelligence	**P**	0	0	2	2	1		60	40	
6	4	PC	CSE	22AML406	Design & Analysis of Algorithms	**T**	3	1	0	3	4	30	20	50	3 Hours
7	4	PC	CSE	22AML407	**Lab:** Design & Analysis of Algorithms	**P**	0	0	2	2	1		60	40	
8	4	PC	CSE	22AML408	Database Management Systems	**T**	3	0	0	3	3	30	20	50	3 Hours
9	4	PC	CSE	22AML409	**Lab:** Database Management Systems	**P**	0	0	2	2	1		60	40	
					TOTAL		**15**	**1**	**8**	**23**	**20**				
List of Mandatory Learning Course (MLC)															
1	4	HS	T&P	MLC2124	YCCE Communication Aptitude Preparation (YCAP4)	**A**	3	0	0	3	0				
2	4	BSE	AIML	MLC124	Computational Sanskrit	**A**	2	0	0	2	0				

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

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

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

		June 2022	**1.00**
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**

Applicable for AY 2022-23 Onwards

IV Semester
22AML401 : 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:1	**Elementary matrix operations**	**6 Hours**
Introduction to Matrices and Determinants, Solution of Linear Equations, Cramer's rule, Inverse of a Matrix. **Contemporary Issues related to Topic**		
Unit:2	**Matrix Algebra**	**6 Hours**
Rank of a matrix, Gaussian elimination, LU Decomposition (Crout's method), Solving Systems of Linear Equations using the tools of Matrices. **Contemporary Issues related to Topic**		
Unit:3	**Diagonalization of matrix**	**7 Hours**
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. **Contemporary Issues related to Topic**		
Unit:4	**Vector Space**	**7 Hours**
Vector Space, Subspace, Sum of Sub space, linear combination, Linear dependence and independence, Span and basis, Spanning sets, Generators. **Contemporary Issues related to Topic**		
Unit:5	**Linear Transformation**	**7 Hours**
Linear transformation, Ranges and Kernel (null space) of linear transformation, Inverse of linear transformation, Algebra of linear transformation, Singular and non-singular linear transformation. . **Contemporary Issues related to Topic**		
Unit :6	**Inner product Spaces**	**6 Hours**
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 . **Contemporary Issues related to Topic**		
	Total Lecture Hours	**39 Hours**

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Text books	
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)
6	Swapan Kumar Sarkar, A Textbook of Discrete Mathematics, S.Chand Company Limited, Delhi.
7	Seymour Lipschutz, Linear Algebra, Schaum's Solved Problem Series, McGraw-Hill Book Company.
8	Vijay M. Soni, Mathematics, B.Sc. Semester VI, Himalaya Publishing House.

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	N.P. Bali & Manish Goyal, A textbook of Engineering Mathematics (Reprint 2008), 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/111106051
2	https://archive.nptel.ac.in/courses/111/104/111104137/
3	https://archive.nptel.ac.in/courses/111/106/111106135/

IV Semester
22AML402 : 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	6
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. **Contemporary Issues related to Topic**	
UNIT II: Process management	6
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 **Contemporary Issues related to Topic**	
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. **Contemporary Issues related to Topic**	
UNIT IV: Memory management techniques	6
Contiguous allocation, static and dynamic partitioning, non-contiguous allocation, paging, translation look aside buffer (TLB) and overheads, segmentation. **Contemporary Issues related to Topic**	
UNIT V: Virtual memory	7
Demand paging, page replacement algorithms, thrashing, and working set model. Deadlocks: necessary conditions, deadlock detection, deadlock avoidance, deadlock prevention, recovery from deadlock. **Contemporary Issues related to Topic**	

UNIT VI: File systems	6
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. **Contemporary Issues related to Topic**	
Total Lectures	**39**

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

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

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

MOOCs Links and additional reading, learning, video material	
1.	https://onlinecourses.nptel.ac.in/noc20_cs04/preview
2.	https://onlinecourses.nptel.ac.in/noc21_cs88/preview
3.	https://onlinecourses.nptel.ac.in/noc21_cs72/preview

IV Semester
22AML403 : Lab. Operating Systems

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

List of Experiment

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

IV Semester
22AML404 : Foundation of Artificial Intelligence

Course Outcome
At the end of the course, the students will be able to: 1. Apply fundamentals of Artificial Intelligence for given problem statements. 2. Use basic algorithms in various applications of AI and related fields. 3. Assess the applicability, strengths, and weaknesses of the basic knowledge representation, problem solving, and learning methods in solving engineering problems. 4. Solve real world problems using AI techniques

UNIT I: Introduction to AI:	**7**
Definition of AI, early work in AI, the importance of AI, AI and related fields, distributed AI, task domain of AI, Introduction to intelligent agents, generic architecture of intelligent agents. Problems, problem spaces and searches: defining the problem on a state space search, issues in the design of search programs. **Contemporary Issues related to Topic**	
UNIT II: Problem Decomposition and Planning:	**7**
Goal Trees, Rule Based Systems, Rule Based Expert Systems. STRIPS, Forward and Backward State Space Planning, Goal Stack Planning, Plan Space Planning, A Unified Framework For Planning, Heuristic search techniques: generate and test, hill climbing, best first search, problem reduction, constraint satisfaction, means-ends analysis. **Contemporary Issues related to Topic**	
UNIT III: Knowledge Representation:	**7**
issues, representation and mapping approaches, procedural Vs declarative knowledge, introduction to proposition logic, knowledge representation using predicate logic, unification and resolution algorithms. Procedure for knowledge acquisition, Representation of knowledge using rules, logic programming, forward backward reasoning, matching, control knowledge. Knowledge representation using semantics nets **Contemporary Issues related to Topic**	
UNIT IV: Introduction to non-monotonic reasoning, logics for non-monotonic reasoning Statistical reasoning	**6**
Introduction to non-monotonic reasoning, logics for non-monotonic reasoning Statistical reasoning: probability and Bays theorem, certainty factors and rule based system. Learning: Supervised, Unsupervised and Reinforcement learning. **Contemporary Issues related to Topic**	

UNIT V: AI Technologies:	**6**
Natural Language Processing: Introduction, Stages in natural language Processing, Application of NLP in Machine Translation, Information Retrieval and Big Data Information Retrieval. Expert Systems: Design & Development of Expert System, knowledge based Systems, Rule Based Expert System, Expert System Shell, Application Areas of Expert System **Contemporary Issues related to Topic**	
UNIT VI: Neural Networks and applications of AI	**6**
Introduction, Features of Biological neural networks, Learning algorithms, Different network architecture and their applications, Some simple networks-Comparison of neural networks with rule based networks and expert systems, AI Applications: AI in Health, AI in Ecommerce, AI in E-Tourism, AI in Industry, AI in Security **Contemporary Issues related to Topic**	
Total Lectures	**39**

Text Books:	
1.	Artificial Intelligence: A Modern Approach, Stuart Russell, Peter Norvig, Pearson education

Reference Book:	
1.	Introduction to Artificial Intelligence, Rajendra Akerkar, PHI Learning Private Limited
2.	A First Course in Artificial Intelligence, Deepak Khemani
3.	Artificial Intelligence, Elaine Rich, Kevin Knight and Nair, TMH

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/18..2017_Book_IntroductionToArtificialIntell.pdf

MOOCs Links and additional reading, learning, video material	
1.	https://onlinecourses.nptel.ac.in/noc20_cs42/preview
2.	https://onlinecourses.nptel.ac.in/noc21_ge20/preview

IV Semester
22AML405 : Lab. Foundation of Artificial Intelligence

Practical's based on above syllabus

IV Semester
22AML406 : Design & Analysis of Algorithms

Course Outcome
After completion of the course, student will be able to: 1. Remember the concepts of algorithms, 2. Understand time requirements of an algorithm and mathematical techniques used in analysis of algorithms. 3. Analyze the Complexities of different algorithms for a wide variety of foundational problems occurring in computer science applications. 4. Apply the knowledge of different algorithms with discussions on complexity. 5. Evaluate the knowledge of algorithms with Complexity and NP-completeness.

UNIT I:	7
Mathematical foundations, summation of arithmetic and geometric series, Σn, Σn2, bound summations using integration, Analysis of algorithms, analyzing control structures, worst case and average case analysis, Asymptotic notations, Analysis of sorting algorithms such as selection sort, insertion sort, bubble sort, heap sort, external Sorting, lower bound proof. **Contemporary Issues related to Topic**	
UNIT II:	7
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. **Contemporary Issues related to Topic**	
UNIT III:	7
Divide and conquer basic strategy, binary search, quick sort, merge sort, Fast Fourier Transform etc. Greedy method –basic strategy, application to job sequencing with deadlines problem, minimum cost spanning trees, single source shortest path etc. **Contemporary Issues related to Topic**	
UNIT IV:	6
Dynamic Programming basic strategy, multistage graphs, all pair shortest path, single source shortest paths, optimal binary search trees, traveling salesman problem, Matrix Chain Multiplication, Longest Common Subsequent. **Contemporary Issues related to Topic**	

UNIT V:	6
Basic Traversal and Search Techniques, breadth first search, connected components, Backtracking basic strategy, 8 – Queen‟s problem, graph colouring, Hamiltonian cycles etc. **Contemporary Issues related to Topic**	
UNIT VI:	6
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. **Contemporary Issues related to Topic**	
Total Lectures	**39**

Text Books:	
1.	Computer Algorithms, Horowitz, Sahani, Rajsekharan ,Third Edition, Galgotia Publications Pvt. Ltd.
2.	Introduction to Algorithms, Thomas H. Cormen ,Third Edition, Prentice Hall of India.
3.	Algorithm design ,Klienberg and Tardos, Pearson

YCC Reference Book:	
1	Fundamentals of Algorithms, Brassard and Bratley, second Edition, Prentice Hall

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

IV Semester
22AML407 : Lab. Design & Analysis of Algorithms

Course Outcome

After completion of the course, student will be able to:

1. Remember the concepts of algorithms,
2. Understand time requirements of an algorithm and mathematical techniques used in analysis of algorithms.
3. Analyze the Complexities of different algorithms for a wide variety of foundational problems occurring in computer science applications.
4. Apply the knowledge of different algorithms with discussions on complexity.
5. Evaluate the knowledge of algorithms with Complexity and NP-completeness.

List of Experiment

Sr. No.	Experiments Based on
1	To Compute and Analyze its time complexity of various sorting algorithm. • Bubble sort • Insertion sort • Selection 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 and compute time complexity of All Pair Shortest Path using dynamic programming for different number of inputs.
8	To implement and compute time complexity of Travelling Salesman Problem using dynamic programming for different number of inputs.
9	To implement and compute time complexity of 8 Queens's problem using backtracking for different number of inputs.
10	To implement and compute time complexity of Graph coloring problem using backtracking for different number of inputs.

IV Semester
22AML408 : Database Management Systems

Course Outcome
Upon successful completion of the course, the student will be able to: 1. Understand & compare different levels of abstraction & data independence. 2. Design Entity Relationship Diagram for any scenario & normalize the database 3. Solve queries based on relational algebra & SQL. 4. Analyze transaction management, various concurrency control protocols and crash recovery methods.

UNIT I: 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. **Contemporary Issues related to Topic**	
UNIT II: SQL:	8
Data definition language (DDL), Data Manipulation Language (DML), Basic structure of SQL Queries, Set operations, Null Values, Nested subqueries, views, Joins,SQL data types & schemas, Integrity Constraints, Domain Constraints, Assertions, triggers, PL/SQL. , jdbc connectivity **No SQL databases**: Features of NoSQL databases, Types of NoSQL databases **Contemporary Issues related to Topic**	
UNIT III: Entity-Relationship Model:	6
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 **Contemporary Issues related to Topic**	
UNIT IV: Relational Database Design	6
Structure of Relational Databases, 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. **Contemporary Issues related to Topic**	
UNIT V: Indexing and Hashing	6
Basic of query processing; Indices: Concepts, B+ trees and B -tree index file; Static and dynamic hashing. **Contemporary Issues related to Topic**	

UNIT VI: Transactions & Concurrency control	7
Transactions: basic concepts, States, Concurrent execution, Serializability, Recoverability, isolation; **Concurrency control:** Timestamps and locking protocols, Validation based protocols, deadlock handling; Recovery: Log-based recovery, Shadow-paging. **Contemporary Issues related to Topic**	
Total Lectures	**39**

Text Books	
1.	Database System Concepts, 6th Edition, Korth, Silberschatz, McGraw-Hill publication
2.	Fundamentals of Database Systems, 5th Edition, 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, Pearson Education
3.	Database Systems, 6th Edition, S. K. Singh,Pearson Education

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/35.Database_Management_Systems__2nd_Ed._.pdf
2	http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/36.dbms%20book%20of%20Raghu%20Ramakrishnan.pdf

MOOCs Links and additional reading, learning, video material	
1.	https://onlinecourses.nptel.ac.in/noc21_cs04/preview
2.	https://nptel.ac.in/courses/106106093

IV Semester
22AML409 : Lab. Database Management Systems

Course Outcome
Upon successful completion of the course, the student will be able to: 1. Understand & compare different levels of abstraction & data independence. 2. Design Entity Relationship Diagram for any scenario & normalize the database 3. Solve queries based on relational algebra & SQL. 4. Analyze transaction management, various concurrency control protocols and crash recovery methods.

List of Experiment

Sr. No.	Experiments Based On
1	To implement different basic Data Definition Language (DDL) & Data Manipulation Language(DML) Commands in SQL , commands that involve constraints for a given schema
2	To implement aggregate function & grouping commands on a given schema
3	To implement basic set operations in SQL on a given schema
4	To apply BETWEEN…AND, NOT BETWEEN, IN, NOT IN, IS NULL, IS NOT NULL clause, single row , mutirow functions on created database tables
5	To implement commands for various joins on a given schema
6	Write SQL queries for given schema using Nested Subqueries and SQL Update on a given schema
7	To create and manipulate various database object of table using views.
8	Select any real time problem for database implementation. Draw an ER diagram for the selected problem in hand. Normalise the database up to appropriate normal form.
9	To display file database connectivity using JDBC
10	Create procedures using PL/SQL for given problem definition

IV SEMESTER

22AML410 : 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, Natural Resources and Sustainable Development**	**6 Hours**
The man-environment interaction; Environmental Ethics and emergence of environmentalism; Overview of natural resources: Definition of resource; Classification of natural resources- biotic and abiotic, water, soil and mineral resources, renewable, and non-renewable energy resources; Introduction to sustainable development: Sustainable Development Goals (SDGs)- targets and indicators, challenges and strategies for SDGs		
Unit:2	**Environmental Issues, Conservation of Biodiversity and Ecosystems**	**6 Hours**
Environmental issues and scales: Land use and Land cover change, Global change; Biodiversity and its distribution, Ecosystems and ecosystem services, Threats to biodiversity and ecosystems, National and international policies for conservation.		
Unit:3	**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 human health		
Unit:4	**Climate Change: Impacts, Adaptation and Mitigation**	**7 Hours**
Understanding climate change, Impacts, vulnerability and adaptation to climate change, Mitigation of climate change		
Unit:5	**Environmental Management**	**7 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 :6	**Environmental Treaties and Legislation**	**6 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	**39 Hours**

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

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

IV Semester
Audit Course
MLC2124 - YCCE Communication Aptitude Preparation (YCAP4)

IV Semester
Department Specific Audit Course
MLC124- Computational Sanskrit

Course Outcome	
1.	To understand the paradigm of programming known as Functional Programming using Haskell language.
2.	To understand the working of Pāṇini's Sanskrit grammar by focusing on the phonetic and morpho-syntactic machinery of the grammar.
3.	To computerize the rules of Pāṇini's Sanskrit grammar using Haskell programming language.
4.	To appreciate how well-defined the grammar is and its similarity to computer programs

UNIT I:	4
Haskell Language: Concepts like types, functions, lists, recursion etc.	
UNIT II:	7
Sanskrit Character Set: Vowels, Consonants, Phonetic Properties Pāṇini's Sanskrit Grammar: Important notions like pratyāhāra, saṃjñā	
UNIT III:	7
Substitutions: ādeśa and ekādeśa Rule Conflict and Resolution: vidhi, niyama and niṣedha rules	
UNIT IV:	6
Specifications: Adapting Pāṇinian Rules for Computation Tips on implementation of the rules	
Total	24

Text Books	
1	Ashtadhyayi of Panini, S. C. Vasu, Motilal Banarsidass
2	The Ashtadhyayi of Panini, Rama Nath Sharma, Munshiram Manoharlal Pub

MOOCs Links and additional reading, learning, video material	
1.	https://nptel.ac.in/courses/106106137

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 3.25)

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Technology

SoE & Syllabus 2022

5th Semester

(Department of Computer Science and Engineering

B.Tech in CSE (AIML)

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.TECH SCHEME OF EXAMINATION 2022

(Scheme of Examination w.e.f. 2022-23 onward)

(Department of Computer Science & Engineering)

CSE (AIML)

SoE No. 22AML-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	HS	CSE	22AML501	Fundamentals of Management and Economics	**T**	3	0	0	3	3	30	20	50	3 Hours
2	5	PC	CSE	22AML502	Machine Learning Essentials	**T**	3	0	0	3	3	30	20	50	3 Hours
3	5	PC	CSE	22AML503	**Lab:** Machine Learning Essentials	**P**	0	0	2	2	1		60	40	
4	5	PE			**Professional Elective-I**	**T**	3	0	0	3	3	30	20	50	3 Hours
5	5	PE			**Lab: Professional Elective-I**	**P**	0	0	2	2	1		60	40	
6	5	OE			**Open Elective - I ***	**T**	3	0	0	3	3	30	20	50	3 Hours
7	5	OE			**Open Elective - II ***	**T**	3	0	0	3	3	30	20	50	3 Hours
8	**5**	**STR**		22AML504	Seminar	**P**	**0**	**0**	**1**	**1**	**1**		60	40	
						TOTAL	**15**	**0**	**5**	**20**	**18**				

List of Professional Electives-I

1	5	PE-I	CSE	22AML511	PE-I: Design Patterns
2	5	PE-I	CSE	22AML512	PE-I: **Lab:** Design Patterns
3	5	PE-I	CSE	22AML513	PE-I: Embeded AI
4	5	PE-I	CSE	22AML514	PE-I: **Lab:** Embeded AI
5	5	PE-I	CSE	22AML515	PE-I: Business Intelligence
6	5	PE-I	CSE	22AML516	PE-I: **Lab:** Business Intelligence
7	5	PE-I	CSE	22AML517	PE-I: Advanced Web Technologies
8	5	PE-I	CSE	22AML518	PE-I: **Lab:** Advanced Web Technologies

Open Elective-I

1	5	OE-I	CSE	22AML531	OE I: Introduction to Artificial Intelligence
2	5	OE-I	CSE	22AML532	OE I: Software Testing

Open Elective-II

1	5	OE-II	CSE	22AML551	OE II: Introduction to Machine Learning
2	5	OE-II	CSE	22AML552	OE II: Problem solving Techniques and Statistical methods

List of Mandatory Learning Course (MLC)												
1	5	HS	T&P	MLC2125	YCAP5: YCCE Communication Aptitude Preparation	**A**	3	0	0	3	0	
2	5	BSE	R&D	MLC125	Design thinking	**A**	2	0	0	2	0	

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

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

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

		June 2022	**1.00**	**Applicable for AY 2022-23 Onwards**
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**	

V Semester

22AML501– Fundamentals of Management and Economics

Course Outcomes:		
Upon successful completion of the course the students will be able to 1. Explain the Functions of Management and identify tools and techniques of Marketing of goods and services 2. Analyze the role of Financial Accountancy and 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:1	**Principles of Management**	**7 Hours**
Evolution of Management Thought: Scientific and Administrative Theory of Management, Definition and Concept of Management, Functions of Management: Planning, Organizing, Directing, Coordinating and Controlling, Motivational Theories, Concept of Leadership.		
Unit:2	**Marketing Management**	**7 Hours**
Marketing Management - Definition & scope, Selling & Modern Concepts of Marketing, Market Research, Customer Behaviors, Product Launching, Sales Promotion, Pricing, Channels of Distribution, Advertising, Market Segmentation, Marketing Mix, Positioning, Targeting.		
Unit:3	**Financial Accountancy and Management**	**7 Hours**
Definition & Functions of Finance department, Sources of finance, Types of capital, Types of Taxes, Introduction of Accountancy and its rules, Preparation of Books of Account- Jounal, Posting of transaction into ledger and preparation of trial balance, Introduction of trading account, profit and loss account and balance sheet		
Unit:4	**Introduction to Economics and engineering Economy:**	**6 Hours**
Economics and engineering economy, Utility analysis- Cardinal, ordinal, Law of diminishing marginal utility, Laws of demand and supply, elasticity of demand, its measurement and application.		
Unit:5	**Engineering Production and Costs**	**7 Hours**
Factors of Production: Land, Labour, Capital, Enterprise and their peculiarities, Concepts and types of costs, Law of Variable proportions (Law of diminishing marginal returns) and Return to Scale (Increasing, constant and decreasing), Economies and diseconomies of scale. Inflation: Meaning, types, causes and consequences, measures to control inflation, Concepts of deflation and Stagflation.		

Unit :6	Market structures - equilibrium output and price	7 Hours
Forms of market structures: Perfect competition, monopolistic competition, oligopoly, duopoly and monopoly, Demand and revenue curves for firm and industry in various forms of market structure, Total, average and marginal revenue curves, equilibrium of firms and industries under various forms of market structures, Price discrimination.		
Total Lecture Hours		**39 Hours**

Textbooks	
1.	Principle of Management, 9th edition , Harold Koontz Ramchandra, Tata McGrow hills
2.	Marketing Management: Planning, Implementation and Control, 3rd Edition, Ramaswamy V.S. and Namakumari S, Macmillian
3.	Financial Services, 19th Edition, Khan M Y, Tata McGraw Hill, 19
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
8.	Economics of Development and Planning, 12th edition, S. K. Misra and V. K. Puri, Himalaya Publishing House, 2006.
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://nptel.ac.in/
3	https://onlinecourses.nptel.ac.in/noc20_mg31/preview
4	https://onlinecourses.nptel.ac.in/noc21_hs52/preview
5	https://onlinecourses.nptel.ac.in/noc22_hs67/preview

V Semester

22AML502– Machine Learning Essentials

Course Outcomes:

After undergoing the course, student will be able to:

1. Understand various supervised machine learning algorithms
2. Understand various unsupervised machine learning algorithms
3. apply supervised and unsupervised learning on the given set of samples and design the model to accomplish the given task.
4. understand various performance evaluation measures for supervised and unsupervised learning

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**	**6 Hours**

Linear and polynomial regression, classification with k-Nearest Neighbours, Naive Bayes Classifiers, Decision Trees, Generalization, logistic regression, bias and variance, Overfitting, and Underfitting

Unit:3	**Supervised Learning-2**	**6 Hours**

Random forests, Kernelized Support Vector Machines, Uncertainty in Multiclass Classification, feature engineering and selection, evaluation metrics for supervised learning

Unit:4	**Unsupervised Learning**	**6 Hours**

k-Means Clustering , Choosing the Number of Clusters, Semi-Supervised Learning , Introduction to Principle Component Analysis, evaluation metrics for unsupervised learning

Unit:5	**Design and Analysis of Machine Learning Experiments**	**6 Hours**

Factors, Response, and Strategy of Experimentation, Randomization, Hypothesis testing, Replication, and Blocking, Guidelines for Machine Learning Experiments , Cross-Validation and Resampling Methods, K-Fold Cross-Validation, Comparing Two Classification Algorithms.

Unit :6	**Advances in Machine Learning**	**6 Hours**

Introduction to learning using Neural networks, types of artificial neuron and activation functions, Feedforward vs. Recurrent networks, multi-layer feedforward networks, Introduction to deep learning, deep learning frameworks.

Total Lecture Hours	**36 Hours**

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Textbooks	
1	Introduction to Machine Learning", Ethem Alpaydin, The MIT Press, second edition
2	Deep learning:Ian Goodfellow, Yoshua Bengio, and Aaron Courville, Deep Learning (http://www.deeplearningbook.org/)
Reference Books	
1	Machine Learning", Tom Mitchell, McGraw-Hill Science/Engineering/Math, 1997
2	Introduction to Machine Learning with Python, A Guide for Data Scientists Andreas C. Müller and Sarah Guido ORIELLY
3	Christopher M. Bishop, Pattern Recognition and Machine Learning. http://research.microsoft.com/enus/um/people/cmbishop/prml/.
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/60.Introduction_to_Machine_Learning_-_2e_-_Ethem_Alpaydin.pdf
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

V Semester

22AML503 : Lab. Machine Learning Essentials

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	Dimensionality reduction using Principal Component Analysis
10	Implementing a feed forward Neural Network based estimation using Scikit learn
11	Experiment on classification using Pre-trained deep network

V Semester

22AML511– PE I: Design Patterns

Course Outcomes:		
Upon successful completion of the course the students will be able to 1. Understand the fundamentals of design pattern. 2. Apply object oriented techniques and tools to Implement various design patterns. 3. Analyze the complexity of design patterns. 4. Design solution for various types of patterns.		
Unit:1	**Introduction**	**7 Hours**
Introduction to Design Patterns and Observer Pattern: Basics of Design patterns, Description of design patterns, Catalog and organization of catalog, design patterns to solve design problems, selection of design pattern, Use of design patterns.		
Unit:2	**Creational Patterns**	**7 Hours**
Abstract Factory, Builder, Factory Method, Prototype, Singleton, Creational Patterns		
Unit:3	**Structural Pattern**	**6 Hours**
Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy, Discussion of Structural Patterns		
Unit:4	**Behavioural Patterns**	**6 Hours**
Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns		
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, Summary		
Unit :6	**Complexity Analysis of Design Patterns**	**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		**38 Hours**

Textbooks	
1	Head First Design Patterns, Eric Freeman and Elisabeth Freeman
2	Design Patterns Explained, Shalloway and Trott
Reference Books	
1	Pattern's in JAVA Vol-I , Mark Grand , Wiley DreamTech.
2	Pattern's in JAVA Vol-II , Mark Grand , Wiley DreamTech.
3	Introduction to design Patterns in C++ with Qt , Alan Ezust, Paul Ezust
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/59-Design%20Pattern_7th%20Semester_Head%20First%20Design%20Patterns.pdf
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc23_cs46/preview

V Semester

22AML512– Lab- PE I: Design Patterns

Sr. No.	Experiments based on
1	Create a design template for a specific problem arises during development of software application.
2	Write a java program to create a shape and concrete class implementing these interfaces. (Factory pattern).
3	Write a java program to create a single object class. (Singleton pattern).
4	Write a java program to create an abstract class shape and concrete classes extending the shape class. (Prototype design pattern).
5	Write a java program to create an adapter class media adapter which implements the media player interface and uses advance media player object to play required format (adapter design pattern).
6	Write a java program to create employee class to add department level hierarchy and print all employees. (Composite design Pattern)
7	Write a Java Program to create Shape interface and add a Shape Decorator Class an additional feature as Red Shape Decorator and give output as Red Shape Circle or Rectangle(Decorator Pattern)
8	Write a java program to create draw api interface which is acting as a bridge implementer and concrete classes redcircle, greencircle implementing drawapi interface.(bridge design pattern).
9	Write a java program to create a Shape interface and concrete classes implementing the Shape interface. A facade class Shape Maker is defined as a next step.(Façade Pattern)
10	Write a java program to create two objects , Stock which gives command and Broker which invokes the object and implement the interface Order.(Command Pattern)

V Semester

22AML513– PE I: Embedded AI

Course Outcomes:		
Upon successful completion of the course the students will be able to 1. Understand the architecture, the design principles and elements of IoT. 2. Gain the necessary skills needed to build Machine learning models for edge devices 3. design, deploy and evaluate scalable real-life IoT systems for different application domains 4. Understand and build scalable ML pipeline using Flask, Python, uWSGI, TensorFlow		
Unit:1	**Embedded Artificial Intelligence**	**7 Hours**
Introduction : Intelligence on Devices: Embedded AI, Merits and Metrics of Embedded AI, workflow of embedded AI, Examples of hardware and software for embedded AI, Applications of Embedded AI		
Unit:2	**Hardware Acceleration Methods for Embedded AI**	**8 Hours**
Three types of hardware: FPGA, ASIC, and GPU. The Key Technologies of Embedded AI : Model Compression of Neural Network, Binary Neural Networks and Optimization Techniques, CPU/GPU Acceleration Algorithm, Application Modes of Embedded Artificial Intelligence: Post-Training Deployment, Training on Embedded Devices		
Unit:3	**Introduction to IoT**	**7 Hours**
Introduction to IoT, Architectural Overview and Design Principles, Elements of IoT (Arduino, Raspberry Pi, NodeMCU, Sensors & Actuators), IoT Applications, Sensing, Actuation, Networking Basics, Embedded OS, IoT and Cloud, Security aspects in IoT.		
Unit:4	**IoT Application Development**	**8 Hours**
IoT Application Development, Introduction to Raspberry Pi, Integrating Sensors and Actuators with Raspberry Pi, Pushing and Managing Data in IoT Clouds, Programming APIs (Python/Node.js/Arduino) for communication protocols (MQTT, ZigBee, Bluetooth, UDP, TCP), Implementation of IoT withRaspberry Pi (lab - sensor, MQTT, visualization)		
Unit:5	**Introduction to ML and Deep learning models**	**6 Hours**
Introduction to ML and Deep learning models for IoT (challenges, opportunities, solutions), Sensor data classification using ML in Raspberry Pi		
Unit :6	**Image classification on Raspberry Pi**	**6 Hours**
Introduction to TensorFlow Lite, Image classification on Raspberry Pi (lab), object detection on Raspberry Pi -building scalable ML pipeline using Flask, Python, uWSGI, TensorFlow		
Total Lecture Hours		**42 Hours**

			July 2022	1.00	Applicable for AY 2022-23 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	

Textbooks	
1	Vijay Madisetti, Arshdeep Bahga, ¨Internet of Things, "A Hands on Approach", University Press
2	Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill
3	Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach" , 3rd Edition, Prentice Hall
Reference Books	
1	Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill
2	https://www.tensorflow.org/lite/tutorials
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	
MOOCs Links and additional reading, learning, video material	
1	

V Semester

22AML514– Lab-PE I: Embedded AI

(Practical's based on above Syllabus)

V Semester

22AML515– PE I: Business Intelligence

Course Outcomes:

Upon successful completion of the course

After completion of the course Students will be able to :

- Assemble BI as a Process, identify its application in various domains and functional area, its roles and responsibilities.
- Identify functions of building blocks in N_tier BI ecosystem
- Identify different stages in Lifecycle of a BI project.
- Differentiate between traditional BI and self-service BI (PO1-2)

1. Apply Multiple programing language for BI (PO2-3)
2. Model a business scenario; identify the metrics, indicators, various dimensions, and aggregation strategies and make recommendations to achieve the business goal (PO3-3)
3. Obtain hands on experience with some popular BI software for analysis, reporting, visualization of results

(PO1-2, PO2-2,PO3-2,PO5-3)

After completion of the course:

Unit:1	Introduction to Business Intelligence	8 Hours

Business intelligence: Overview, 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

Unit:2	Principles of Dimensional Modelling	7 Hours

Foundation for Fact based decision making, The STAR and SNOWFLAKE schema, Pros & Cons of the STAR/SNOWFLAKE Schema Dimensional Model, Slowly Changing Dimension tables, Fact-less Fact Tables, Aggregation Strategy, Time Dimension

Unit:3	Data Pre-processing	7 Hours

Basics of Data Integration (Extraction Transformation Loading): Concepts of data integration, needs and advantages of using data integration, introduction to common data integration approaches, Meta data – types and sources, Introduction to data quality, data profiling concepts and applications, introduction to ETL

Unit:4	Business Intelligence system architecture	6 Hours

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.

Unit:5	BI Project Lifecycle	6 Hours
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		
Unit :6	**Self-service Analytics and USE Cases**	**6 Hours**
Self-service Analytics: Overview, pros, cons. Use cases of self-service analytics. Use cases of Business Intelligence (BI): Water quality monitoring, Air quality monitoring, Waste management, Energy efficiency, Climate change.		
Total Lecture Hours		**40 Hours**

Textbooks	
1	Turban E., Sharda R., Delen D., King D., Business Intelligence, Pearson Education.
2	Microsoft Power BI complete reference, Devin Knight, Brian Knight, Mitchell Pearson, Manuel Quintana, Brett Powell. Birmingham, UK : Packt Publishing, 2018.
Reference Books	
1	Sabherwal R. and Becerra-Fernandez I., Business Intelligence, Wiley
2	Kimball R., Ross M., The Kimball Group Reader: Relentlessly Practical Tools for Data Warehousing and Business Intelligence, Wiley and Sons (2010).
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

22AML516– Lab- PE I: Business Intelligence

Sr. No.	Experiments based on
1	a. Design a multidimensional data cube for given data Using EXCEL b. Perform OLAP- slicing operation on it
2	Creation Of Dashboard Using EXCEL
3	Microsoft Power BI: Installation tool, Importing Data from file, Data Wrangling (Editing Data).
4	Visualization Of Data Using different visualizations in Power BI analytic desktop, Filtering data, and delivering Insights from data
5	Data Visualization: Create interactive and visually appealing dashboards and reports to present data in a meaningful way, making it easier to identify patterns and trends. (Data available with BI server)
6	Case study 1- Supply Chain Analytics: Analyze supply chain data to improve efficiency, reduce costs, and identify potential bottlenecks in the supply chain process.
7	Case study 2 - Business Performance Monitoring: Monitor key performance indicators (KPIs) in real-time and track business metrics to evaluate the performance of the organization.
8	Case study 3- Geographic Analysis: Utilize geographic information system (GIS) data to create location-based visualizations and perform spatial analysis.

V Semester

22AML517– PE I: Advanced Web Technologies

Course Outcomes:		
Upon successful completion of the course the students will be able to 1. Understand fundamental concepts of Web Services. 2. Design modern interactive web pages using HTML5, CSS3, Javascript. 3. Develop advanced client side programming. 4. Develop fast, flexible, and scalable backend applications using nodejs and mongoDB .		
Unit:1	**Introduction to Web Technology**	**6 Hours**
Client, Servers and Communication, Internet Protocols (HTTP,FTP, SMTP),WWW. Web Basics: Web Browsers, Web Servers, Tier Technology and its types, Static and Dynamic Web Page. Client side and Server side Scripting.		
Unit:2	**HTML5,CSS3**	**7 Hours**
HTML5: Structure of an HTML Program, Basic HTML Tags (Headings, Paragraph, Division, Text formatting, Image, Anchors), HTML Lists (Ordered Lists, Unordered Lists, Description Lists), HTML Links (href attribute, target attribute), HTML colors, Table handling in HTML, HTML Layout Elements, HTML class and id Attribute, HTML Forms, HTML Responsive Web Design. CSS3: Inline, Internal, External, CSS3 selectors, CSS3- Colors, Backgrounds, Borders, Text, Font, List, CSS3 Box Model, CSS3 Navigation Bar (Vertical, Horizontal), Introduction to Bootstrap.		
Unit:3	**Client Side Scripting with JavaScript**	**7 Hours**
Introduction to JavaScript, Variables and Data Types, Operators and Expressions in JavaScript, Functions In JavaScript, Arrays, Loops and control statement, RegExp, Dialog Boxes, JavaScript Events. Event Handling and Form Validation, Error Handling, Handling Cookies, XML, JSON. Introduction to Web Frameworks- React JS, Angular JS.		
Unit:4	**Advanced Client side programming**	**6 Hours**
WebSockets, Server-Sent Event (SSE), WebRTC, Web Graphics, Canvas, WebGL, WebWorkers, SVG. Libraries: Modernizr, Polyfills, Polymer.		
Unit:5	**Introduction to Node.js**	**6 Hours**
Introduction, Modules, HTTP Module, File System Module, URL Module, NPM, Events, Upload Files.		

Unit :6	Node.js and Database Connectivity with MongoDB	6 Hours
Introduction to MongoDB, Creating a Database, Create Collection, Insert, Find, Delete, Update, Node.js Connection with MongoDB.		
Total Lecture Hours		**38 Hours**

Textbooks	
1	HTML & CSS: The Complete Reference,Fifth Edition, Thomas A. Powell
2	Web Technologies: Html, Javascript, Php, Java, Jsp, Asp.Net, Xml And Ajax, Black Book , Kogent Learning Solutions Inc., Dreamtech Press
Reference Books	
1	Pro HTML5 with CSS, JavaScript, and Multimedia., Mark J. Collins
2	Web Development with MongoDB and Node., Bruno Joseph D'mello
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/book%20details/CSE.aspx
2	http://link.springer.com/openurl?genre=book&isbn=978-1-4613-5409-3
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.swayam2.ac.in/nou20_cs05/preview

V Semester

22AML518– Lab- PE I: Advanced Web Technologies

Sr. No.	Experiments based on
1	Write a HTML code to create single page website using Layout Elements
2	Write a HTML code to create responsive website using <meta> tags.
3	Create a JavaScript Calculator using the JavaScript, HTML and CSS programming languages.
4	Creating Image Slider Using JavaScript, HTML, And CSS
5	Write JavaScript code to validate the following fields of the Registration form. First Name: Last Name: Password: Email ID: Mobile Number: Address:
6	Write a script which creates and retrieves Cookies information
7	Create a web page which shows the use of Canvas & SVG
8	Creating the MongoDB Database in Robo 3T GUI
9	Create a simple "Hello, World!" server using Node.js and Express.
10	Create a RESTful API that performs CRUD operations on a database

V Semester

22AML531– OE I: Introduction to Artificial Intelligence

Course Outcomes:		
Upon successful completion of the course the students will be able to 1. Understand concepts of Artificial Intelligence and different types of intelligent agents and their architecture.		
Unit:1	**Introduction to AI**	**6 Hours**
Introduction : What Is AI?, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art, Risks and Benefits of AI, Intelligent Agents: Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents, Representation the AI Problems, Production System		
Unit:2	**Knowledge Representation**	**6 Hours**
Predicate and propositional logic , Forward and Backward Chaining , Backtracking		
Unit:3	**Local Search Algorithms and Optimization Problems**	**6 Hours**
Local Search in Continuous Space, Searching with Non deterministic actions, Searching with partial observations, online search agents and unknown environments.		
Unit:4	**Adversarial Search & Games**	**6 Hours**
Game Theory, Optimal Decisions in Games, Mini-Max Search, Alpha Beta Pruning, and Limitations of Game Search Algorithms.		
Unit:5	**Uncertainty in AI**	**6 Hours**
Conditional Reasoning & Bayes Rule, Bayesian Networks, Maximum Likelihood Learning, Maximum A-posterior learning, Markov Decision Processes		
Unit:5	**Introduction to Knowledge**	**6 Hours**
Introduction, Types of Knowledge, Knowledge Representation, Knowledge Storage, Knowledge Acquisition, Knowledge Organization and Management, Basic Concepts of Knowledge Engineering		
Total Lecture Hours		**36 Hours**

Textbooks	
1	Stuart Russell and Peter Norvig. Artificial Intelligence: A Modern Approach, 3rd Edition, Prentice Hall, 2009Tata McGraw-Hills Publication Company Limited, New Delhi.
2	Elaine Rich, Kevin Knight, Shivshankar Nair, Artificial Intelligence, McGraw Hill.
Reference Books	
1	R. C. Schank and C. K. Riesbeck: Inside Computer Understanding: Five Programs Plus Miniatures, Lawrence Erlbaum, 1981.
2	Murray Shanahan: A Circumscriptive Calculus of Events. Artificial. Intelligence 77(2), pp. 249-284, 1995.

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	Handbook of Artificial Intelligence, Edited By Avronn Barr and Edward Feigenbaum https://stacks.stanford.edu/file/druid:qn160ck3308/qn160ck3308.pdf
2	Patrick Henry Winston. Artificial Intelligence, Addison-Wesley, 1992. https://courses.csail.mit.edu/6.034f/ai3/rest.pdf
MOOCs Links and additional reading, learning, video material	
1	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs42/

V Semester

22AML532– OE I: Software Testing

Course Outcome
Upon successful completion of this course, the student will be able to: 1. Formulate problem by following Software testing life cycle. 2. Design Manual Test cases for Software Project. 3. Demonstrate utilization of testing automation though testing tool.

Unit No.	Contents	Max. Hrs.
1	**Software Testing Basics:** Basic concepts of Testing: Need of Testing, Basic concepts-errors, faults, defects, failures, objective of testing, central issue in testing, Testing activities, V-Model, Sources of information for test cases, Monitoring and Measuring Test Execution, Test tools and Automation, Limitation of Testing.	6
2	**Unit Testing:** Unit Testing: Concepts of Unit Testing, Static Unit Testing, Defect Prevention, Dynamic Unit Testing, Mutation Testing, Debugging, Tools for Unit Testing.	6
3	**Control Flow Testing:** Control Flow Testing: Outline of Control Flow Testing, Control Flow Graphs, Path in Control Flow Graph, Path selection criteria, All path coverage criteria, Statement coverage, Path coverage.	7
4	**Integration Testing:** Data Flow and System Integration Testing: Introduction Data flow testing, Data flow graph, Data flow testing criteria, Fundamentals of System Integration: Types of interfaces and interface errors, System integration testing, Software and Hardware integration.	7
5	**System Testing:** System Testing: Taxonomy of system test, Basic Test, Functionality test, Robustness test, Performance test, Scalability test, Stress test, Load and Stability test, Reliability test, Regression test, Documentation Test.	6
6	**Test Cases:** Test Design: Test cases, Necessity of test case documentation, Test case design methods, Functional specification-based test case design, Use case bases, application based test case design, level of test execution.	6
	Total Lecture Hours	**36 Hours**

Text Books	
S.No	**Title**
1	Software Testing and Quality Assurance**,** Kshirsagar Naik and PriyadarshiniTripathi**,** Wiley Publication
2	Software Testing Principles, Techniques and Tools**,** M.G. Limaye**,** McGraw Hills

Reference Books	
S.No	**Title**
1	Foundations of Software Testing**,** Aditya P. Mathur**,** Pearson Education
2	Software Testing Tools**,** Dr. K. V. K. K. Prasad**,** Dream Tech

MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc21_cs13/preview
2	https://onlinecourses.nptel.ac.in/noc19_cs71/preview

V Semester

22AML551– OE II: Introduction to Machine Learning

Course Outcomes:

After undergoing the course, student will be able to:

1. Understand various supervised machine learning algorithms
2. Understand various unsupervised machine learning algorithms
3. Apply supervised and unsupervised learning on the given set of samples and design the model to accomplish the given task.
4. understand various performance evaluation measures for supervised and unsupervised learning

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**	**6 Hours**
Linear and polynomial regression, classification with k-Nearest Neighbours, Naive Bayes Classifiers, Decision Trees, Generalization, logistic regression, bias and variance, Overfitting, and Underfitting		
Unit:3	**Supervised Learning-2**	**6 Hours**
Random forests, Kernelized Support Vector Machines, Uncertainty in Multiclass Classification, feature engineering and selection, evaluation metrics for supervised learning		
Unit:4	**Unsupervised Learning**	**6 Hours**
k-Means Clustering , Choosing the Number of Clusters, Semi-Supervised Learning , Evaluation metrics for unsupervised learning		
Unit:5	**Design and Analysis of Machine Learning Experiments**	**6 Hours**
Factors, Response, and Strategy of Experimentation, Randomization, Hypothesis testing, Replication, and Blocking, Guidelines for Machine Learning Experiments , Cross-Validation and Resampling Methods, K-Fold Cross-Validation, Comparing Two Classification Algorithms.		
Unit :6	**Advances in Machine Learning**	**6 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		**36 Hours**

Textbooks	
1	Introduction to Machine Learning", Ethem Alpaydin, The MIT Press, second edition
2	Deep learning:Ian Goodfellow, Yoshua Bengio, and Aaron Courville, Deep Learning (http://www.deeplearningbook.org/)
Reference Books	
1	Machine Learning", Tom Mitchell, McGraw-Hill Science/Engineering/Math, 1997
2	Introduction to Machine Learning with Python, A Guide for Data Scientists Andreas C. Müller and Sarah Guido ORIELLY
3	Christopher M. Bishop, Pattern Recognition and Machine Learning. http://research.microsoft.com/enus/um/people/cmbishop/prml/.
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/60.Introduction_to_Machine_Learning_-_2e_-_Ethem_Alpaydin.pdf
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

V Semester

22AML552– OE II: Problem solving Techniques and Statistical methods

Course Outcomes:		
Upon successful completion of the course the students will be able to 1. Apply Techniques of Problem solving for the solution of mathematical problems. 2. Solve problems related to Numbers, Sets, and Functions, Induction, Combinatorics. 3. Define, formulate and solve problems in a systematic manner. 4. Understand fundamental concepts of data analysis using statistics.		
Unit:1	**Introduction**	**6 Hours**
Numbers, Sets and Functions, Problem Solving Techniques,Language and Proofs, Quantifiers and Logical Statements, Compound Statements, Elementary proof techniques.		
Unit:2	**Combinatorics**	**7 Hours**
Induction, Bijection and Cardinality, Combinatorics,		
Unit:3	**Graph**	**7 Hours**
Counting, Graph Theory, Recurrence Relations		
Unit:4	**Basic Statistics**	**6 Hours**
Sources of Data, Organization of Data, The Histogram, Measures of central tendency, Mean Deviation, Standard Deviation, Correlation, Coefficient of correlation, Rank correlation, Regression.		
Unit:5	**Probability**	**6 Hours**
Equally likely, mutually exclusive events, definitions of probability, additions & multiplication theorems of probability and problems based on them. Bayesian approach, distributions; Poisson, normal, Erlang, Gamma and Weibull probability distributions		
Unit :6	**Multivariate Data**	**6 Hours**
Random Vectors and Matrices, sample estimate of centroid, standard deviation, SSCP, dispersion, variance, covariance, correlation matrices.		
Total Lecture Hours		**38 Hours**

Textbooks	
1	Mathematical Thinking-Problem Solving and Proofs. 2nd Edition (2000), JohnP.D'Angelo and Douglas B.,Prentice Hill , West
2	Statistics for Management, Levin R.I. and Rubin D.S., Pearson education
Reference Books	
1	Probability and Statistics , Third edition ,Murray R. Spiegel, John J.Schiller, R AluSrinivasan, Mc Graw Hill education
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/111105077
2	https://onlinecourses.nptel.ac.in/noc21_ma74/preview

V SEMESTER

22AML504 : Industrial training, Seminar & Report

V SEMESTER

Audit Course

MLC2125 : YCAP5

V SEMESTER
Audit Course
MLC125 : Design thinking

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 3.25)

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Technology

SoE & Syllabus 2022

6th Semester

(Department of Computer Science and Engineering

B.Tech in CSE (AIML)

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.TECH SCHEME OF EXAMINATION 2022

(Scheme of Examination w.e.f. 2022-23 onward)

(Department of Computer Science & Engineering)

CSE (AIML)

SoE No. 22AML-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	22AML601	Advanced Artificial Intelligence	**T**	3	0	0	3	3	30	20	50	3 Hours
2	6	PC	CSE	22AML602	**Lab:** Advanced Artificial Intelligence	**P**	0	0	2	2	1		60	40	
3	6	PC	CSE	22AML603	Computer Networks	**T**	3	0	0	3	3	30	20	50	3 Hours
4	6	PC	CSE	22AML604	**Lab:** Computer Networks	**P**	0	0	2	2	1		60	40	
5	6	PC	CSE	22AML605	Digital Image Processing	**T**	3	0	0	3	3	30	20	50	3 Hours
6	6	PC	CSE	22AML606	**Lab:** Digital Image Processing	**P**	0	0	2	2	1		60	40	
10	7	7	STR	22AML607	Project Phase-I	**P**	0	0	10	10	5		60	40	
7	6	PE	CSE		**Professional Elective-II**	**T**	3	0	0	3	3	30	20	50	3 Hours
8	6	PE	CSE		**Lab: Professional Elective-II**	**P**	0	0	2	2	1		60	40	
9	6	OE	CSE		**Open Elective - III**	**T**	3	0	0	3	3	30	20	50	3 Hours
10	6	OE	CSE		**Open Elective - IV**	**T**	3	0	0	3	3	30	20	50	3 Hours
					TOTAL		**18**	**0**	**18**	**36**	**27**				

List of Professional Electives-II

1	6	PE-II	CSE	22AML611	PE II: Blockchain Technology
2	6	PE-II	CSE	22AML612	PE II: **Lab:** Blockchain Technology
3	6	PE-II	CSE	22AML613	PE II: Internet of Things
4	6	PE-II	CSE	22AML614	PE II: **Lab:** Internet of Things
5	6	PE-II	CSE	22AML615	PE II: Cloud computing
6	6	PE-II	CSE	22AML616	PE II: **Lab:** Cloud Computing

Open Elective-III

1	6	OE-III	CSE	22AML631	OE III: Introduction to Artificial Intelligence
2	6	OE-III	CSE	22AML632	OE III: Software Testing

Open Elective-IV

1	6	OE-IV	CSE	22AML651	OE IV: Introduction to Machine Learning
2	6	OE-IV	CSE	22AML652	OE IV: Problem solving Techniques and Statistical methods

List of Mandatory Learning Course (MLC)

1	6	HS	T&P	MLC2126	YCAP6 :	**A**	3	0	0	3	0		

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

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

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

		June 2022	**1.00**	**Applicable for AY 2022-23 Onwards**
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**	

VI Semester

22AML601– Advanced Artificial Intelligence

Course Outcomes:		
Upon successful completion of the course the students will be able to **C01:** Understand concepts of Artificial Intelligence and different types of intelligent agents and their architecture. **C02:**Identify problems where artificial intelligence techniques are applicable **C03:** Formulate problems as state space search problem & efficiently solve them. **C04:** Solve various constraint satisfaction problem and game playing techniques. **C05:** Understand the capabilities and limitations of Generative AI.		
Unit:1	**Planning Techniques**	**6 Hours**
Definition of AI, Application of AI,Classical Planning, Algorithms for planning as state space search, Planning Graph, Time, Schedule and resources, Hierarchical planning, Planning & acting in Non deterministic domain, Multiagent Planning.		
Unit:2	**Knowledge Learning**	**7 Hours**
Logical Formulation of Learning, Knowledge in Learning, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming, Learning Probabilistic Models, Statistical Learning, Learning with Complete Data, Learning with Hidden Variables: The EM Algorithm		
Unit:3	**Reinforcement Learning**	**7 Hours**
Introduction, Active and Passive Reinforcement learning, Generalization in Reinforcement Learning, Policy Searching, Applications of Reinforcement Learning, Q Learning, Genetic Algorithm for Reinforcement Learning.		
Unit:4	**Robotics**	**6 Hours**
Introduction, Robot Hardware, Robotics Perception, Planning to move, Planning Uncertain Movements, Moving, Robotics Software Architecture, Application Domains, Case Study related to Robotics.		
Unit:5	**Generative AI**	**6 Hours**
What is Generative AI? What is generative AI and how does it differ from traditional AI? Generative AI system: ChatGPT, Generative Adversarial Network- GAN architecture, Generative model, Approaches of Generative model ,Naive Bayes generative model, Types of GANs, Applications of GANs		

Unit :6	Introduction to Large Language Models (LLMs)	6 Hours
Large language models working, Use of Large language models, advantages of large language models, challenges and limitations of large language models, types of large language models, Applications of Large Language Models		
Textbooks		
1.	Artificial Intelligence A Modern Approach, Third Edition by Stuart J. Russell and Peter Norvig	
2.	Introduction to Generative AI :An ethical, societal, and legal overview Numa Dhamani and Maggie Engler	
Reference Books		
1.	ARTIFICIAL INTELLIGENCE Third Edition, by Kevin Knight (Author), Elaine Rich (Author), Shivashankar B. Nair (Author)	
2.	Artificial Intelligence: Concepts and Applications, by Lavika Goel	
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]		
MOOCs Links and additional reading, learning, video material		
1.	https://onlinecourses.nptel.ac.in/noc23_ge40/announcements?force=true#registration_confirmation	
2.	https://www.youtube.com/watch?v=XCPZBD9lbVo&list=PLbMVogVj5nJQu5qwm-HmJgjmeGhsErvXD	

VI Semester

22AML602– Lab: Advanced Artificial Intelligence

(Practical's based on above syllabus)

VI Semester

22AML603– Computer Networks

Course Outcomes:		
Upon successful completion of the course the students will be able to 1. Identify appropriate design issues and explain network reference model. 2. Select appropriate protocol at various layers for the given application. 3. Solve problems in the networking domain. 4. Analyze the performance of network using different tools 5. Design computer networks and sub-networks		
Unit:1	**Introduction to computer networks and Internet**	**5 Hours**
Introduction to computer networks and Internet, The uses of computer networks, LAN's, MAN's, WAN's, Heterogeneous Networks Network Topologies, Physical Mediums, Concept of Network Protocols, design issues for layers. Layered Architecture: The OSI reference model. TCP/IP reference model, Comparison of OSI & TCP/IP reference models, Various Losses in the Internet, Brief History of Computer Network.		
Unit:2	**Application Layer**	**7 Hours**
Basics of Socket Programming, Transport Layer Programming Interface(TCP, UDP) , Protocols: HTTP (Overview, Persistent and Non-Persistent, Message Format, Cookies, Cachess) , SMTP (Overview, Message Formats) , IMAP, POP, DNS; FTP; Telnet, SSH; Peer-to-Peer Applications, BitTorrent Protocol; Conte Distribution Networks;		
Unit:3	**Transport Layer**	**7 Hours**
Relationship Between Transport and Network Layer, TCP and UDP; Multiplexing and Demultiplexing; Principles of Reliable Data Transfer; Go-Back-N and Selective Repeat; TCP: Segment Structure, Round Trip Time Estimation, Reliable Data Transfer, State Transitions, Flow Control, Congestion Control, UDP: Segment Structure		
Unit:4	**Network Layer**	**7 Hours**
Subnets, Concept of IP Address, Netmask, Subnet; CIDR; Design of a LAN and WAN,r, Routers, Functions of a Router; Switching; Queueing: Causes, Delays; IPV4: Datagram Format, Fragmentation; Network Address Translation; IPv6 Introduction; Multicasting, , Routing algorithms: Link State, Distance Vector Routing; OSPF, BGP, RIP; Routing Policies		
Unit:5	**Link Layer**	**5 Hours**
Review of fundamentals of link layer protocols; Error-Detection and -Correction Techniques Ethernet Switches, LANs, LinkLayer Switches, VLANs, Complete tracking of traversal of a packet over internet between two application, MAC		
Unit :6	**Transmission Impairments, Transmission Media**	**5 Hours**
Guided, unguided, Architecture of the Internet, Wireless LANs: IEEE 802.11, IEEE 802., The Public Switched Telephone Network, Switching: circuit, packet and message switching, Modems.		
Total Lecture Hours		**36 Hours**

Textbooks	
1	Computer Networking: A Top-Down Approach, 6th Kurose and Ross, Pearson Publication
2	Computer Networks, Behrouz A. Forouzan ,McGraw-Hill Publication
3	Computer Networks , A.S. Tanenbaum, Pearson Publication
Reference Books	
1	Computer Networks A Systems Approach,ISBN: 9780123850591,Larry Peterson Bruce Davie Elsevier
2	Data and computer Communication, ISBN-81- 297-0206-1, William Stallings, Pearson Education
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Technology/40-Guide%20to%20computer%20network%20security.pdf
2	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Technology/58-Computer%20Networks%205th%20Edition.pdf
MOOCs Links and additional reading, learning, video material	
1	https://nptel.ac.in/courses/106105183
2	https://nptel.ac.in/courses/106106091

VI Semester

22AML604– Lab: Computer Networks

Sr. No.	Experiments based on
1	Study of Network Devices and Network cables.
2	Study of basic network command and Network configuration commands.
3	Create two Networks using star topology and add a resource (printer) to the network using CISCO Packet Tracer. Also show the transmission of packet from one host to other.
4	Configuring VLAN in a network using CISCO Packet Tracer.
5	Configure routers in a network using Static routing protocol in Cisco Packet Tracer and show transmission of packet from one network to another.
6	To implement Routing algorithm OSPF: Open Source Shortest Path First using Cisco Packet Tracer.
7	Use traffic monitoring tool Wire shark to observe network traffic with packet detail.
8	Case Study on Network at YCCE.
9	Advanced Practical: Study of NS2 tool.

VI Semester

22AML605– Digital Image Processing

Course Outcomes:		
Upon successful completion of the course the students will be able to 1. Describe Basic relationships between pixels. 2. Compare various image enhancement techniques in spatial domain and frequency domain. 3. Illustrate different image compression techniques to understand the advantage of image compression 4. Demonstrate the applications of similarity based and dissimilarity-based approaches for image segmentation. 5. Interpret various representation techniques		
Unit:1	**Introduction**	**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**	**5 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		**38 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

VI Semester

22AML606– Lab: 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.

VI Semester

22AML611– PE II: Blockchain Technology

Course Outcomes:

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

1. Conceptual understanding of how blockchain technology can be used to innovate and improve business processes.
2. Apply cryptographic hash required for blockchain.
3. Apply the concepts of smart contracts for an application.
4. Design a public blockchain using Ethereum.
5. Design a private blockchain using Hyperledger.
6. Use different types of tools for blockchain applications.

Unit:1	**Introduction to Block chain**	**6 Hours**

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

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

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

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

Unit:3	**Programming for Blockchain & Introduction to Programming**	**6 Hours**

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

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

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

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

Ethereum frameworks.		
Unit:5	**Private Blockchain**	**7 Hours**
Introduction, Key characteristics, Need of Private Blockchain, Smart Contract in Private Environment, State Machine Replication, Consensus Algorithms for Private Blockchain - PAXOS and RAFT, Byzantine Faults: Byzantine Fault Tolerant (BFT) and Practical BFT. Introduction to Hyperledger, Tools and Frameworks, Comparison between Hyperledger Fabric & Other Technologies. Hyperledger Fabric Architecture, Components of Hyperledger Fabric: MSP, Chain Codes, Transaction Flow, Working of Hyperledger Fabric, Creating Hyperledger Network		
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		**38 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

22AML612– Lab-PE II: Blockchain Technology

Sr. No	List of practical
1	How to Build Your Own Blockchain Part 1 — Creating, Storing, Syncing, Displaying,
2	How to Build Your Own Blockchain Part 1 — Creating, Storing, Syncing, Displaying, Mining, and Proving Work
3	Develop a full blockchain in javascript.
4	Introduction to web3j, REMIX IDE
5	Intro to Solidity Programming Language - Ethereum Blockchain Developer Tutorial for Beginners
6	Case study of E-voting and write smart contract using Solidity programming
7	Induction to Ganach, Metamask (installation and basics)
8	Develop a simple application and execute using Ganache and Metamask
9	Project – develop a dapp in blockchain.

VI Semester

22AML613– PE II: Internet of Things

Course Outcomes:		
Upon successful completion of the course the students will be able to 1. Develop various IOT environments 2. Demonstrate IOT architecture and its enabling technologies 3. Analyze IOT environments using various communication technologies 4. Apply various IOT enabling technologies for creation of IOT environments		
Unit:1	**Introduction**	**5 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		**38 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
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/noc21_cs17/preview
2	https://onlinecourses.nptel.ac.in/noc21_ee85/preview

VI Semester

22AML614– Lab- PE II: Internet of Things

Sr. No.	Experiments based on
1	To study IoT Kit
2	Design a sketch for running of LED's
3	Design a sketch to monitor state of switch by establishing serial communication between Arduino and computer
4	Design a sketch to read analog value of potentiometer by establishing serial communication between arduino and computer
5	Design a sketch for blinking LED's without using delay
6	Design a sketch to develop switch based binary LED counter. Also observe output on serial monitor
7	Design a sketch to create a simple digital clock using LCD display
8	Design a sketch to make use of EEPROM to control devices(LED)
9	To log data of temperature sensor over internet and monitor it from anywhere in the world
10	Use of ESP-32

VI Semester

22AML615– PE II: Cloud computing

Course Outcomes:		
Upon successful completion of the course the students will be able to 1. Explain software and hardware support for enterprise and cloud computing. 2. Perform data modelling for enterprise and cloud knowledge bases. 3. Design enterprise and cloud software applications. 4. Implement and run distributed and cloud applications. 5. Ensure security and privacy in enterprise and cloud application while implementing cloud applications methodologies.		
Unit:1	**Introduction to Cloud Computing**	**6 Hours**
Defining Cloud Computing; Cloud Types and different models-The NIST model, The Cloud Cube Model, Deployment models, Service models; Examining the Characteristics of Cloud Computing; Benefits of cloud computing; Disadvantages of cloud computing; Assessing the Role of Open Standards.		
Unit:2	**Cloud Architecture, Services and Applications**	**6 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	**Abstraction and Virtualization**	**6 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	**Exploring Cloud Infrastructures**	**6 Hours**
Managing the Cloud-Administrating the Clouds, Management responsibilities, Lifecycle management Cloud Management Products, Emerging Cloud Management Standards, Understanding Service Oriented Architecture- Introducing Service Oriented Architecture.		
Unit:5	**Managing & Securing the Cloud**	**6 Hours**
Administrating the Clouds, Cloud Management Products, Emerging Cloud Management Standards, Securing the Cloud, Securing Data, the security boundary, Security service boundary, Security mapping, Brokered cloud storage access, Establishing Identity and Presence.		

Unit :6	Advance Clouds and Case Studies	6 Hours
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		**36 Hours**
Textbooks		
1	Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Michael Miller, Springer	
2	Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc., Rajkumar Buyya, James Broberg, Andrzej Goscinski, A John Wiley & Sons, Inc. Publication	
Reference Books		
	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 Mc-Graw-HILL	
3	Cloud computing bible, Barrie sosinsky, Wiley publishing	
4	https://cloud.google.com/appengine/docs https://www.chef.io/solutions/cloud-management/ https://aws.amazon.com/documentation https://dev.twitter.com/overview/documentation https://developers.facebook.com/ https://www.cloudfoundry.org/ https://puppet.com/blog/implement-a-message-queue-your-cloud-applicati	
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	
MOOCs Links and additional reading, learning, video material		
1	https://onlinecourses.nptel.ac.in/noc21_cs14/preview	
2	https://nptel.ac.in/courses/106105167	

VI Semester

22AML616– Lab- PE II: Cloud computing

Sr. No.	List of Experiment
1	To Study Cloud Computing Stack and Different Models of Cloud computing.
2	Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
3	Install a C compiler in the virtual machine created using virtual box and execute Simple Programs.
4	Install Google App Engine. Create hello world app and other simple web applications using python/java.
5	Use GAE launcher to launch the web applications.
6	Find a procedure to transfer the files from one virtual machine to another virtual machine.
7	Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version).
8	Installation and Configuration of Hadoop.
9	Create a word count application using Hadoop Map/Reduce.

VI Semester

22AML631– OE III: Introduction to Artificial Intelligence

Course Outcomes:		
Upon successful completion of the course the students will be able to 1. Understand concepts of Artificial Intelligence and different types of intelligent agents and their architecture.		
Unit:1	**Introduction to AI**	**6 Hours**
Introduction : What Is AI?, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art, Risks and Benefits of AI, Intelligent Agents: Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents, Representation the AI Problems, Production System		
Unit:2	Knowledge Representation	**6 Hours**
Predicate and propositional logic , Forward and Backward Chaining , Backtracking		
Unit:3	**Local Search Algorithms and Optimization Problems**	**6 Hours**
Local Search in Continuous Space, Searching with Non deterministic actions, Searching with partial observations, online search agents and unknown environments.		
Unit:4	**Adversarial Search & Games**	**6 Hours**
Game Theory, Optimal Decisions in Games, Mini-Max Search, Alpha Beta Pruning, and Limitations of Game Search Algorithms.		
Unit:5	**Uncertainty in AI**	**6 Hours**
Conditional Reasoning & Bayes Rule, Bayesian Networks, Maximum Likelihood Learning, Maximum A-posterior learning, Markov Decision Processes		
Unit:5	**Introduction to Knowledge**	**6 Hours**
Introduction, Types of Knowledge, Knowledge Representation, Knowledge Storage, Knowledge Acquisition, Knowledge Organization and Management, Basic Concepts of Knowledge Engineering		
Total Lecture Hours		**36 Hours**

Textbooks	
1	Stuart Russell and Peter Norvig. Artificial Intelligence: A Modern Approach, 3rd Edition, Prentice Hall, 2009Tata McGraw-Hills Publication Company Limited, New Delhi.
2	Elaine Rich, Kevin Knight, Shivshankar Nair, Artificial Intelligence, McGraw Hill.

Reference Books	
1	R. C. Schank and C. K. Riesbeck: Inside Computer Understanding: Five Programs Plus Miniatures, Lawrence Erlbaum, 1981.
2	Murray Shanahan: A Circumscriptive Calculus of Events. Artificial. Intelligence 77(2), pp. 249-284, 1995.

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	Handbook of Artificial Intelligence, Edited By Avronn Barr and Edward Feigenbaum https://stacks.stanford.edu/file/druid:qn160ck3308/qn160ck3308.pdf
2	Patrick Henry Winston. Artificial Intelligence, Addison-Wesley, 1992. https://courses.csail.mit.edu/6.034f/ai3/rest.pdf
MOOCs Links and additional reading, learning, video material	
1	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs42/

VI Semester

22AML632– OE III: Software Testing

Course Outcome
Upon successful completion of this course, the student will be able to: 1. Formulate problem by following Software testing life cycle. 2. Design Manual Test cases for Software Project. 3. Demonstrate utilization of testing automation though testing tool.

Unit No.	Contents	Max. Hrs.
1	**Software Testing Basics:** Basic concepts of Testing: Need of Testing, Basic concepts- errors, faults, defects, failures, objective of testing, central issue in testing, Testing activities, V-Model, Sources of information for test cases, Monitoring and Measuring Test Execution, Test tools and Automation, Limitation of Testing.	6
2	**Unit Testing:** Unit Testing: Concepts of Unit Testing, Static Unit Testing, Defect Prevention, Dynamic Unit Testing, Mutation Testing, Debugging, Tools for Unit Testing.	6
3	**Control Flow Testing:** Control Flow Testing: Outline of Control Flow Testing, Control Flow Graphs, Path in Control Flow Graph, Path selection criteria, All path coverage criteria, Statement coverage, Path coverage.	7
4	**Integration Testing:** Data Flow and System Integration Testing: Introduction Data flow testing, Data flow graph, Data flow testing criteria, Fundamentals of System Integration: Types of interfaces and interface errors, System integration testing, Software and Hardware integration.	7
5	**System Testing:** System Testing: Taxonomy of system test, Basic Test, Functionality test, Robustness test, Performance test, Scalability test, Stress test, Load and Stability test, Reliability test, Regression test, Documentation Test.	6
6	**Test Cases:** Test Design: Test cases, Necessity of test case documentation, Test case design methods, Functional specification-based test case design, Use case bases, application based test case design, level of test execution.	6

Text Books	
S.No	**Title**
1	Software Testing and Quality Assurance**,** Kshirsagar Naik and PriyadarshiniTripathi**,** Wiley Publication
2	Software Testing Principles, Techniques and Tools**,** M.G. Limaye**,** McGraw Hills

Reference Books	
S.No	**Title**
1	Foundations of Software Testing**,** Aditya P. Mathur**,** Pearson Education
2	Software Testing Tools**,** Dr. K. V. K. K. Prasad**,** Dream Tech

MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc21_cs13/preview
2	https://onlinecourses.nptel.ac.in/noc19_cs71/preview

VI Semester

22AML651– OE IV: Introduction to Machine Learning

Course Outcomes:

After undergoing the course, student will be able to:

1. Understand various supervised machine learning algorithms
2. Understand various unsupervised machine learning algorithms
3. Apply supervised and unsupervised learning on the given set of samples and design the model to accomplish the given task.
4. understand various performance evaluation measures for supervised and unsupervised learning

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**	**6 Hours**
Linear and polynomial regression, classification with k-Nearest Neighbours, Naive Bayes Classifiers, Decision Trees, Generalization, logistic regression, bias and variance, Overfitting, and Underfitting		
Unit:3	**Supervised Learning-2**	**6 Hours**
Random forests, Kernelized Support Vector Machines, Uncertainty in Multiclass Classification, feature engineering and selection, evaluation metrics for supervised learning		
Unit:4	**Unsupervised Learning**	**6 Hours**
k-Means Clustering , Choosing the Number of Clusters, Semi-Supervised Learning , Evaluation metrics for unsupervised learning		
Unit:5	**Design and Analysis of Machine Learning Experiments**	**6 Hours**
Factors, Response, and Strategy of Experimentation, Randomization, Hypothesis testing, Replication, and Blocking, Guidelines for Machine Learning Experiments , Cross-Validation and Resampling Methods, K-Fold Cross-Validation, Comparing Two Classification Algorithms.		
Unit :6	**Advances in Machine Learning**	**6 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		**36 Hours**

Textbooks	
1	Introduction to Machine Learning", Ethem Alpaydin, The MIT Press, second edition
2	Deep learning:Ian Goodfellow, Yoshua Bengio, and Aaron Courville, Deep Learning (http://www.deeplearningbook.org/)
Reference Books	
1	Machine Learning", Tom Mitchell, McGraw-Hill Science/Engineering/Math, 1997
2	Introduction to Machine Learning with Python, A Guide for Data Scientists Andreas C. Müller and Sarah Guido ORIELLY
3	Christopher M. Bishop, Pattern Recognition and Machine Learning. http://research.microsoft.com/enus/um/people/cmbishop/prml/.
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/60.Introduction_to_Machine_Learning_-_2e_-_Ethem_Alpaydin.pdf
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

Vl Semester

22AML652– OE IV: Problem solving Techniques and Statistical methods

Course Outcomes:		
Upon successful completion of the course the students will be able to 1. Apply Techniques of Problem solving for the solution of mathematical problems. 2. Solve problems related to Numbers, Sets, and Functions, Induction, Combinatorics. 3. Define, formulate and solve problems in a systematic manner. 4. Understand fundamental concepts of data analysis using statistics.		
Unit:1	**Introduction**	**6 Hours**
Numbers, Sets and Functions, Problem Solving Techniques,Language and Proofs, Quantifiers and Logical Statements, Compound Statements, Elementary proof techniques.		
Unit:2	**Combinatorics**	**7 Hours**
Induction, Bijection and Cardinality, Combinatorics,		
Unit:3	**Graph**	**7 Hours**
Counting, Graph Theory, Recurrence Relations		
Unit:4	**Basic Statistics**	**6 Hours**
Sources of Data, Organization of Data, The Histogram, Measures of central tendency, Mean Deviation, Standard Deviation, Correlation, Coefficient of correlation, Rank correlation, Regression.		
Unit:5	**Probability**	**6 Hours**
Equally likely, mutually exclusive events, definitions of probability, additions & multiplication theorems of probability and problems based on them. Bayesian approach, distributions; Poisson, normal, Erlang, Gamma and Weibull probability distributions		
Unit :6	**Multivariate Data**	**6 Hours**
Random Vectors and Matrices, sample estimate of centroid, standard deviation, SSCP, dispersion, variance, covariance, correlation matrices.		
Total Lecture Hours		**38 Hours**

Textbooks	
1	Mathematical Thinking-Problem Solving and Proofs. 2nd Edition (2000), JohnP.D'Angelo and Douglas B.,Prentice Hill , West
2	Statistics for Management, Levin R.I. and Rubin D.S., Pearson education
Reference Books	
1	Probability and Statistics , Third edition ,Murray R. Spiegel, John J.Schiller, R AluSrinivasan, Mc Graw Hill education
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/111105077
2	https://onlinecourses.nptel.ac.in/noc21_ma74/preview

VI SEMESTER

22AML607 : Project Phase I

VI SEMESTER

Audit Course

MLC2126 : YCAP6

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 3.25)

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Technology

SoE & Syllabus 2022

7th & 8th Semester

(Department of Computer Science and Engineering

B.Tech in CSE (AIML)

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.TECH SCHEME OF EXAMINATION 2022

(Scheme of Examination w.e.f. 2022-23 onward)

(Department of Computer Science & Engineering)

CSE (AIML)

SoE No. 22AML-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	
SEVENTH SEMESTER															
1	7	7	PC	22AML701	Computer Vision	**T**	3	0	0	3	3	30	20	50	3 Hours
2	7	7	PC	22AML702	**Lab:** Computer Vision	**P**	0	0	2	2	1		60	40	
3	7	7	PC	22AML703	Shallow & Deep Learning	**T**	3	0	0	3	3	30	20	50	3 Hours
4	7	7	PC	22AML704	**Lab:** Shallow & Deep Learning	**P**	0	0	2	2	1		60	40	
5	7	7	HS	22AML705	Cyber laws & Ethics in IT	**T**	3	0	0	3	3	30	20	50	3 Hours
6	7	7	PE		**Professional Elective-III**	**T**	3	0	0	3	3	30	20	50	3 Hours
7	7	7	PE		**Professional Elective-IV**	**T**	3	0	0	3	3	30	20	50	3 Hours
8	7	7	PE		**Lab:Professional Elective-IV**	**P**	0	0	2	2	1		60	40	
9	7	7	PE		**Professional Elective-V**	**T**	3	0	0	3	3	30	20	50	3 Hours
10	7	7	STR	22AML706	Project Phase-II	**P**	0	0	10	10	5		60	40	
11	7	7	STR	22AML707	Campus Recruitment Training (CRT)	**P**	0	0	0	0	2		100		
						TOTAL	**18**	**0**	**16**	**34**	**28**				

List of Professional Electives-III

1	7	PE-III	CSE	22AML711	PE III: Big Data Analytics
2	7	PE-III	CSE	22AML712	PE III: Nature Inspired Computing
3	7	PE-III	CSE	22AML713	PE III: Information Retrival System
4	7	PE-III	CSE	22AML714	PE III: Data Mining

List of Professional Electives-IV

1	7	PE-IV	CSE	22AML731	PE IV: Cyber Forensic
2	7	PE-IV	CSE	22AML732	PE IV: **Lab:** Cyber Forensic
3	7	PE-IV	CSE	22AML733	PE IV: AI for Medical Domain
4	7	PE-IV	CSE	22AML734	PE IV: **Lab:** AI for Medical Domain
5	7	PE-IV	CSE	22AML735	PE IV: Cognitive System
6	7	PE-IV	CSE	22AML736	PE IV: **Lab:** Cognitive System
7	7	PE-IV	CSE	22AML737	PE IV: Natural Language Processing
8	7	PE-IV	CSE	22AML738	PE IV: **Lab:** Natural Language Processing

List of Professional Electives-V

1	7	PE-V	CSE	22AML751	PE V: Robotics and its Applications
2	7	PE-V	CSE	22AML752	PE V: Augumented / Virtual reality
3	7	PE-V	CSE	22AML753	PE V: Game theory
4	7	PE-V	CSE	22AML754	PE V: Human Computer Interaction

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

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

		June 2022	**1.00**	**Applicable for AY 2022-23 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)

B.TECH SCHEME OF EXAMINATION 2022

(Scheme of Examination w.e.f. 2022-23 onward)

(Department of Computer Science & Engineering)

CSE (AIML)

SoE No. 22AML-101

SN	Sem	Type	BoS/ Deptt	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
							L	T	P	Hrs		MSEs*	TA**	ESE	
Eighth Semester															
1	**8**	**STR**	AML	22AML801	Internship - training / Seminar & Report	**P**	0	0	12	12	3		60	40	
2	**8**	**STR**	AML	22AML802	Extra Curricular Activity Evaluation	**P**	0	0	0	0	2		100		
TOTAL EIGHTH SEM							**0**	**0**	**12**	**12**	**5**				
GRAND TOTAL							**111**	**6**	**81**	**196**	**161**				

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

TA ** = for Theory : 12 marks on lecture quizzes, 12 marks on two TA2 activitied decided by course teacher, 2 marks on class attendance and 4

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

		June 2022	**1.00**
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**

Applicable for AY 2022-23 Onwards

VII Semester

22AML701– Computer Vision

Course Outcomes:
Upon successful completion of the course the students will be able to
1. Learn fundamentals of computer vision and its applications 2. Understand the basic image processing operations to enhance, segment the images. 3. Understand the analyzing and extraction of relevant features of the concerned domain problem. 4. Understand and apply the motion concepts and its relevance in real time applications. 5. Apply the knowledge in solving high level vision problems like object recognition, image classification etc.

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

Textbooks	
1	Computer Vision: Algorithms and Applications, R. Szeliski, Springer, 2011.
2	Introductory techniques for 3D computer vision, E. Trucco and A. Verri, Prentice Hall, 1998.
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/e-copies%20of%20books/7.Information%20Technology/54.NLP_Language_processing_jurafsky_BOOK.pdf
MOOCs Links and additional reading, learning, video material	
1	https://www.youtube.com/live/FbOCV344iLA?si=IQdy1JM1b4z-Evww
2	

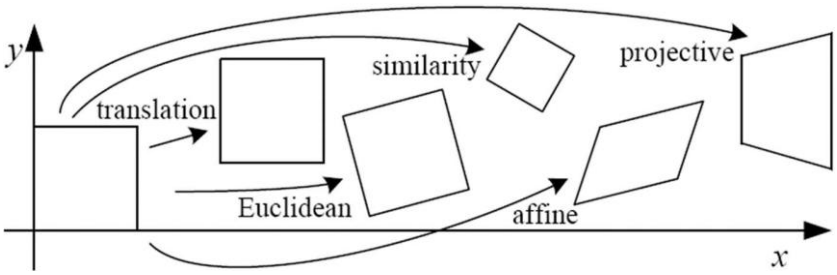
VII Semester

22AML702– Lab: Computer Vision

Sr.No	Experiments based on
01	**AIM:** Write and execute the MATLAB Code to learn the RGB color image plane separation, image sampling, quantization and false contouring. Refer the Lenna.tif color image and perform the following: *(i)* Evaluate the given image and identify how many bits are used for the pixel intensity representation. *(ii)* The given image is a color image. Separate out three grey level planes of the image and do *(i)*. *(iii)* For each separated grey level plane, convert it to 7-bit, 6- bit, 5-bit, 4-bit, 3-bit, 2-bit, and 1-bit images (keeping the image size constant). *(iv)* Plot the results obtained in *(ii)* and *(iii)* for each grey level plane independently (Three independent plots for R, G and B Plane and each plot consists of 8 images). *(v)* Analyze the plots obtained in *(iv)* and discuss about the quantization. *(vi)* Analyze the plots obtained in *(iv)* and discuss about the false contouring. *(vii)* Plot the color images for 7-bit, 6-bit, 5-bit, 4-bit, 3-bit, 2- bit, and 1-bit (Single plot consists of 8 color images including original image). *(viii)* Analyze the plot obtained in *(vii)* and write the comments. ***Give the Proper Titles to the generated plots.***
02	**AIM:** Write and execute the MATLAB Code to learn the conversion of color image to grey level image, contrast stretching, intensity level slicing, and bit-plane slicing. Refer the Lenna.tif color image and perform the following: *(i)* Convert the given image to grey level image and visualize the obtained image. *(ii)* Obtained the Negative Image of the result obtained in *(i)*. *(iii)* Take suitable Transformation function and perform contrast stretching on the image obtained in *(i)*. *(iv)* Take suitable Transformation function and perform intensity level slicing on the image obtained in *(i)*. *(v)* Perform bit-plane slicing on the image obtained in *(i)*. *(vi)* Plot the result obtained in *(i)*, *(ii)*, *(iii)* and *(iv)* (Single plot consists of 6 images including original color image). *(vii)* Plot the result obtained in *(v)* (Single plot consists of 8 images). ***Give the Proper Titles to the generated plots.***
03	**AIM:** Write and execute the MATLAB Code to learn the different contrast images, histogram of grey level images, and histogram equalization of grey level images. Refer the Lenna.tif color image and perform the following: *(i)* Convert the given image to grey level image and visualize the obtained image. *(ii)* Obtained four different contrast images from the obtained image in *(i)*. Use the addition and

	subtraction operation with the values 50 and 100. *(iii)* Plot the result obtained in *(i)* and *(ii)* (Single plot consists of 5 images). *(iv)* Generate the histograms of the obtained images in *(ii).* *(v)* Plot the result obtained in *(ii)* and *(iv)* (Single plot consists of 4 images and 4 histograms). *(vi)* Generate the histogram-equalized images for the images obtained in *(ii)* and the corresponding equalized histograms. *(vii)* Plot the result obtained in *(vi)* (Single plot consists of 4 images and 4 histograms). *(viii)* Plot the images obtained in *(ii)* and *(vi)* (Single plot consists of 8 images). *(ix)* Plot the histograms obtained in *(iv)* and *(vi)* (Single plot consists of 8 histograms). ***Give the Proper Titles to the generated plots.***
04	Write and execute the MATLAB Code to learn the image filtering operations of smoothing and sharpening in spatial domain. Refer the Lenna.tif color image and perform the following: *(i)* Convert the given image to grey level image and visualize the obtained image. *(ii)* Perform the following filtering operations on the image obtained in *(i)*. (A) Smoothing using the following spatial domain filters (1) Average Filter (Box Filter) (2) Weighted Average Filter (3) Min Filter (4) Median Filter (5) Max Filter (B) Sharpening using the following spatial domain filters (1) All Four Versions of Laplacian Filter (2) Roberts Cross Gradient Operators (3) Sobel Operators *(iii)* Plot the results obtained in *(ii)(A)(1),* and *(ii)(A)(2)* (Single plot consists of 3 images, including original grey level image). *(iv)* Plot the results obtained in *(ii)(A)(3), (ii)(A)(4)* and *(ii)(A)(5)* (Single plot consists of 4 images, including original grey level image). *(v)* Plot the results obtained in *(ii)(B)(1)* (Single plot consists of 5 images, including original grey level image). *(vi)* Plot the results obtained in *(ii)(B)(2)* and *(ii)(B)(3)* (Single plot consists of 3 images, including original grey level image). ***Give the Proper Titles to the generated plots.***
05	**AIM:** Write and execute the MATLAB Code to learn the image filtering operations of smoothing and sharpening in frequency domain. Refer the Lenna.tif color image and perform the following: *(i)* Convert the given image to grey level image and visualize the obtained image. *(ii)* Perform the following filtering operations on the image obtained in *(i)*. (A) Smoothing using the following frequency domain filters (1) Gaussian Low Pass Filter Do the filtering with different Cut-off frequencies,

	e.g. 10, 20, 30, 40 and 50. (2) Butterworth Low Pass Filter Do the filtering with different orders e.g. *n* = 1, 2, 3, 4, and 5 with Cut-off frequencies, e.g. 10, 20, 30, 40 and 50 in each *n*. (B) Sharpening using the following frequency domain filters (1) Gaussian High Pass Filter Do the filtering with different Cut-off frequencies, e.g. 10, 20, 30, 40 and 50. (2) Butterworth High Pass Filter Do the filtering with different orders e.g. *n* = 10, 20, 30, 40, and 50 with Cut-off frequencies, e.g. 10, 20, 30, 40 and 50 in each *n*. *(iii)* Plot the results obtained in *(ii)(A)(1)* for original grey level image, Fourier Spectrum *F* of image, Centered Filter *H* (2D view), Centered Filter *H* (3D view), Spectrum of the Product *HF* (Single plot consists of 5 images, including original grey level image) and Filtered Images for each Cut-off frequencies (Single plot consists of 6 images, including original grey level image). (TOTAL 2 Plots). *(iv)* When *n= 1,* plot the results obtained in *(ii)(A)(2)* for original grey level image, Fourier Spectrum *F* of image, Centered Filter *H* (2D view), Centered Filter *H* (3D view), Spectrum of the Product *HF* (Single plot consists of 5 images, including original grey level image) and Filtered Images for each Cut-off frequencies (Single plot consists of 6 images, including original grey level image). Repeat above for other values of *n*, *i.e. n= 2, 3, 4,* and *5*. (TOTAL 10 Plots). *(v)* Plot the results obtained in *(ii)(B)(1)* (like (iii)). *(vi)* Plot the results obtained in *(ii)(B)(2)* (like (iv)). ***Give the Proper Titles to the generated plots.***
06	**AIM:** Write and execute the MATLAB Code to learn the image edge detection using Roberts Cross Gradient, Sobel, Prewitt and Canny edge detectors. Refer the Lenna.tif color image and perform the following: *(i)* Convert the given image to grey level image and visualize the obtained image. *(ii)* Compute the edges in grey level image using different edge detectors like Roberts Cross Gradient, Sobel, Prewitt and Canny. *(iii)* Plot the results obtained *(Original grey level image and other four edge images)*. ***Give the Proper Title to the generated plot.***
07	**AIM:** Write and execute the MATLAB Code to learn the region growing based image segmentation. Refer the Lenna.tif color image and perform the following: *(i)* Convert the given image to grey level image and visualize the obtained image. *(ii)* Generate the histogram of the obtained grey level image. *(iii)* Write a function *rgis(I,S,T)* where *S* can be an array (the same size as *I*) with a 1 at the coordinates of every seed point and 0s elsewhere. *S* can also be a single seed value. Similarly *T* can be an array (the same size as *I*) containing a threshold value for each pixel in I. *T* can also be a scalar, in which case it becomes a global threshold. The output of the function *rgis(I,S,T)* is *[IO, NR, SI, TI]* where *IO* is the segmented image, with the members of each region being labeled with an integer value. *NR* is the number of different regions. *SI* is an image containing the final seed points, and *TI* is an image

	containing the pixels in *I* that passed the threshold test before they were processed for connectivity. Both *SI* and *TI* are of the same size as *I*. *(iv)* Plot the results obtained *((a) Original grey level image, (b) Histogram, (c) Seed points image, (d) Binary image showing all the pixels (in white) that passed the threshold test, and* *(e) Result after all the pixels in (d) were analyzed for 8- connectivity to the seed points).* ***Give the Proper Title to the generated plot.***
08	**AIM:** Develop an interactive simulator for at least FOUR 2D planar transformations (Translation, Euclidean, Similarity, Affine and Projective).  Following points to be pondered: *(i)* Simulator should allow the user to select the geometry of the 2D plane **OR** Simulator should allow the user to select the coordinates of the 2D plane. *(ii)* Simulator should show the transformed 2D plane **OR** Simulator should show the transformed 2D plane with transformed coordinates. *(iii)* Prepare a README file (Word document which will describe How do one can use the Simulator, provide the demonstration screenshots in this README file along with the instructions). *(iv)* You are allowed to use any language and platform (C, C++, Python, MATLAB, etc.) for the development. If you could do it in MATLAB that would be appreciated. *(v)* Use the proper titles and sub-titles for the screens of simulator. Simulator opening screen should be titled as "**2D planar Transformations**".
09	**AIM:** Write the case study report for ANY ONE of the following: *(i)* Facial Recognition *(ii)* 2D Object Recognition (iii)Image Classification **NOTE:** • Content of the case study report should be as per the provided format. Relevant code, dataset and all relevant executables should be provided as per the instructions

10	**AIM:** Write the case study report for ANY ONE of the following: *(i)* Object Tracking *(ii)* 3D Object Recognition *(iii)* 3D Object Reconstruction **NOTE:** • Content of the case study report should be as per the provided format. Relevant code, dataset and all relevant executables should be provided as per the instructions (*i.e.* Repository).

VII Semester

22AML703– Shallow & Deep Learning

Course Outcomes:		
Upon successful completion of the course the students will be able to CO-1: Understand the basic concepts, underlying mathematics, neural network architectures and learning rules CO-2: Understand , Design and Apply shallow networks for solving classification and regression problems CO-3: Select suitable model parameters for different shallow and deep learning models. CO-4: Understand, Design and Apply deep networks for solving real world problems		
Unit:1	**Introduction to Biological and Artificial Neural Networks**	6 Hrs
Necessary mathematics for shallow and deep learning: review of basics of Linear algebra, statistics, and calculus. Biological Neurons, General Artificial Neuron Model, MP Neuron, Neuron activation functions, Perceptron and its types, Neural Network learning Rules, types of neural networks, feedforward vs recurrent neural networks.		
Unit:2	**Perceptron Training and Machine Learning Basics**	6 Hrs
Single Discrete Perceptron training algorithm, linear machine and minimum distance classification, gradient descent and Single Continuous Perceptron training algorithm. Machine learning basics: supervised vs unsupervised learning, various Machine learning(ML) tasks like classification, regression, and clustering. Capacity, Overfitting and Underfitting, bias and variance of a ML model.		
Unit:3	**Multilayer Perceptrons and Backpropagation Algorithm**	6 Hrs
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.		
Unit:4	**Regularization and MLP applications**	5 Hrs
L1, L2 Regularization, Early stopping, Dropout regularization, Dataset augmentation, Normalization of inputs. Applications of MLPs for classification and regression, performance measures for classification and regression.		

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

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

VII Semester

22AML704– Lab: Shallow & Deep Learning

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

VII Semester

22AML705– Cyber laws & Ethics in IT

Course Outcomes:
Upon successful completion of the course the students will be able to 1. Understand Cyber laws 2. Describe Information Technology act and Related Legislation. 3. Demonstrate Electronic business and legal issues. 4. Interpret Cyber Ethics.

Unit:1	**Introduction to Cyber law**	**6 Hours**
Evolution of computer Technology, emergence of cyber space. Cyber Jurisprudence, Jurisprudence and law, Doctrinal approach, Consensual approach, Real Approach, Cyber Ethics, Cyber Jurisdiction, Hierarchy of courts, Civil and criminal jurisdictions, CyberspaceWeb space, Web hosting and web Development agreement, Legal and Technological Significance of domain Names, Internet as a tool for global access.		
Unit:2	**Information Technology Act**	**7 Hours**
Overview of IT Act, 2000, Amendments and Limitations of IT Act, Digital Signatures, Cryptographic Algorithm, Public Cryptography, Private Cryptography, Electronic Governance, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature, Certifying Authorities, Cyber Crime and Offences, Network Service Providers Liability, Cyber Regulations Appellate Tribunal, Penalties and Adjudication.		
Unit:3	**Cyber law and Related Legislation**	**7 Hours**
Patent Law, Trademark Law, Copyright, Software – Copyright or Patented, Domain Names and Copyright disputes, Electronic Data Base and its Protection, IT Act and Civil Procedure Code, IT Act and Criminal Procedural Code, Relevant Sections of Indian Evidence Act, Relevant Sections of Bankers Book Evidence Act, Relevant Sections of Indian Penal Code, Relevant Sections of Reserve Bank of India Act, Law Relating To Employees And Internet, Alternative Dispute Resolution , Online Dispute Resolution (ODR).		
Unit:4	**Electronic Business and legal issues**	**6 Hours**
Evolution and development in E-commerce, paper vs paper less contracts E-Commerce models- B2B, B2C, E security. Business, taxation, electronic payments, supply chain, EDI, E-markets, Emerging Trends.		
Unit:5	**Cyber Ethics**	**7 Hours**
The Importance of Cyber Law, Significance of cyber Ethics, Need for Cyber regulations and Ethics. Ethics in Information society, Introduction to Artificial Intelligence Ethics: Ethical Issues in AI and core Principles, Introduction to Block chain Ethics.		

Unit :6	Treatment of cyber crimes under the IT Act 2008	6 Hours
Offence and penalties prescribed in I.T Act 2008, Controller"s powers with respect to offences And their regulation. Law relating to Cyber crime Under Indian Penal Code (IPC) 1860 Making false electronic record (S.464 IPC) Punishment for forgery (S.465 IPC); forgery of public record etc. (S.466 IPC) and Forgery for purpose of cheating (S.468) Forged document or electronic record (S.470); Using as genuine a forged document or electronic record (S.471); Counterfeiting device or mark used for authenticating documents or electronic record or possessing counterfeit marked material, Falsifying accounts. (S.474 and S.477A).		
Total Lecture Hours		**39 Hours**

Textbooks	
1	"Cyberlaw: Text and Cases" by Gerald R. Ferrera, Catherine D. Ferrera, and Andrew C. Hess
2	"Cyber Law and Cyber Security in Developing and Emerging Economies" by Babu, N."
3	"Cyber Ethics: Morality and Law in Cyberspace" by Richard A. Spinello
Reference Books	
1	Cyber Laws: Intellectual property & E Commerce, Security- Kumar K, dominant Publisher
2	Cyber Ethics 4.0, Christoph Stuckelberger, Pavan Duggal, by Globethic
3	Legal Dimensions of Cyber Space, Verma S, K, Mittal Raman, Indian Law Institute, New Delhi
4	Satyam infoway Ltd. Vs Sifynet solution Pvt. Ltd (2004) 6SCC145
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc23_cs127/preview
2	https://onlinecourses.swayam2.ac.in/nou19_cs08/preview

VII Semester

22AML711– PE III: Big Data Analytics

Course Outcomes:

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

1. **Understand** fundamentals of big data, issues in big data management, big data analytics and its associated applications in intelligent business and scientific computing
2. **Apply** machine Learning algorithms for real world data, to provide analytics
3. **Demonstrate** the Map Reduce programming model to process the big data along with Hadoop tools
4. **Illustrate** the concepts of NoSQL using MongoDB and Cassandra for BigData.

Unit:1	**Introduction to Big Data**	**5 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.

Unit:2	**Big data analytics and Analytical methods**	**8 Hours**

Overview of business intelligence, Characteristics and need of big data analytics, Classification of analytics, Challenges to big data analytics. Analytical operations: Associations rules- Apriori algorithm, classifications- decision trees, naïve bayes clustering- K means.

Unit:3	**Hadoop foundation for analytics**	**6 Hours**

Features, key advantages of Hadoop , key aspects of Hadoop, versions of Hadoop , Hadoop ecosystem ,and Components, HDFS, HBase, Hadoop Technology Stack: Hive, Pig, Zookeeper, Swoop, oozie, flume, etc. Hadoop distributions, Hadoop vs SQL

Unit:4	**MapReduce and YARN framework**	**6 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**	**5 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

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, Document searching, Constructing queries on Databases, documents

Total Lecture Hours	**36 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
4	BIG Data and Analytics ,Sima Acharya, Subhashini Chhellappan , Willey
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
MOOCs Links and additional reading, learning, video material	
1. https://onlinecourses.nptel.ac.in/noc20_cs92/preview	

VII Semester

22AML712– PE III: Nature Inspired Computing

Course Outcomes:		
Upon successful completion of the course the students will be able to 1. Understand the principles and theoretical foundations of nature-inspired computing. 2. Develop a working knowledge of the major nature-inspired computing techniques and algorithms. 3. Explore the applications of nature-inspired computing in various problem domains. 4. Gain hands-on experience in implementing and evaluating nature-inspired computing algorithms. 5. Develop critical thinking and problem-solving skills through analyzing and discussing research papers		
Unit:1	**Introduction to Nature-Inspired Computing**	**6 Hours**
History, Major tasks, Natural paradigms, Cellular automata :Dynamical systems, simulation,Self-replication, Comparison with traditional computation paradigms.		
Unit:2	**Evolutionary Computing**	**6 Hours**
Background and history of evolutionary computation (EC), Different branches of EC: GA, GP, EA, EP, DE, Selected applications of EC methods		
Unit:3	**Neural Networks, Deep Learning**	**6 Hours**
Neural Networks : Background and history of artificial neural networks (ANNs), Learning algorithms based on ANNs, Optimization with ANNs, Selected applications of ANNs		
Unit:4	**Swarm Intelligence**	**6 Hours**
Swarm Intelligence :Background and history of collective and swarm intelligence, Examples of swarm intelligence in biology, Mechanisms of swarm behaviour (such as recruitment, quorum sensing), Selected application of swarm methods, Ant Colony Optimization and other swarm-based algorithms		
Unit:5	**Artificial Immune Systems**	**6 Hours**
Immune system functioning and principles, Immune-inspired algorithms: clonal selection, negative selection, and immune network algorithms, Applications in anomaly detection, optimization, and pattern recognition		

Unit :6	Applications of Nature-Inspired Computing	6 Hours
Engineering design optimization, Financial forecasting and portfolio optimization, Image and signal processing, Data mining and pattern recognition		
Total Lecture Hours		**36 Hours**

Textbooks	
	Leandro Nunes de Castro, " Fundamentals of Natural Computing, Basic Concepts, Algorithms and Applications", Chapman & Hall/ CRC, Taylor and Francis Group, 2007
1	Kazumi Nakamatsu, Srikanta Patnaik, Xin-She Yang "Nature-Inspired Computing and Optimization Theory and Applications".
2	Himansu Das, Jitendra Kumar Rout, Minakhi Rout ,"Nature Inspired Computing for Data Science".
Reference Books	
1	Floreano D. and Mattiussi C., "Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies", MIT Press, Cambridge, MA, 2008.
2	3. Albert Y.Zomaya, "Handbook of Nature-Inspired and Innovative Computing", Springer, 2006. 4. Marco Dorrigo,
3	Thomas Stutzle," Ant Colony Optimization", PHI,2005
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	https://download.e-bookshelf.de/download/0000/0007/62/L-G-0000000762-0002339775.pdf
MOOCs Links and additional reading, learning, video material	
1	https://www.youtube.com/watch?v=3OkQ72y77LM

VII Semester

22AML713– PE III: Information Retrieval System

Course Outcomes:		
Upon successful completion of the course the students will be able to 1. Understand different Information retrieval models. 2. Know about evaluation methods of the information retrieval model. 3. 3. Know the challenges associated with each topic		
Unit:1	**Introduction to Information retrieval**	**7 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**	**7 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**	**6 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**	**6 Hours**
Web Information Retrieval Hypertext, web crawling, search engines, ranking, link analysis, PageRank, HITS.		
Total Lecture Hours		**39 Hours**

Textbooks	
1	Introduction to Information Retrieval , Christopher D. Manning, Raghavan and Schutze, Cambridge University Press,2008
Reference Books	
1	Natural Language Processing And Information Retrieval, Tanveer Siddiqui and U. S. Tiwary, Oxford Higher Education,2008**,** Royce**,** 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://cse.iitkgp.ac.in/~pabitra/course/ir06/ir06.html
2	https://cse.iitk.ac.in/pages/CS657.html

VII Semester

22AML714– PE III: Data Mining

Course Outcomes:
Upon successful completion of the course the students will be able to CO-1: Define and explain fundamental concepts in data mining CO-2 Apply various data mining techniques, including decision trees, neural networks, clustering algorithms, and association rule mining algorithms. CO-3: Evaluate and validate the results of data mining models, considering factors like accuracy, precision, recall, and F1-score. CO-4: Apply data mining techniques to real-world datasets and scenarios, solving practical problems and making informed decisions. CO-5- Gain practical experience using data mining tools such as WEKA, R or other relevant software.

Unit:1	**Introduction to Data Mining**	6 Hrs
Data mining definitions & task, data mining on what kind of data ,Knowledge Discovery vs. Data mining, DBMS vs. Data Mining, Data mining functionalities, data mining task primitives , Major issues in data mining , applications of data mining.		
Unit:2	**Association Rule Mining**	7 Hrs
Frequent itemsets, closed itemsets, and association rules, frequent pattern mining, applications of Association Rule mining, The Apriori algorithm for finding frequent itemset using candidate generation, generating association rules from frequent itemsets, Improving effieciency of Apriori , FP- growth algorithm.		
Unit:3	**Classification and prediction**	7 Hrs
What is classification , prediction., Issues regarding Classification and prediction, Decision tree construction principle, Decision tree construction algorithms ID3, C4.5, Classification using decision tree Induction, Bayes classifier ,K- nearest Neighbour , prediction using Linear regression, Logistic regression		

Unit:4	**Cluster Analysis**	7 Hrs
What is cluster analysis, its applications, clustering paradigms, Partioning algorithms: K-means,K-medoids, Hierarchial clustering: Agglomerative and Divisive hierarchical clustering, DBSCAN algorithm ,Outlier Detection,		
Unit:5	**Web Mining**	7Hrs
Introduction, web content mining, web structure mining, web usage mining, mining multimedia data on web.		
Unit :6	**Text mining:**	7Hrs
Text data analysis and Information retrieval, Unstructured texts, text mining approaches, episode rule discovery for texts, Hierarchy of categories, text clustering		

Text books	
1.	Data Mining: Concepts and Techniques, Pei, Han and Kamber, Elsevier, 2011
2.	Introduction to Data Mining, Tan, Steinbach and Vipin Kumar, Pearson Education, 2016
Reference Books	
1.	Data mining methods and models second reprint,2007 Daniel Larose Wiley Interscience
2.	Data mining techniques 2nd edition Arun Pujari University press,(India) 2010
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	https://link.springer.com/book/10.1007/978-3-319-14142-8
2	https://onlinelibrary.wiley.com/doi/book/10.1002/9781118950951
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc21_cs06/preview

VII Semester

22AML731– PE IV: Cyber Forensic

Course Outcomes:		
Upon successful completion of the course the students will be able to 1. Investigate hardware parts of a computer system for evidences 2. Use different tools for data acquisition and duplication for forensic study 3. Securely store data and evidence collected 4. Create report of forensic investigation made		
Unit:1	**Introduction**	**8 Hours**
Types of Cyber Crime, Security Attacks, Overview of computer forensics in today's world, computer hardware basics, Computer forensics investigation process, understanding hard disks and file systems, Types of computer forensics.		
Unit:2	**Computer Forensic**	**8Hours**
Computer forensic: Data acquisition and duplication, defeating anti-forensics techniques, operating system forensics, Log analysis and event viewer, File auditing, identifying rogue machines, Malware forensic Database forensic.		
Unit:3	**IT Fraud**	**7 Hours**
IT fraud, Recovery of deleted files, Live Data collection and investigating Linux environment. Password recovery (tools like John the ripper, L0phtcrack, and THC-Hydra), email crimes.		
Unit:4	**Network Forensics**	**8 Hours**
Network forensics, investigating web attacks, Gathering Tools to create a response toolkit. Hidden files and unauthorized access points. Analyzing network traffic, Sniffers Hardware forensic tools like Port scanning and vulnerability assessment tools like Nmap, Netscan etc.		
Unit:5	**Mobile Forensics**	**7 Hours**
Mobile Forensics, Live Data collection and investigating on android, ios, windows environment, Investigating report generation, investigation process, acquisition types, tools, report generation		
Unit :6	**Case Studies**	**7 Hours**
Forensics report writing and presentation, Case studies		
Total Lecture Hours		**45 Hours**

Textbooks	
1	Incident Response & Computer Forensics, Second, Mandia, K., Prosise, C., Pepe, M., Tata-McGraw Hill
2	Guide to Computer Forensics and Investigations, Bill Nelson, Amelia Phillips, Frank Enfinger, and Chris Steuart, Thomson Learning
Reference Books	
1	File System Forensic Analysis, Brian Carrier, Wesley
2	Digital Evidence and Computer Crime, Eoghan Casey, Academic Press
3	Windows Forensic Analysis DVD Toolkit (Book with DVD-ROM), Harlan Carvey, Syngress Publication
4	EnCE: The Official EnCase Certified Examiner Study Guide, Steve Bunting, Sybex Publication
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://103.152.199.179/YCCE/Suported%20file/Supprted%20file/e-copies%20of%20books/Computer%20Technology/41-Introductory%20Computer%20%20Forensics.pdf
MOOCs Links and additional reading, learning, video material	
1	Cyber Security and Cyber Forensics (cdac.in)
2	https://onlinecourses.swayam2.ac.in/cec20_lb06/preview

VII Semester

22AML732– Lab: PE IV: Cyber Forensic

Exp. No	Name of Experiment /Problem Statement
1	Study Practical on Cyber-crime and generation of Hash values on file system
2	Perform data accusation and imaging on digital evidence.
3	Perform recovery and data carving on digital evidence.
4	Explore and analyses tools on Email analysis an investigation.
5	Password recovery tools, from RAR, DOC, PDF, windows password.
6	Mobile forensics SIM analysis.
7	Mobile data Analysis.
8	Vulnerability Analysis on Windows.
9	Report and Evidence Submission using tools.
10	Innovation

VII Semester

22AML733– PE IV: AI for Medical Domain

Course Outcomes:		
Upon successful completion of the course the students will be able to 1. Understand what is Artificial Intelligence (AI) and Machine learning (ML) 2. Understand the concept of Internet of Things (IoT) and its applications in healthcare 3. Analyze the healthcare data and process it using data analysis and statistical tools 4. Explore the applications of AI and ML with respect to healthcare domain		
Unit:1	**Introduction**	**7Hours**
Introduction to Artificial Intelligence (AI), Overview of techniques and applications,Artificial neural networks,Supervised, semi-, and non-supervised learning,Pattern recognition,Interactive process mining,Tools and real-world examples, Importance and Applications of AI and ML in Healthcare		
Unit:2	**Types of Machine Learning and its classification**	**4 Hours**
Traditional machine learning methods,Decision Tree, Bayesian Classifier, Regression		
Unit:3	**Neural Networks, their types, and processing**	**7 Hours**
Neural Networks – learning Models,Deep Neural Network, Convolution Neural Networks & Recurrent Neural Networks , Natural Language Processing , Commonly Used and Advanced Neural Network architectures,Computer Vision		
Unit:4	**Internet of Things (IoT)**	**5 Hours**
Introduction ,Process flow and Tools, Use Cases,Remote Patient Monitoring		
Unit:5	**Data Representation**	**7 Hours**
Data Representation: Introduction to data, data frames ,Data standardization, Dealing with noise and missing values ,Transforming and normalizing data		
Unit :6	**Data Analytics and Data Analysis**	**8 Hours**
Overview of tools like R, Python ,Statistical and Visualization tools,Sources of the healthcare data ,Pre-processing of the healthcare data ,Handling of the healthcare data ,Creation of analysis-ready datasets		
Total Lecture Hours		**39 Hours**

Textbooks	
1	Russell, S. and Norvig, N. Artificial Intelligence: A Modern Approach. Prentice Hall Series in Artificial Intelligence 3
2	Bishop, C. M. Neural Networks for Pattern Recognition. Oxford University Press.
Reference Books	
1	Hastie, T., Tibshirani, R. and Friedman, J. The Elements of Statistical Learning, Springer
2	Adam Gibson, Josh Patterson, Deep Learning, O'Reilly Media, Inc.
3	Guoguang Rong, Arnaldo Mendez, Elie Bou Assi, Bo Zhao, Mohamad Sawan, Artificial Intelligence in Healthcare: Review and Prediction Case Studies, Engineering, Volume 6, Issue 3, 2020, Pages 291-301, ISSN 2095-8099, https://doi.org/10.1016/j.eng.2019.08.015.
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	https://onlinelibrary.wiley.com/doi/book/10.1002/9781394242528
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc21_ge20/preview
2	https://www.bing.com/videos/riverview/relatedvideo?q=nptel+swayam+video-+Artificial+inteigence%2c+R%2cHaelth+care&&view=riverview&mmscn=mtsc&mid=983697E5D426C99AEAB9983697E5D426C99AEAB9&&aps=7&mcid=97B87FCE36CE427786162C21300F3310&FORM=VMSOVR

VII Semester

22AML734– Lab: PE IV: AI for Medical Domain

(Practical's based on above Syllabus)

VII Semester

22AML735– PE IV: Cognitive System

Course Outcomes:		
Upon successful completion of the course the students will be able to: 1. To understand the way in which cognitive science is methodologically distinctive while at the same time is an interdisciplinary field where established fields of research—including Psychology, Computer Science, Linguistics, Neuroscience. 2. To develop skills in analyzing, interpreting, and assessing the empirical data and research techniques that contribute to cognitive science. 3. To understand central modeling techniques in cognitive science, including traditional computational approaches, neural network/deep learning approaches, and dynamical approaches.		
Unit:1	**Introduction to Cognitive Science**	**7 Hours**
Introduction to the study of cognitive sciences. Neural Network Models- language: definition Affordances Categories and concepts; Concept learning: Linguistic knowledge: Syntax, semantics, (and pragmatics) Direct perception, Logic; Machine learning.		
Unit:2	**Concept Hierarchies**	**7 Hours**
A brief history of cognitive science. Processing of sensory information in the brain, Linguistic knowledge: Syntax, semantics, (and pragmatics), Ecological Psychology, constructing memories Methodological concerns in philosophy, Discretization and generating concept hierarchies, Data Mining System, Generative linguistic, Affordance learning in robotics, Explicit vs. implicit memory		
Unit:3	**Anatomy of brain**	**7 Hours**
Artificial intelligence and psychology, Brain Imaging, Brain and language, Affordance learning in robotics, Information processing (three-boxes) model of memory Structure and constituents of the brain fMRI, MEG, Language disorders, Development Information processing (three-boxes) model of memory.		
Unit:4	**Memory Models**	**5 Hours**
Brief history of neuroscience, PET, EEG Lateralization Child and robotic development Sensory memory; Short term memory Mathematical models, Multisensory integration in cortex, Lateralization, Attention and related concepts, long term memory; Rationality		

Unit:5	Sensory Information fusion and Modelling	7 Hours
Mathematical models Information fusion, the great past tense debate, Human visual attention, Bounded rationality; Prospect theory; Heuristics and biases Looking at brain signals. Computational models of attention, Reasoning in computers, Cybernetics, Cognitivist and emergent stand points, Computational models of attention, Key points in social cognition		
Unit :6	**Information processing**	**6 Hours**
Processing of sensory information in the brain. From physics to meaning, Analog vs. Digital: Code duality. A robotic perspective, Applications of computational models of attentional Context and social judgment; Schemas; Social signals		
Total Lecture Hours		**39 Hours**

Textbooks	
1	Pradeep KumarMallick, Samarjeet Borah," Emerging Trends and Applications in Cognitive Computing", 2019, IGI Global Publishers
2	Masood, Adnan, Hashmi, Adnan ,Cognitive Computing Recipes-Artificial Intelligence Solutions Using Microsoft Cognitive Services and TensorFlow, 2015
Reference Books	
1	Jose Luis Bermudez, "Cognitive Science: An Introduction to the Science of the Mind", 2020 Cambridge University Press, New York.
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	
MOOCs Links and additional reading, learning, video material	
1	https://nptel.ac.in/courses/109103134
2	https://onlinecourses.nptel.ac.in/noc20_hs29/preview
3	https://onlinecourses.nptel.ac.in/noc22_ee122/preview

VII Semester

22AML736– Lab: PE IV: Cognitive System

(Practical's based on above Syllabus)

VII Semester

22AML737– PE IV: Natural Language Processing

Course Outcomes:
Upon successful completion of the course the students will be able to 1. Model linguistic phenomena with formal grammars. 2. Design, implement and test algorithms for NLP problems 3. Apply NLP techniques to design real world NLP applications 4.Develop useful systems for language processing and related tasks involving text processing

Unit:1	**Introduction to NLP**	**5 Hours**
Introduction, History of NLP, Generic NLP system, levels of NLP , Knowledge in language processing , Ambiguity in Natural language, stages in NLP, challenges of NLP, Applications of NLP.		

Unit:2	**Morphology**	**8 Hours**
Morphology fundamentals, Morphological Diversity of Indian Languages, Morphology Paradigms, Shallow Parsing, Named Entities, Maximum Entropy Models, Random Fields. Word Level Analysis, Morphology analysis –survey of English and Indian language Morphology, Inflectional morphology & Derivational morphology, Lemmatization, Regular expression, finite automata, finite state transducers (FST) ,Morphological parsing with FST , Lexicon free FST Porter stemmer. N –Grams- N-gram language model, N-gram for spelling correction.		

Unit:3	**Parsing**	**7 Hours**
Theories of Parsing, Parsing Algorithms; Robust and Scalable Parsing on Noisy Text as in Web documents, Hybrid of Rule Based and Probabilistic Parsing; Scope Ambiguity and Attachment Ambiguity resolution, Dependency Parsing, Distributional Semantics.		

Unit:4	**Semantic & Lexical Analysis**	**8 Hours**
Meaning : Lexical Knowledge Networks, Wordnet Theory, Indian Language Wordnets and Multilingual Dictionaries, Semantic Roles, Word Sense Disambiguation, WSD and Multilinguality Semantic Analysis: Lexical Semantics, Attachment for fragment of English- sentences, noun phrases, Verb phrases, prepositional phrases, Relations among lexemes & their senses –Homonymy, Polysemy, Synonymy, Hyponymy, Robust Word Sense Disambiguation (WSD), Dictionary based approach.		

Unit:5	**NLP Operations**	7 Hours
Information Extraction, Relation Extraction, Text Summarization, Text Classification, Entity Linking, Syntax and Grammar Analysis		

Unit :6	NLP Applications	7 Hours
Natural language Processing applications (preferably for Indian regional languages) : Sentiment Analysis, Text Entailment, Robust and Scalable Machine Translation, Question Answering in Multilingual Setting, Cross Lingual Information Retrieval (CLIR).		
Total Lecture Hours		**Hours**

Textbooks	
1	Jurafsky, Daniel, and James H. Martin, Speech and Language Processing:An Introduction to Natural Language Processing, Speech Recognition, and Computational Linguistics, PrenticeHall, 2000.
2	Christopher D. Manning and HinrichSchütze, Foundations of Statistical Natural Language Processing. Cambridge, MIT Press, 1999.
3	Speech and Language Processing: An Introduction to Natural Language Processing by Dan Jurafsky and James Martin,3rd Edition, Pearson Publication
Reference Books	
1	James Allen, Natural Language Understanding, Benjamin/Cummings, 2ed, 1995.
2	Eugene Charniak, Statistical Language Learning, MIT Press, 1996.
3	Martin Atkinson, David Britain, Harald Clahsen, Andrew Redford, Linguistics, Cambridge University Press, 1999.
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
MOOCs Links and additional reading, learning, video material	
1	https://nptel.ac.in/courses/106101007
2	https://onlinecourses.nptel.ac.in/noc22_cs98/preview

VII Semester

22AML738– Lab: PE IV: Natural Language Processing

Sr.No	Experiments based on
01	Program should be based on Natural Language Understanding (Lexical Ambiguity, Syntactical Ambiguity, Referential Ambiguity)
02	Study and understand the BERT Model
03	Perform a program based on Errors Detection and Corrections
04	Program should be based on Sentence Framing
05	Perform a program based on Part-of-Speech (POS) Tagging
06	Perform a program based on Lexical Semantics
07	Perform a program based on Dependency Parsing
08	Perform a program based on NLP Applications

VII Semester

22AML751– PE V: Robotics and its Applications

Course Outcome
Upon completion of the course the students will be able to 1. Interpret terminologies related to Robotics technology. 2. Understand various grippers and sensors for robotics and Analyze basics of principles of robot system integration. 3. Integrate knowledge of AI techniques in the area of robotic technology. 4. Apply robotics concept to automate the monotonous and hazardous tasks and categorize various types of robots based on the design and applications in real world scenarios.

Unit No.	Contents	Max Hrs.
1	**Introduction to Robotics :**	7
Brief History, Basic Concepts of Robotics such as Definition , Three laws,Elements of Robotic Systems i.e. Robot anatomy, DOF, Misunderstood devices etc., Classification of Robotic systems on the basis of various parameters such as work volume, type of drive, etc., Associated parameters i.e. resolution, accuracy, repeatability, dexterity, compliance, RCC device etc., Introduction to Principles & Strategies of Automation, Types & Levels of Automations, Need of automation, Industrial applications of robot.		
2	**Grippers and Sensors for Robotics:**	6
Grippers for Robotics - Types of Grippers, Guidelines for design for robotic gripper, Force analysis for various basic gripper system. Sensors for Robots - Types of Sensors used in Robotics, Classification and applications of sensors, Characteristics of sensing devices, Selections of sensors. Need for sensors and vision system in the working and control of a robot.		
3	**Drives and Control for Robotics:**	6
Drive - Types of Drives, Types of transmission systems,Actuators and its selection while designing a robot system. Control Systems: Types of Controllers, Introduction to closed loop control		
4	**Programming and Languages for Robotics:**	7
Robot Programming: Methods of robot programming,WAIT, SIGNAL and DELAY commands, subroutines, Programming Languages: Generations of Robotic Languages, Introduction to various types such as VAL, RAIL, AML, Python, ROS etc., Development of languages since WAVE till ROS.		
5	**Related Topics in Robotics:**	6
Socio-Economic aspect of robotisation. Economical aspects for robot design, Safety for robot and standards, Introduction to Artificial Intelligence, AI techniques, Need andapplication of AI, New trends & recent updates in robotics		
6	**Robotics Applications:**	7

Material Handling: pick and place, palletizing and depalletizing, machining loading and unloading, welding & assembly, Medical, agricultural and space applications, unmanned vehicles: ground, Ariel and underwater applications, robotic for computer integrated manufacturing. Types of robots: Manipulator, Legged robot, wheeled robot, aerial robots, Industrial robots, Humanoids, Robots, Autonomous robots, and Swarm robots

Total Lectures	

Text Books	
1	S. K. Saha, Introduction to Robotics 2e, TATA McGraw Hills, Education (2014)
2	Dilip Kumar Pratihar Fundamentals of Robotics Narosa Publishing House
3	Asitava Ghoshal, Robotics: Fundamental concepts and analysis, Oxford University Press

Reference Books	
1	S. B. Niku Introduction to Robotics – Analysis Contro, Applications John, Wiley & Sons Ltd., (2020)
2	J. Angeles Fundamentals of Robotic Mechanical Systems Theory Methods and Algorithms Springer (1997).

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	https://roboticscasual.com/robotics-tutorials/
2	https://www.ieee-ras.org/educational-resources-outreach/educational-material-in-robotics-and-automation
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc21_ge20/preview

VII Semester

22AML752– PE V: Augmented & Virtual Reality

Course Outcome
Upon completion of the course the students will be able to 1. Understand the basic concepts of Virtual and Augmented Reality 2. Identify the differences in AR/VR concepts and technologies 3. Understand the fundamental concepts relating to Virtual Reality such as presence, immersion, and engagement 4. Evaluate usability of AR/VR applications and critique their use of AR/VR capabilities 5. Design and prototype effective AR/VR applications using UNITY platform for business, industry, non-profit and government organizations

Unit No.	Contents	Max Hrs.
1	**Introduction to Augmented Reality (AR)**	6
Definition and Scope, A Brief History of Augmented Reality ,Displays (Multimodal Displays, Spatial Display Model, and Visual Displays), Strong vs Weak AR, Applications of AR, Challenges in AR		
2	**Introduction to Virtual Reality (VR)**	6
Definition and Scope, Types of VR, Characteristics of VR, Basic VR environments, Limitations of VR environments, Immersion Vs Presence, Key hardware requirements for VR		
3	**Interaction design for AR/VR environments**	6
Interaction design process, Identifying user needs, AR/VR design considerations, Typical AR/VR Interface Metaphors, Affordances in AR/VR, Human Information Processing.		
4	**AR/VR and UNITY**	7
Design for Perception and cognition, User experience(UX) guidelines for AR/VR UX challenges for AR/VR, Prototyping for AR/VR, Evaluation of the developed AR/VR prototype. Unity Overview: Windows, Interface, Navigation, Terminology, Game Objects, Hierarchy, Parenting Objects		
5	**Introduction to UNITY**	6
Asset Store, Importing Plug-ins, Creating a Terrain, Materials, Colors, Transparency Introduction to Monobehaviors: Awake, Start, Update		
6	**Introduction to Vuforia and Physics in UNITY**	7
Vuforia Overview: Interface, Navigation, Terminology, Image Targeting, Custom Images Overview of Physics in Unity, Introduction to Scripting: Terminology, Creating Objects, Accessing Components, Debugging, Lists, Loops		
	Total Lectures	**38**

Text Books	
1	Sherman, W. R., & Craig, A. B. (2003). Understanding virtual reality. San Francisco, CA: Morgan Kauffman.
2	Schmalstieg, D., & Hollerer, T. (2016). Augmented reality: principles and practice. Addison-Wesley Professional.

Reference Books	
1	http://lavalle.pl/vr/book.html

YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]
1. http://lavalle.pl/vr/book.html
MOOCs Links and additional reading, learning, video material
https://nptel.ac.in/courses/106/106/106106138/
https://www.coursera.org/learn/introduction-virtual-reality
https://www.youtube.com/watch?v=MGuSTAqlZ9Q
https://www.udemy.com/course/fundamentals-of-augmented-reality-virtual-reality-101-ar-vr/

VII Semester

22AML753– PE V: Game Theory

Course Outcomes:		
Upon successful completion of the course the students will be able to 1. Identify areas where game theory is applicable 2. Implement different principals of game theory 3. Find the various theorems by Analyzing game theory 4. Develop real life applications using game theory		
Unit:1	**Introduction to Game Theory**	**6 Hours**
Elements of Game theory, examples, Strategic Games, 2 Player Strategy Games, payoffs, Minimax, Weak and Strong Domination, Saddle Points, Nash Equilibrium, Prisoner's Dilemma,Stag Hunt, Matching pennies, BOS, Multi NE, Cooperative and Competitive Games, Strict and Non Strict NE, Best response functions for NE		
Unit:2	**Principles of Game Theory**	**7 Hours**
Combinatorial games, Winning and losing positions, Subtraction Game, 3-Pile and K-Pile Games, Proof of Correctness, Variations of K-Pile Games, Graph Games, Construction, Proof of finiteness, SG theorem for sum of games.		
Unit:3	**Theorems of Game Theory**	**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, Stackelberg's model of Duopoly, Buying Votes, Committee Decision making, Repeated Games, Prisoner's Dilemma, Supermodular Game and Potential games		
Unit:4	**Extensive form games: perfect information**	**6 Hours**
Game trees and extensive forms, Reduced form and Nash equilibrium, Backward induction and subgame perfect equilibrium, Stackelberg's model of Duopoly, Buying Votes,Mixed and behavior strategies, Alternating offers bargaining		
Unit:5	**Extensive form games: incomplete information**	**6 Hours**
Perfect Bayesian equilibrium,Sequential equilibrium		

Unit :6	Auction and Mechanism Design with Applications	6 Hours
Revenue Equivalence, Risk Averse Bidders, Asymmetries among Bidders, Optimal Mechanism, Bargaining in Wireless Network, Efficient Mechanism: Vickrey-Clarke-Groves Auction, Dynamic Spectrum Auction in Cognitive Radio Networks.		
Total Lecture Hours		**38 Hours**

Textbooks	
1	Game Theory by Michael Maschler, Eilon Solan, and Shmuel Zamir.
2	Game Theory by Fudenberg, Drew, and Jean Tirole.. MIT Press
Reference Books	
1	An Introduction to Game Theory by Martin Osborne, Oxford University Press
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/noc19_ge32/preview
2	https://archive.nptel.ac.in › courses

VII Semester

22AML754– PE V: 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:1	**Introduction**	**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**	**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 and Evaluation**	**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**	**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	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	

VII Semester

22AML706– Project Phase-II

VII Semester

22AML707– Campus Recruitment Training (CRT)

VIII SEMESTER

22AML801– Internship - training / Seminar & Report

VIII SEMESTER

22AML802- Extra-Curricular Activity Evaluation

COURSE OBJECTIVES	COURSE OUTCOME
1. To organize co-curricular activities to make competitive spirit, cooperation, leadership, diligence, punctuality, team spirits. 2. To develop creative talent, self-confidence, sense of achievement. 3. To be able to design process on environmental, social, political, ethical, health and safety. 4. To develop broad education to understand the impact of engineering solution in a global economic, environmental, society.	1. An ability to work initially as well as part of team to achieve set goals. 2. An ability to work to serve society and for betterment of society. 3. An ability to communicate with people at large.
Mapped Program Outcomes : 1,2,3,45,6,7,9,10,11	

Due credits will be given to the students based on their performance and involvement in different extra and co-curricular activities conducted within the college or by other organizations/ institutions. Due credit will also be given to the student if they are successful in different competitive examinations conducted by different organizations. The guidelines as given in academic regulations will be followed for evaluation.