VELALAR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

Thindal, Erode - 638 012

(Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai) (Accredited by NAAC with 'A+' grade)



REGULATIONS 2022

CURRICULUM AND SYLLABUS

B.Tech. ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Choice Based Credit System (CBCS)

4
VCET

VELALAR COLLEGE OF ENGINEERING AND TECHNOLOGY (Autonomous)

-VCEL -	
Department	Artificial Intelligence and Data Science
Programme	B.Tech - Artificial Intelligence and Data Science
Regulations	2022

	SUMMARY OF CREDITS												
				Cre	edits po	er Sem	ester				Credite	Credits as	
S.No	Course Category	1	2	3	4	5	6	7	8	Total Credits	in %	per AICTE Model Curriculum	
1	HS	4	4					4		12	7.50	15	
2	BS	11	8	4	4					27	16.88	23	
3	ES	8	8	4			4			24	15.00	22	
4	PC			12	20	12	7	4		55	34.37	54	
5	PE					6	6	6		18	11.25	18	
6	OE					3	3	3		9	5.63	15	
7	EC						3		12	15	9.37	16	
8	MC					✓						-	
9	VC					✓						-	
10 OC, SC, AC						✓						-	
Total	Credits / Sem	23	20	20	24	21	23	17	12	160	100	163	

HS - Humanities and Social Science

BS - Basic Science

ES - Engineering Science

PC - Professional Core

PE - Professional Elective

OE - Open Elective

EC - Employability Enhancement Course (Project, Seminar, Internship, etc.)

MC - Mandatory Course

VC - Value added course (If three or more credits earned, then one elective course may be exempted)

OC - Online Course (If six or more credits earned, then two elective courses may be exempted)

SC - Self Study course

AC - Audit Course

ENROLLMENT FOR B.E. / B. TECH. (HONOURS) / MINOR DEGREE (OPTIONAL)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree.

For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only.

For Minor Degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes.



VELALAR COLLEGE OF ENGINEERING AND TECHNOLOGY (Autonomous)

CURRICULUM

R – 2022 Incorporating

Relative Grading

System

UG

Department

Artificial Intelligence and Data Science

Programme B.Tech- Artificial Intelligence and Data Science

SEMESTER 1 Course Title Course Code Max. Marks S. Category Periods / Credits No Week Т Р CA SE L Tot. 1 22MCT01 Induction Programme MC 2 WEEKS 0 _ _ _ Theory 3 2 HS 3 0 0 40 22ENT11 **Communicative English** 60 100 (For the students admitted in AY 2022–2023 only) 22ENT11 **Communicative English** 3 2a HS 0 0 3 40 60 100 (For Students admitted from AY: 2023–2024 onwards) 22MAT12 Matrices and Differential Calculus 4 3 BS 3 1 0 40 60 100 Engineering Physics 4 22PHT11 BS 3 0 0 3 40 60 100 22CYT11 3 5 **Engineering Chemistry** BS 3 0 40 100 0 60 3 22CST11 **Python Programming** ES 3 0 0 40 60 100 6 7 22MET11 **Engineering Graphics** ES 2 0 4 4 40 60 100 22HST11 தமிழர் மரபு /Heritage of Tamils 8 (For Students admitted from AY:2023-2024 HS 1 0 0 40 60 1 100 onwards) **Practical** 9 22PHL11 Physics and Chemistry Laboratory I BS 0 2 40 0 1 60 100 10 22CSL11 Python Programming Laboratory ES 0 0 2 1 60 40 100 (For the students admitted in AY 2022–2023 and 2023–2024 only) ES 2 10a 22CSL11 Python Programming Laboratory 0 0 1 60 40 100 (For Students admitted from AY:2024-2025 onwards) Mandatory 22MCT02 Universal Human Values 100 11 MC 0 0 2 0 0 100 **Total Credits** 23

	SEMESTER 2										
S. No	Course Code	Course Code Course Title		Periods / Week			riods / stipe Veek page		Max. Marks		
NO			Ca	L	Т	Р	C	CA	SE	Tot.	
	Theory										
1	22ENT21	Professional English (For the students admitted in AY 2022–2023 only)	HS	3	0	0	3	40	60	100	
1a	22ENT21	Professional English (For Students admitted from AY: 2023–2024 onwards)	HS	3	0	0	3	40	60	100	
2	22MAT22	Probability and Statistics	BS	3	1	0	4	40	60	100	

3	22PHT22	Physics for Information Sciences	BS	3	0	0	3	40	60	100	
4	22EET11	Basics of Electrical and Electronics Engineering	ES	3	0	0	3	40	60	100	
5	22ITT21	C Programming	ES	3	0	0	3	40	60	100	
6	22HST11	தமிழர் மரபு /Heritage of Tamils (For Students admitted in AY:2022-2023 only)	HS	1	0	0	1	40	60	100	
6a	22HST21	தமிழரும் தொழில்நட்பமும் /Tamils and Technology (For Students admitted from AY:2023-2024 onwards)	HS	1	0	0	1	40	60	100	
	1	Practical				l				-	
7	22PHL21	Physics And Chemistry Laboratory II	BS	0	0	2	1	60	40	100	
8	22ITL21	C Programming Laboratory	ES	0	0	2	1	60	40	100	
9	22EEL22	Engineering Practices Laboratory	ES	0	0	2	1	100	0	100	
		Mandatory									
10	22MCT03	Environmental Science and Engineering	MC	2	0	0	0	100	0	100	
			То	otal	Cre	dits	20				
		SEMESTER 3	SEMESTER 3								
S.	Course Code	Course Title	tegory	Pe	eriods / stip			Ma	x. Ma	irks	
			Ca	L	Т	Р	C	CA	SE	Tot.	
		Theory			1	1				[
1	22MAT34	Discrete Mathematics	BS	3	1	0	4	40	60	100	
2	22ADT31	Foundations of Data Science	PC	3	0	0	3	40	60	100	
3	22ADC31	Data Structures using Python	PC	3	0	2	4	50	50	100	
4	22ADT32	Java Programming	PC	3	0	0	3	40	60	100	
5	22ADC32	Digital Principles and Computer Organization	ES	3	0	2	4	50	50	100	
6	22HST21	தமிழரும் தொழில்நட்பமும் / Tamils and Technology (For Students admitted in AY:2022-2023 only)	HS	1	0	0	1	40	60	100	
	1	Practical									
7	22ADL31	Java Programming Laboratory	PC	0	0	2	1	60	40	100	
8	22ADL32	Data Science Laboratory	PC	0	0	2	1	60	40	100	
			Т	otal	Cre	dits	20				
		SEMESTER 4				1 /					
S. No	Course Code	Course Title	Course Title		We	ds / ek	redits	Ma	ax. Ma	arks	
		101	Ŭ		, T	P	U U	CA	SE	Tot.	
1	22N/ AT/2	Incory	DC	_ ^	1	0	Л	40	60	100	
1	22IVIA142 22ADT41	Design and Analysis of Algorithms	DC DC	2 2	1	0	4	40	60	100	
2	22AD141 22ADC41	Operating Systems		2		2	4	40 50	50	100	
	22ADC41 22ADT42	Database Management Systems		2			4	10	60	100	
+ 5	22AD142 22ADT42	Data Mining Techniques	PC	2	1	0	<u>з</u>	40	60	100	
5		Data Mining Teeningues	IC	15	11		-	UT 1	00	100	

6	22ADT44	Fundamentals of Artificial Intelligence	PC	3	0	0	3	40	60	100		
		Practical										
7	22ADL41	Artificial Intelligence Laboratory	PC	0	0	2	1	60	40	100		
8	22ADL42	Database Management Systems Laboratory	PC	0	0	2	1	60	40	100		
	Mandatory											
9 22MCL04 English for Professionals (For the students admitted in AY 2022–2023 and 2023– MC 0 0 2024 only)							0	100	0	100		
9a22MCL04English for Professionals (For Students admitted from AY:2024-2025 onwards)					0	2	0	100	0	100		
Total Credits 24												
	SEMESTER 5											
S.	Course Code	Course Title	Periods /			ls / k	edits	Max. Marks				
No	course coue		Cat	L	Т	Р	Cre	CA	SE	Tot.		
	Theory											
1	22ADT51	Machine Learning	PC	3	0	0	3	60	40	100		
2	22ADC51	Computer Networks	PC	3	0	2	4	50	50	100		
3	22ADT52	Big Data Analytics	PC	3	0	0	3	60	40	100		
4		Professional Elective - 1	PE	3	0	0	3	60	40	100		
5		Professional Elective - 2	PE	3	0	0	3	40	60	100		
6		Open Elective - 1	OE	3	0	0	3	40	60	100		
		Practical										
7	22ADL51	Machine Learning Laboratory	PC	0	0	2	1	60	40	100		
8	22ADL52	PC	0	0	2	1	60	40	100			
Mandatory												
9	22MCT05	Aptitude and Logical Reasoning	MC	2	0	0	0	100	0	100		
			Т	otal	Cree	dits	21					

	SEMESTER 6											
S.	Course	Course Title	tegory	Pe	eriod Weel	ls / k	redits	Max. Marks				
INO	Code		Cai	L	Т	Р	Cr	CA	SE	Tot.		
	Theory											
1	22ADT61	Data and Information Security	PC	3	0	0	3	40	60	100		
2	22ADT62	Deep Learning	PC	3	0	0	3	40	60	100		
3	22ADC61	Embedded Systems and IoT	ES	3	0	2	4	50	50	100		
4		Professional Elective - 3	PE	3	0	0	3	40	60	100		
5		Professional Elective - 4	PE	3	0	0	3	40	60	100		
6		Open Elective - 2	OE	3	0	0	3	40	60	100		
	Practical											
7	22ADL61	Deep Learning Laboratory	PC	0	0	2	1	60	40	100		

8	22ADL62	Mini Project	EC	0	0	6	3	40	60	100	
	Mandatory										
9	22MCL06	Communication Skills Laboratory	MC	0	0	2	0	100	0	100	
Total Credit											

	SEMESTER 7										
S.	Course	Course Title	tegory	Pe	eriods / Week		edits	Max. Marks			
INO	Code		Cai	L	Т	Р	Cr	CA	SE	Tot.	
	Theory										
1	22ADT71	Economics and Management for Engineers	HS	3	0	0	3	40	60	100	
2	22ADT72	Data Warehousing and Business Intelligence	PC	3	0	0	3	40	60	100	
3		Professional Elective - 5			0	0	3	40	60	100	
4		Professional Elective - 6		3	0	0	3	40	60	100	
5		Open Elective - 3	OE	3	0	0	3	40	60	100	
6	22HST71	Human Values and Professional Ethics	HS	1	0	0	1	40	60	100	
		Practical									
7	22ADL71	Data Warehousing and Business Intelligence Laboratory	PC	0	0	2	1	60	40	100	
	Mandatory										
8	22MCT07	Indian Constitution and Traditional Knowledge	MC	2	0	0	0	100	0	100	
		lits	17								

	SEMESTER 8										
S.	Course	Course Title	tegory	Periods / Week			edits	Max. Marks			
INO	Code	Practical	Cat	L	Т	Р	Cr	CA	SE	Tot.	
	Practical										
1	22ADL81	Internship	EC	-	-	-	2	100	0	100	
2	22ADL82	Project Work	EC	0	0	20	10	40	60	100	
Total Credits							12				
Total Programme Credit							160				

PROFESSIONAL ELECTIVE COURSES: VERTICALS

Vertical I Artificial	Vertical II Data Science	Vertical III Full Stack	Vertical IV Cloud Computing	Vertical V Emerging	Vertical VI Networking and
Intelligence and Machine Learning		Development	and Data Processing Technologies	Technologies	Cyber Security
Knowledge Engineering	Exploratory Data Analysis	Cloud Computing	Cloud Computing	Augmented Reality / Virtual Reality	Ethical Hacking
Soft Computing	Information Retrieval Techniques	nation App Virtualization ieval Development Techniques		Robotic Process Automation	Cyber Forensics
Reinforcement Learning	Text and Speech Analytics	UI/UX Design	Stream Processing	Cyber Security	Cyber Security
Natural Language Processing	Deep Neural Networks	Java Script Frameworks	Storage Technologies	Block chain Technologies	Block chain Technologies
Generative AI	Pattern Recognition	Service Oriented Architecture	Distributed Computing	3D Printing and Design	Distributed Computing
Computer Vision	Predictive Analytics	Software Testing and Automation	Software Defined Networks	Game Development	Modern Cryptography
Feature Engineering	Cognitive Science	Python Web Development	Edge Computing	Quantum Computing	Social Networks
Ethics and AI	Health care Analytics	Devops	Security and Privacy in Cloud	Agile Methodologies for Software Development	Security and Privacy in Cloud

Registration of Professional Elective Courses from Verticals:

Professional Elective Courses will be registered in Semesters V tod VII. These courses are listed in groups called verticals that represent a particular area of specialisation / diversified group. Students are permitted to choose all the Professional Electives from a particular vertical or from different verticals. Further, only one Professional Elective course shall be chosen in a semester horizontally (row-wise). However, two courses are permitted from the same row, provided one course is enrolled in Semester V and another in semester VI & VII.

The registration of courses for B.E./B.Tech (Honours) or Minor degree shall be done from Semester V to VIII. The procedure for registration of courses explained above shall be followed for the courses of B.E/B.Tech (Honours) or Minor degree also. For more details on B.E./B.Tech (Honours) or Minor degree refer to the Regulations 2022.

	PROFESSIONAL ELECTIVE COURSES: VERTICALS										
S.	Course	Course Title	tegory	Pe	erioo Wee	ls / k	edits	Ma	ax. Ma	arks	
INO	Code		Cat	L	Т	Р	Cr	CA	SE	Tot.	
	1	Vertical I : Verticals for Artificial Intelligence a	nd Ma	achi	ne I	Jear	ning		I	I	
1	22ADE11	Knowledge Engineering	PE	3	0	0	3	40	60	100	
2	22ADE12	Soft Computing	PE	3	0	0	3	40	60	100	
3	22ADE13	Reinforcement Learning	PE	3	0	0	3	40	60	100	
4	22ADE14	Natural Language Processing	PE	3	0	0	3	40	60	100	
5	22ADE15	Generative AI	PE	3	0	0	3	40	60	100	
6	22ADE16	Computer Vision	PE	3	0	0	3	40	60	100	
7	22ADE17	Feature Engineering	PE	3	0	0	3	40	60	100	
8	22ADE18	Ethics and AI	PE	3	0	0	3	40	60	100	
		Vertical II : Verticals for Data S	Science								
1	22ADE21	Exploratory Data Analysis	PE	3	0	0	3	40	60	100	
2	22ADE22	Information Retrieval Techniques	PE	3	0	0	3	40	60	100	
3	22ADE23	Text and Speech Analytics	PE	3	0	0	3	40	60	100	
4	22ADE24	Deep Neural Networks	PE	3	0	0	3	40	60	100	
5	22ADE25	Pattern Recognition	PE	3	0	0	3	40	60	100	
6	22ADE26	Predictive Analytics	PE	3	0	0	3	40	60	100	
7	22ADE27	Cognitive Science	PE	3	0	0	3	40	60	100	
8	22ADE28	Health care Analytics	PE	3	0	0	3	40	60	100	
	1	Vertical III : Vertical for Full Stack I	Develop	ome	nt	1		1			
1	22ADE31	Cloud Computing	PE	3	0	0	3	40	60	100	
2	22ADE32	App Development	PE	3	0	0	3	40	60	100	
3	22ADE33	UI/UX Design	PE	3	0	0	3	40	60	100	
4	22ADE34	Java Script Frameworks	PE	3	0	0	3	40	60	100	
5	22ADE35	Service Oriented Architecture	PE	3	0	0	3	40	60	100	
6	22ADE36	Software Testing and Automation	PE	3	0	0	3	40	60	100	
7	22ADE37	Python Web Development	PE	3	0	0	3	40	60	100	
8	22ADE38	Devops	PE	3	0	0	3	40	60	100	
	V	ertical IV : Verticals for Cloud Computing and Da	ta Proc	essi	ng T	echn	ologi	es			
1	22ADE31	Cloud Computing	PE	3	0	0	3	40	60	100	
2	22ADE41	Virtualization Techniques	PE	3	0	0	3	40	60	100	
3	22ADE42	Stream Processing	PE	3	0	0	3	40	60	100	
4	22ADE43	Storage Technologies	PE	3	0	0	3	40	60	100	
5	22ADE44	Distributed Computing	PE	3	0	0	3	40	60	100	
6	22ADE45	Software Defined Networks	PE	3	0	0	3	40	60	100	

7	22ADE46	Edge Computing	PE	3	0	0	3	40	60	100
8	22ADE47	Security and Privacy in Cloud	PE	3	0	0	3	40	60	100
		Vertical V : Verticals for Emerging T	echnol	ogie	s					
1	22ADE51	Augmented Reality / Virtual Reality	PE	3	0	0	3	40	60	100
2	22ADE52	Robotic Process Automation	PE	3	0	0	3	40	60	100
3	22ADE53	Cyber Security	PE	3	0	0	3	40	60	100
4	22ADE54	Block chain Technologies	PE	3	0	0	3	40	60	100
5	22ADE55	3D Printing and Design	PE	3	0	0	3	40	60	100
6	22ADE56	Game Development	PE	3	0	0	3	40	60	100
7	22ADE57	Quantum Computing	PE	3	0	0	3	40	60	100
8	22ADE58	Agile Methodologies for Software Development	PE	3	0	0	3	40	60	100
		Vertical VI : Verticals for Networking and	l Cybe	r Seo	curit	y				
1	22ADE61	Ethical Hacking	PE	3	0	0	3	40	60	100
2	22ADE62	Cyber Forensics	PE	3	0	0	3	40	60	100
3	22ADE53	Cyber Security	PE	3	0	0	3	40	60	100
4	22ADE54	Block chain Technologies	PE	3	0	0	3	40	60	100
5	22ADE44	Distributed Computing	PE	3	0	0	3	40	60	100
6	22ADE63	Modern Cryptography	PE	3	0	0	3	40	60	100
7	22ADE64	Social Networks	PE	3	0	0	3	40	60	100
8	22ADE47	Security and Privacy in Cloud	PE	3	0	0	3	40	60	100

		OPEN ELECTIVES								
S.	Course	Course Title	egory	Pe	eriod Wee	ls / k	edits	M	ax. Ma	arks
No	Code		Cat	L	Т	Р	Cr	CA	SE	Tot.
	OFFERE	ED BY DEPARTMENT OF ARTIFICIAL INTELI	LIGEN	CE	ANI) DA	TA S	CIEN	CE	
1	22ADO01	Fundamentals of Database	OE	3	0	0	3	40	60	100
2	22ADO02	Data Science for Engineers	OE	3	0	0	3	40	60	100
3	22ADO03	Cyber Security	OE	3	0	0	3	40	60	100
4	22ADO04	Data Visualization	OE	3	0	0	3	40	60	100
5	22ADO05	Business Analytics	OE	3	0	0	3	40	60	100
		OFFERED BY DEPARTMENT OF BIO MEDI	CAL F	ENG	INE	ERI	NG			
1	22BMO01	Biometric Systems and their Applications	OE	3	0	0	3	40	60	100
2	22BMO02	Healthcare Management Systems	OE	3	0	0	3	40	60	100
3	22BMO03	Basics of Bioinformatics	OE	3	0	0	3	40	60	100
4	22BMO04	Biology for Engineers	OE	3	0	0	3	40	60	100
5	22BMO05	Regulatory Requirements in Pharmaceutical Industries	OE	3	0	0	3	40	60	100
6	22BMO06	Rapid Prototyping	OE	3	0	0	3	40	60	100
7	22BMO07	Radiotherapy Basis and Applications	OE	3	0	0	3	40	60	100
8	22BMO08	Nanotechnology and Applications	OE	3	0	0	3	40	60	100
	1	OFFERED BY DEPARTMENT OF CIVIL	ENG	INE	ERI	NG	1	1	1	
1	22CEO01	Civil and Infrastructure Engineering	OE	3	0	0	3	40	60	100
2	22CEO02	Environmental pollution and waste Management	OE	3	0	0	3	40	60	100
3	22CEO03	Disaster Management and Mitigation	OE	3	0	0	3	40	60	100
4	22CEO04	Building Services	OE	3	0	0	3	40	60	100
	OFF	ERED BY DEPARTMENT OF COMPUTER SCI	ENCE	AN	D EI	NGIN	NEER	ING	1	
1	22CSO01	Foundation of AR/VR	OE	3	0	0	3	40	60	100
2	22CSO02	Web Designing	OE	3	0	0	3	40	60	100
3	22CSO03	Block Chain Fundamentals	OE	3	0	0	3	40	60	100
4	22CSO04	Knowledge Management	OE	3	0	0	3	40	60	100
5	22CSO05	Cloud Computing Essentials	OE	3	0	0	3	40	60	100
	OFFERED	BY DEPARTMENT OF ELECTRONICS AND CO	OMMU	JNI	CAT	ION	ENG	INEE	RING	
1	22ECO01	Consumer Electronics	OE	3	0	0	3	40	60	100
2	22ECO02	Advanced Mobile Communication	OE	3	0	0	3	40	60	100
3	22ECO03	Optoelectronics	OE	3	0	0	3	40	60	100
4	22ECO04	IOT System Design and Applications	OE	3	0	0	3	40	60	100
5	22ECO05	5G Technologies	OE	3	0	0	3	40	60	100

	OFFERED BY DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING 22EEO01 Domestic and Industrial Electrical OE 3 0 0 3 40 60 100													
1	22EEO01	Domestic and Industrial Electrical Installations	OE	3	0	0	3	40	60	100				
2	22EEO02	Renewable Energy Sources	OE	3	0	0	3	40	60	100				
3	22EEO03	Electric Vehicles	OE	3	0	0	3	40	60	100				
4	22EEO04	Energy Auditing and Conservation	OE	3	0	0	3	40	60	100				
		OFFERED BY DEPARTMENT OF MECHANI	CAL I	ENG	INE	ERI	NG							
1	22MEO01	Industrial Instrumentation	OE	3	0	0	3	40	60	100				
2	22MEO02	Product Design and Development	OE	3	0	0	3	40	60	100				
3	22MEO03	Sustainable Manufacturing	OE	3	0	0	3	40	60	100				
4	22MEO04	Entrepreneurship Development	OE	3	0	0	3	40	60	100				
5	22MEO05	Fundamentals of Ergonomics	OE	3	0	0	3	40	60	100				
6	22MEO06	Principles of Management and Industrial Psychology	OE	3	0	0	3	40	60	100				
7	22MEO07	Safety Measures for Engineers	OE	3	0	0	3	40	60	100				
	1	OFFERED BY DEPARTMENT OF MEDICA	AL EL	ECT	RO	NICS	5	1						
1	22MDO01	Introduction To Medical Electronics	OE	3	0	0	3	40	60	100				
2	22MDO02	Hospital Waste Management	OE	3	0	0	3	40	60	100				
3	22MDO03	Hospital Information System	OE	3	0	0	3	40	60	100				
4	22MDO04	IoT Applications in Healthcare	OE	3	0	0	3	40	60	100				
	1	OFFERED BY DEPARTMENT OF INFORMA	FION	ГЕС	HN	OLO	GY		1	r				
1	22ITO01	Basics of Java Programming	OE	3	0	0	3	40	60	100				
2	22ITO02	Ethical Hacking	OE	3	0	0	3	40	60	100				
3	22ITO03	E-Commerce and Applications	OE	3	0	0	3	40	60	100				
4	22ITO04	Basics of Android Application Development	OE	3	0	0	3	40	60	100				
5	22ITO05	Web Essentials	OE	3	0	0	3	40	60	100				
6	22ITO06	Digital Video Editing	OE	3	0	0	3	40	60	100				
		OFFERED BY DEPARTMENT OF SCIENCE	AND	HUN	ЛAN	ITI	ES							
1	22GEO01	National Cadet Corps Studies – I	OE	3	0	0	3	40	60	100				
2	22GEO02	National Cadet Corps Studies – II	OE	3	0	0	3	40	60	100				

VERTICALS FOR MINOR DEGREE (In addition to all the verticals of other programmes

Vertical I Fintech and	Vertical II Entrepreneurship	Vertical III Public	Vertical IV Business Data	Vertical V Environmental	Vertical VI Artificial
Block Chain		Administration	Analytics	and Sustainability	Intelligence
Financial Management	Foundations of Entrepreneurship	Principles of Public Administration	Statistics for Management	Sustainable infrastructure Development	Introduction to Data Science
Fundamentals of Investment	Team Building & Leadership Management for Business	Constitution of India	Data mining for Business Intelligence	Sustainable Agriculture and Environmental Management	Principles of Artificial Intelligence
Banking, Financial Services and Insurance	Creativity & Innovation in Entrepreneurship	Public Personnel Administration	Human Resource Analytics	Sustainable Bio Materials	Data Warehousing and Data Mining
Introduction to Blockchain and its Applications	Principles of Marketing Management For Business	Administrative Theories	Digital Marketing and Social Network Analytics	Materials for Energy Sustainability	Machine Learning Techniques
Fintech Personal Finance and Payments	Human Resource Management for Entrepreneurs	Indian Administrative System	Supply Chain Analytics	Green Technology	Expert Systems
Introduction to Fintech	Financing New Business Ventures	Public Policy Administration	Financial Analytics	Environmental Quality Monitoring and Analysis	Cognitive Science
-	-	-	-	Integrated Energy Planning for Sustainable Development	Gamification
-	-	-	-	Energy Efficiency for Sustainable Development	-

	MINOR DEGREE COURSES: VERTICALS Hours / K N N												
S.	Course	Course Title	H	lour Wee	s / k	edits		Max.	Marks				
No	Code		L	Т	Р	Cr	CA	SE	Tot.				
	I	VERTICAL I- FINTECH AND BLOG	СКС	HAI	N	1	1		1				
1	22ITM11	Financial Management	3	0	0	3	40	60	100				
2	22ITM12	Fundamentals of Investment	3	0	0	3	40	60	100				
3	22ITM13	Banking, Financial Services and Insurance	3	0	0	3	40	60	100				
4	22ITM14	Introduction to Blockchain and its Applications	3	0	0	3	40	60	100				
5	22ITM15	Fintech Personal Finance and Payments	3	0	0	3	40	60	100				
6	22ITM16	Introduction to Fintech	3	0	0	3	40	60	100				
	1	VERTICAL II - ENTREPRENEU	RSH	IP									
1	22MEM21	Foundations of Entrepreneurship	3	0	0	3	40	60	100				
2	22MEM22	Team Building & Leadership Management for Business	3	0	0	3	40	60	100				
3	22MEM23	Creativity & Innovation in Entrepreneurship	3	0	0	3	40	60	100				
4	22MEM24	Principles of Marketing Management for Business	3	0	0	3	40	60	100				
5	22MEM25	Human Resource Management for Entrepreneurs	3	0	0	3	40	60	100				
6	22MEM26	Financing New Business Ventures	3	0	0	3	40	60	100				
		VERTICAL III – PUBLIC ADMINIS	TRA	TIO	N								
1	22ECM31	Principles of Public Administration	3	0	0	3	40	60	100				
2	22ECM32	Constitution of India	3	0	0	3	40	60	100				
3	22ECM33	Public Personnel Administration	3	0	0	3	40	60	100				
4	22ECM34	Administrative Theories	3	0	0	3	40	60	100				
5	22ECM35	Indian Administrative System	3	0	0	3	40	60	100				
6	22ECM36	Public Policy Administration	3	0	0	3	40	60	100				
	I	VERTICAL IV - BUSINESS DATA A	NAL	YTI	CS	-	-	T	T				
1	22CSM41	Statistics for Management	3	0	0	3	40	60	100				
2	22CSM42	Data mining for Business Intelligence	3	0	0	3	40	60	100				
3	22CSM43	Human Resource Analytics	3	0	0	3	40	60	100				
4	22CSM44	Digital Marketing and Social Network Analytics	3	0	0	3	40	60	100				
5	22CSM45	Supply Chain Analytics	3	0	0	3	40	60	100				
6	22CSM46	Financial Analytics	3	0	0	3	40	60	100				
	I	VERTICAL V - ENVIRONMENTAL AND S	UST	AINA	BIL	ITY			I				
1	22CEM51	Sustainable infrastructure Development	3	0	0	3	40	60	100				
2	22CEM52	Sustainable Agriculture and Environmental Management	3	0	0	3	40	60	100				
3	22CEM53	Sustainable BioMaterials	3	0	0	3	40	60	100				
4	22CEM54	Materials for Energy Sustainability	3	0	0	3	40	60	100				
5	22CEM55	Green Technology	3	0	0	3	40	60	100				
6	22CEM56	Environmental Quality Monitoring and Analysis	3	0	0	3	40	60	100				

7	22CEM57	Integrated Energy Planning for Sustainable Development	3	0	0	3	40	60	100
8	22CEM58	Energy Efficiency for Sustainable Development	3	0	0	3	40	60	100
		VERTICAL VI - ARTIFICIAL INTEL	LIG	ENC	CE				
1	22ADM61	Introduction to Data Science	3	0	0	3	40	60	100
2	22ADM62	Principles of Artificial Intelligence	3	0	0	3	40	60	100
3	22ADM63	Data Warehousing and Data Mining	3	0	0	3	40	60	100
4	22ADM64	Machine Learning Techniques	3	0	0	3	40	60	100
5	22ADM65	Expert Systems	3	0	0	3	40	60	100
6	22ADM66	Cognitive Science	3	0	0	3	40	60	100
7	22ADM67	Gamification	3	0	0	3	40	60	100

		VALUE ADDED COURSES	5									
S.	Course	Course Title	egory	Pe	eriod Wee	ls / k	sdits	Max. Marks				
No	Code	course mile	Cat	L	Т	Р	Cre	CA	SE	Tot.		
1	22ADV01	R Programming	VAC	0	0	2	1	100	0	100		
2	22ADV02	Power BI	VAC	0	0	2	1	100	0	100		
3	22ADV03	Type Script	VAC	0	0	2	1	100	0	100		
4	22ADV04	Kotlin Programming	VAC	0	0	2	1	100	0	100		

		MANDATORY COURS	SES								
S.	Course Code	Course Title	tegory	Pe V	riod Veel	ls / k	edits	Ma	ax. Marks		
INO			Cat	L	Т	Р	C	CA	SE	Tot.	
1	22MCT01	Induction Programme	MC	-	-	-	-	-	-	100	
2	22MCT02	Universal Human Values	MC	2	0	0	0	100	0	100	
3	22MCT03	Environmental Science and Engineering	MC	2	0	0	0	100	0	100	
4	22MCL04	English for Professionals	MC	0	0	2	0	100	0	100	
5	22MCT05	Aptitude and Logical Reasoning	MC	2	0	0	0	100	0	100	
6	22MCL06	Communication Skills Laboratory	MC	0	0	2	0	100	0	100	
7	22MCT07	Indian Constitution and Traditional Knowledge	MC	2	0	0	0	100	0	100	

L - Lecture Period

T - Tutorial Period

P - Practical Period

CA - Continuous Assessment

SE - Semester Examination Tot. - Total

Category	Credits	Minimum contact periods per week	
Theory	3	3	1 Period = 50 Minutes duration
•	4	4	winnutes duration
Practical	1	2	

22MCT01

Preamble:

This is a mandatory 2 week programme to be conducted as soon as the students enter theinstitution. Normal classes start only after the induction program is over.

The induction programme has been introduced by AICTE with the following objective:

"Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his/her study. However, he/shemust also have broad understanding of society and relationships. Character needs to be nurturedas an essential quality by which he/she would understand and fulfill his/her responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlyingvalues are needed."

"One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make themwork for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character. "Hence, the purpose of this programme is to make the students feel comfortable in their newenvironment, open them up, set a healthy daily routine, create bonding in the batch as well asbetween faculty and students, develop awareness, sensitivity and understanding of the self, peoplearound them, society at large, and nature.

The following are the activities under the induction program in which the student would be fullyengaged throughout the day for the entire duration of the program:

(i) Physical Activity

This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc.

(ii) Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it every day for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, grow into engineering design later.

(iii)Universal Human Values

This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do's and dont's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions

and real life activities rather than lecturing. Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It would be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.

(iv)Literary Activity

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

(v) Proficiency Modules

This would address some lacunas that students might have, for example, English, computer familiarity etc.

(vi)Lectures by Eminent People

Motivational lectures by eminent people from all walks of life should be arranged to give the students exposure to people who are socially active or in public life.

(vii) Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

(viii) Familiarization to Dept./Branch & Innovations

They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

(ix)Department Specific Activities

About a week can be spent in introducing activities (games, quizzes, social interactions, small experiments, design thinking etc.) that are relevant to the particular branch of Engineering /Technology/Architecture that can serve as a motivation and kindle interest in building things (become a maker) in that particular field. This can be conducted in the form of a workshop. For example, CSE and IT students may be introduced to activities that kindle computational thinking, and get them to build simple games. ECE students may be introduced to building simple circuits as an extension of their knowledge in Science, and so on. Students may be asked to build stuff using their knowledge of science.

Induction Programme is totally an activity based programme and therefore there shall be no tests / assessments during this programme.

References:

• Guide to Induction program from AICTE

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Preamble :

Communicative English is a life skill necessary for all students of Engineering and Technology. The course Communicative English aims at developing Communication Skills in English which is essential for the learner to handle English language for a variety of everyday purposes through acquisition of basic grammar and vocabulary along with LSRW skills.

INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION UNIT 1

Listening: Listening for General Information - Specific Details - Conversations - Telephone Conversation - Listening to Voicemail and Messages - Listening and Filling a form Speaking: Self Introduction - Introducing a Friend - Politeness Strategies - Telephone Conversation - Leave a Message with Another Person - Asking for Information to Fill Details in a form **Reading:** Reading Brochures - Telephone Messages - Social Media Messages relevant to Technical Contexts Writing: Writing Reviews - Book/Movie - Writing about Oneself Grammar & Vocabulary: Tenses - Types of Questions - Parts of Speech - Contextual Meaning of Words - Abbreviations and Acronyms.

EXPRESSING CASUAL CONVERSATIONS UNIT 2

Listening: Information about Hotels and Accommodation - Recipes and Food Items - Listening to Conversations Asking for and Giving Directions - Making an Enquiry Speaking: Life Style Changes and Making Comparisons - Talking about Food - Making Conversation using Asking for Directions -Making an Enquiry - Role Plays - Dialogues Reading: Habit Formation and Changing Habits -International Cuisine - Reading a Print Interview and Answering Comprehension Questions Writing: E-Mail to Friend - E-Mails about Food and Recipes, Inviting Dignitaries, Accepting and Declining Invitations Grammar & Vocabulary: Evaluations and Comparisons with Adjectives - Prepositions -Modifiers. 9

CLARIFICATIONS AND RECOMMENDATIONS UNIT 3

Listening: Listening to Short Talks and Fill a table – Gap Filling Exercises - Note Taking Speaking: Group Discussion - Agreeing and Disagreeing - Tips and Strategies for GD Reading: Reading Problems and Solutions - Articles - Essays drawn from various sources Writing: Making Recommendations -Giving Instructions - Note Making - Itinerary- Process Description Grammar & Vocabulary: Word Formation - Compound Nouns - Phrasal Verbs.

PUBLIC SPEAKING AND BUSINESS COMMUNICATION **UNIT 4**

Listening: Listening to Speeches by Famous People and Identifying the Central Message of the Speech -Answering Multiple Choice Questions Speaking: Welcome Address - Vote of Thanks - Special Address on Specific Topic Reading: Life and Achievements of a Famous Personality - Reading Motivational Essays on Famous Engineers and Technologists Writing: Checklists - Business Communication -Quotations, Placing Orders, Complaints Grammar & Vocabulary: Modal Verbs and Probability -Collocations - Fixed Expressions - Semi-Fixed Expressions.

WRITING DEFINITIONS AND PRODUCT DESCRIPTIONS UNIT 5

Listening: Listening to Product Description - Labeling and Gap Filling Exercises - Seeking help with Office Equipment - Job Details Speaking: Describe a Product - Compare and Contrast with other Products - Buying a Product - Selling a Product - Cancelling and Fixing Appointments - Hotel Accommodation - Training Facilities - Conference Facilities Reading: Reading Graphical Material for Comparison (advertisements) - Clarifying an Error in the Bill Writing: Writing Definitions - Single Line Definition and Extended Definition - Compare and Contrast Paragraphs - Designing a Website Grammar & Vocabulary: Use of Discourse Markers – One Word Substitution.

TOTAL: 45 PERIODS

TEXT BOOKS:

- Richards, Jack. C with Jonathan Hull and Susan Proctor New Interchange: English for International 1. Communication. (Level 1, Student's Book) Cambridge University Press, New Delhi: 2017.
- Sanjay Kumar and Pushp Lata, "Communication Skills: A Workbook, Oxford University Press, 2. 2020.

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REFERENCES:

- 1. M Ashraf Rizvi, "Effective Technical Communication", McGraw-Hill, 2nd Edition, New Delhi, 2018.
- 2. J K Gangal, "A Practical course in Spoken English", PHI Learning Pvt. Ltd., 1st Edition, Delhi, 2014.

e -RESOURCES :

- 1. https://learnenglish.britishcouncil.org/intermediate-vocabulary
- 2. http://www.usingenglish.com
- 3. https://learnenglish.britishcouncil.org/intermediate-grammar
- 4. https://learnenglish.britishcouncil.org/speaking

Course Outcomes: Upon completion of the course, students will be able to:

- CO1 Converse and read fluently using basic grammar components.
- CO2 Communicate through writing without any grammatical errors.
- CO3 Write clear, coherent and organized passages adhering to instructions.
- CO4 Speak effectively in real-time and business situations.
- CO5 Enhance vocabulary through listening and reading.

Mapping of COs with POs and PSOs

COs/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C01	-	-	-	-	1	3	-	-	2	3	-	1	-	-
CO2	-	-	-	-	1	3	-	-	2	3	-	1	-	-
CO3	-	-	-	-	1	3	-	-	2	3	-	1	-	-
CO4	-	-	-	-	1	3	-	-	2	3	-	1	-	-
CO5	-	-	-	-	1	1	-	-	2	3	-	1	-	-

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

22ENT11

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Preamble :

Communicative English is a life skill necessary for all students of Engineering and Technology. The course Communicative English aims at developing Communication Skills in English which is essential for the learner to handle English language for a variety of everyday purposes through acquisition of basic grammar and vocabulary along with LSRW skills.

UNIT 1 INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION

Listening: Listening for General Information - Specific Details – Conversations - Telephone Conversation - Listening to Voicemail and Messages – Gap Filling **Speaking**: Self Introduction – Expressing Opinions - Introducing a Friend - Telephone Conversation - Leave a Message - **Reading**: Reading Brochures and Pamphlets **Writing**: Writing Reviews - Book/Movie – Writing about Oneself **Grammar & Vocabulary**: Parts of Speech - Tenses - Contextual Meaning of Words - Abbreviations and Acronyms.

UNIT 2 EXPRESSING CASUAL CONVERSATIONS

Listening: Information about Hotels and Accommodation - Recipes and Food Items - Listening to Conversations Asking for and Giving Directions – Making an Enquiry **Speaking:** Talking about Daily Routine - Talking about Food - Making Conversation using Asking for and Giving Directions - Making an Enquiry - Role Plays - Dialogues **Reading:** International Recipes - Reading a Print Interview and Answering Comprehension Questions **Writing:** E- Mail to a Friend – E-Mails about Food and Recipes, Inviting Dignitaries, Accepting and Declining Invitations **Grammar & Vocabulary**: Evaluations and Comparisons with Adjectives - Word Formation.

UNIT 3 CLARIFICATIONS AND RECOMMENDATIONS

Listening: Listening to Short Talks and Fill a table – Gap Filling Exercises - Note Taking **Speaking:** Group Discussion - Agreeing and Disagreeing - Tips and Strategies for GD **Reading:** Articles - Essays drawn from various sources - Note Making **Writing:** Writing Recommendations - Giving Instructions – Itinerary - Process Description **Grammar & Vocabulary:** Prepositions - Modifiers - Phrasal Verbs.

UNIT 4 PUBLIC SPEAKING AND BUSINESS COMMUNICATION

Listening: Listening to Speeches by Famous People and Identifying the Central Message of the Speech -Answering Multiple Choice Questions **Speaking**: Welcome Address - Vote of Thanks - Special Address on Specific Topic **Reading**: Life and Achievements of Famous People **Writing**: Checklists – Personal Letters **Grammar & Vocabulary**: Modal Verbs and Probability - Collocations – Fixed Expressions -Semi-Fixed Expressions.

UNIT 5 WRITING DEFINITIONS AND PRODUCT DESCRIPTIONS

Listening: Listening to Product Description - Labeling and Gap Filling Exercises - Seeking help with Office Equipment - Job Details **Speaking**: Describe a Product - Compare and Contrast with other Products - Buying a Product - Selling a Product - Cancelling and Fixing Appointments - Hotel Accommodation **Reading**: Reading Graphical Material for Comparison - Tables - Pie Charts **Writing**: Writing Definitions – Single Line Definition and Extended Definition - Compare and Contrast Paragraphs - Clarifying an Error in the Bill **Grammar & Vocabulary**: Types of Questions - Use of Discourse Markers – One Word Substitution.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Richards, Jack. C with Jonathan Hull and Susan Proctor New Interchange: English for International Communication. (Level 1, Student's Book) Cambridge University Press, New Delhi: 2017.

REFERENCES:

- 1. M Ashraf Rizvi, "Effective Technical Communication", McGraw-Hill, 2nd Edition, New Delhi, 2018.
- 2. Sanjay Kumar and Pushp Lata, "Communication Skills: A Workbook, Oxford University Press, 2020.
- 3. J K Gangal, "A Practical course in Spoken English", PHI Learning Pvt. Ltd., 1st Ed., Delhi, 2014.

e. RESOURCES :

- 1. <u>https://learnenglish.britishcouncil.org</u>
- 2. <u>https://www.usingenglish.com</u>

Course Outcomes: Upon completion of the course, students will be able to:

- CO1 Converse and read fluently using basic grammar components.
- CO2 Communicate through writing without any grammatical errors.
- CO3 Write clear, coherent and organized passages adhering to instructions.
- CO4 Speak effectively in real-time and business situations.
- CO5 Enhance vocabulary through listening and reading.

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	-	-	-	-	1	3	-	-	2	3	-	1	-	-
CO 2	-	-	-	-	1	3	-	-	2	3	-	1	-	-
CO 3	-	1	-	-	1	3	1	-	2	3	-	1	-	-
CO 4	-	-	-	-	1	3	-	-	2	3	-	1	-	-
CO 5	-	1	-	-	1	1	-	-	2	3	-	1	-	-
Mapping Average	-	1	-	-	1	2.6	-	-	2	3	-	1	-	-

MATRICES AND DIFFERENTIAL CALCULUS

22MAT12

(Common to B.E-CS, B.Tech-AI & DS and IT Programmes)

Preamble

The course aims at achieving conceptual understanding of topics such as Matrix Algebra and Calculus. The syllabus is designed to provide the skills for modeling engineering problems and understand the role of calculus in the discipline of engineering and computer science.

UNIT 1 EIGEN VALUES AND EIGEN VECTORS

Eigen values and Eigenvectors of a real matrix – Properties of Eigenvalues and Eigenvectors – Statement and application of Cayley Hamilton Theorem – Orthogonal transformation of a symmetric matrix to diagonal form – Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT 2 DIFFERENTIAL CALCULUS

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules (sum, product, quotient, chain rules) - Implicit differentiation - Logarithmic differentiation -Applications: Maxima and Minima of functions of one variable

UNIT 3 ORDINARY DIFFERENTIAL EQUATIONS

Linear higher order differential equations with constant coefficients – Method of variation of Parameters – Cauchy's and Legendre's linear differential equations

UNIT 4 MULTIPLE INTEGRALS IN CARTESIAN COORDINATES

Double integration–Change of order of integration, Area between two curves –Triple integration, Volume as triple integrals

UNIT 5 VECTOR CALCULUS

Gradient of a Scalar point function – Divergence, Curl, Solenoidal and irrotational of a vector point function– Directional Derivative–Green's and Gauss divergence theorems (without proof)

TEXT BOOKS:

LECTURE : 45, TUTORIAL : 15, TOTAL : 60 PERIODS

- 1. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016
- James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 8th Edition, New Delhi, 2015.

REFERENCES:

- 1. Grewal B.S., "Higher Engineering Mathematics" 43rd Edition, Khanna Publishers, New Delhi, 2014.
- 2. P.Kandasamy, K.Thilagavathy, K.Gunavathy, "Higher Engineering Mathematics", S.Chand & Company Limited, Chennai, 2016.

e-RESOURCES:

- 1. https://www.digimat.in/nptel/courses/video/111107112/L14.html -Matrix Analysis with Applications'IIT Roorkee by Dr.S.K.Gupta
- 2. https://nptel.ac.in/courses/111105122 'Integral and Vector Calculus', IIT Kharagpur by Prof. Hari Shankar Mahato

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Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Determine eigen values and eigenvectors of real symmetric matrices and reduce the quadratic form to canonical form by orthogonal transformation
- CO2 Apply the concept of differential calculus to solve various application problems.
- CO3 Solve linear differential equations with constant and variable coefficients .
- CO4 Compute area and volume by double and triple integrals in Cartesian co-ordinates
- CO5 Compute gradient, directional derivative by vector differentiation and determine line integrals, surface integrals and volume integrals by vector integration.

COs/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	-	-	-	-	-	-	-	1	-	-
CO2	3	3	2	2	-	-	-	-	-	-	-	1	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	1	-	-
CO4	3	3	2	2	-	-	-	-	-	-	-	1	-	-
CO5	3	3	2	2	-	-	-	-	-	-	-	1	-	-

Mapping of COs with POs and PSOs

This course aims to impart the essential concepts of laser, fibre optics, ultrasonics, quantum physics and crystal structure and crystal defects. It also describes the physical phenomena related to the above mentioned concepts and their applications in engineering and provides motivation towards innovations.

UNIT I LASER

Introduction –spontaneous emission and stimulated emission, population inversion, pumping. Einstein's coefficients - derivation. Types of lasers- Nd-YAG-CO₂, Semiconductor lasers (homojunction & heterojunction) – Industrial applications - lasers in welding, heat treatment, cutting-medical applications- holography-construction and reconstruction-Safety classes of laser.

UNIT II FIBRE OPTICS

Principle and propagation of light in optical fibres – numerical aperture and acceptance angle - types of optical fibres (material, refractive index, mode) – double crucible technique of fibre drawing - splicing, losses in optical fibre, dispersion - fibre optical communication system (Block diagram) - light sources - detectors - fibre optic sensors – temperature & displacement - endoscope.

UNIT III ULTRASONICS

Introduction – Production – magnetostriction effect – piezoelectric effect - piezoelectric generatordetection of ultrasonic waves properties – cavitations - velocity measurement – acoustic grating -Industrial applications – drilling, welding, soldering and cleaning – SONAR - non destructive testing – pulse echo system through transmission and reflection modes - A, B and C – scan displays, medical applications - sonograms.

UNIT IV QUANTUM PHYSICS

Black body radiation – Planck's theory (derivation) – deduction of Wien's displacement law and Rayleigh – Jeans' law from Planck's theory – Compton effect - theory and experimental verification – matter waves – Schrödinger's wave equation – time independent and time dependent equations – physical significance of wave function – particle in a one dimensional box.

UNIT-V CRYSTAL PHYSICS

Lattice – unit cell – Bravais lattice – lattice planes – Miller indices – d spacing in cubic lattice – calculation of number of atoms per unit cell – atomic radius – coordination number – packing factor for SC, BCC, FCC and HCP structures – NaCl, ZnS, diamond and graphite structures – polymorphism and allotropy - crystal defects – point, line and surface defects.

TOTAL: 45 PERIODS

TEXT BOOKS:

- 1. Gaur R.K. and Gupta S.L., "Engineering Physics", 8th Edition, Dhanpat Rai publishers, 2009.
- 2. Mani Naidu S., "Engineering Physics", 2nd Edition, Pearson Publishing, 2011.

REFERENCES:

- Serway and Jewett, "Physics for Scientists and Engineers with Modern Physics", 9th Edition, Thomson Brooks Cole, 2013
- 2. Palanisamy P.K., "Engineering Physics", 2nd Edition, Scitech Publications, 2011
- 3. Chitra Shadrach and Sivakumar Vadivelu, "Engineering Physics", 1st Edition, Pearson Education, 2007.

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e-RESOURSES

- 1. <u>http://oupinheonline.com/book/bhattacharya-tandon-engineering</u>-physics/9780199452811.
- 2. https://www.khanacademy.org/science/physics/quantum-physics.

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Compare Nd-YAG, CO₂ and Semiconductor lasers for welding, heat treatment, cutting, medical applications and holography using Stimulated Emission.
- CO2 Demonstrate the knowledge of wave optics using light waves for communication system.
- CO3 Describe the production and applications of ultrasonics.
- CO4 Examine the dual nature of light waves using quantum theory for Black body radiation and Schrodinger's wave equations in particle in a one and three dimensional box.
- CO5 Explain the description of a crystal structure in terms of atom positions, unit cells, and crystal symmetry; and to relate the crystal symmetry to the symmetry observed in a diffraction experiment.

COs/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1	1	1	1	1	-	-	1	1	1	-	-
CO2	3	2	1	1	1	1	1	-	-	1	1	1	-	-
CO3	3	2	1	1	1	1	1	-	-	1	1	1	-	-
CO4	3	2	1	1	1	1	1	-	-	1	1	1	-	-
CO5	3	2	1	1	1	1	1	-	-	1	1	1	-	-

Mapping of COs with POs and PSOs

22CVT11	ENGINEERING CHEMISTRY	\mathbf{L}	Т	Р	С
	(Common to all B.E, B.Tech Programmes)	3	0	0	3

Preamble

The study of water technology enables engineers to acquire skills to choose the appropriate method of water treatment for industrial and domestic purposes. Electrochemistry and corrosion explain the fundamentals, identification and corrosion prevention for solving electrochemical and corrosion problems. The study of energy storage devices exposes some of the most commonly used energy storage devices. Nanochemistry empowers engineers to acquire knowledge about nanomaterials and their applications in various fields. Polymeric materials aim to equip the engineering students to realize the importance of chemistry in composites and conducting polymers.

WATER TECHNOLOGY UNIT 1

Hardness - types and its units - Boiler troubles - scale and sludge, boiler corrosion, caustic embrittlement, priming and foaming - Internal conditioning - carbonate and calgon conditioning -External conditioning - demineralization process - Desalination - electrodialysis, reverse osmosis -Treatment of water for municipal water supply (Removal of suspended particles and disinfection methods – Ozonisation).

ELECTROCHEMISTRY AND CORROSION UNIT 2

Electrochemistry - Emf Series and its applications. Metal Finishing - Manufacture of Printed Circuit Board.

Corrosion - mechanism - Galvanic, atmospheric (O2) and Pitting corrosion. Protective coating electroplating of nickel and electroless copper plating on printed circuit board. 9

ENERGY STORAGE DEVICES UNIT 3

Batteries - types - Construction and working of Primary battery - Zinc-Air/carbon, Secondary batteries - Lead-acid battery and Lithium-ion battery, Fuel cells - H₂-O₂ fuel cell and Microbial fuel cell. 9

UNIT 4 NANOCHEMISTRY

Nanomaterials – Types – Synthesis – sol-gel and laser ablation – Characterization – Scanning Electron Microscope and Transmission Electron Microscope - Principle and instrumentation (block diagram) -Properties - optical, electrical, mechanical and magnetic and Applications of nanomaterials - medicine, agriculture, electronics and catalysis.

UNIT 5 POLYMERS

Polymers - thermoplastics and thermosetting plastics - polymerization - types (definition only) -Compounding of plastics - fabrication - compression and injection - Composites - polymer matrix composites (Fibre reinforced composites) and metal matrix composites - Conduction polymers -General mechanism of conduction in polymers.

TOTAL : 45 PERIODS

TEXT BOOKS:

- 1. Engineering chemistry, 17th Edition. P. C. Jain & Monica Jain, Dhanpat Rai Publishing Company, 2021.
- 2. Applied chemistry, 2nd Edition. P. N. Palanisamy, P. Manikandan, A. Geetha, K. Manjula Rani, McGraw Hill Education (India) Private Limited, 2019.

REFERENCES:

- 1. Wiley Engineering Chemistry, 2nd Edition, Wiley, Wiley India Pvt. Ltd, New Delhi, 2014.
- 2. Engineering chemistry, 2nd Edition. O. G. Palanna, McGraw Hill Education (India) Private Limited, New Delhi, 2017.
- 3. A Textbook of NanoScience, 2nd Edition, Dr. Rakesh Kumar, Dr. Kamala Pati Tiwary, S. K. Kataria & Sons, New Delhi, 2013.

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e-RESOURCES:

- 1. http://nptel.ac.in/courses/113105028/, "Science and Technology of Polymers"- Prof. Basudam Adhikari, Materials Science Centre, IIT Kharagpur
- https://archive.nptel.ac.in/courses/118/102/118102003/, "Nano structured materials-Synthesis, Properties, Self-Assembly and Applications" - Prof. Ashok K Ganguli, Department of Chemistry, IIT Delhi

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Evaluate the process to purify hard water using internal and external treatment.
- CO2 Apply the principle of electrochemistry in PCB etching and surface coating to prevent corrosion.
- CO3 Compare and contrast the performance of primary, secondary and flow battery.
- CO4 Analyze the characteristics of nanomaterials synthesized by top down and bottom-up process with the aid of SEM and TEM.
- CO5 Categorize the types of polymeric materials and fabrication of plastic by injection and compression molding for engineering applications.

COs\POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	1	1	1	2	-	1	1	1	1	-	-
CO2	3	2	2	1	1	1	2	-	1	1	1	1	-	-
CO3	3	2	2	1	1	1	2	-	1	1	1	1	-	-
CO4	3	2	2	1	1	1	2	-	1	1	1	1	-	-
CO5	3	2	2	1	1	1	2	-	1	1	1	1	-	-

Mapping of COs with POs and PSOs

Preamble

Python is easy to use, powerful, and versatile, making it a great choice for beginners and experts alike. Python's readability makes it a great first programming language — it allows you to think like a programmer and not waste time understanding the mysterious syntax that other programming languages can require. The syntax in Python helps the programmers to do coding in fewer steps. Python is widely used in bigger organizations because of its multiple programming paradigms.

UNIT 1 COMPUTING FUNDAMENTALS

Fundamentals of Computing - Identification of Computational Problems - Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion).

UNIT 2 INTRODUCTION TO PYTHON

Python interpreter, data types: int, float, boolean, string, and list; variables, expressions, statements, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT 3 CONTROL FLOW, FUNCTIONS, STRINGS

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT 4 LISTS, TUPLES, DICTIONARIES

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation.

UNIT 5 FILES. MODULES AND PACKAGES

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages, Introduction to Pygame tool; Illustrative programs: word count, copy file, Voter's age validation, Marks range validation (0-100).

TOTAL : 45 PERIODS

TEXT BOOKS:

- Reema Thareja, "Python Programming using Problem Solving Approach", Oxford University 1. Press, 2017.
- Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, 2. O'Reilly Publishers, 2016.

REFERENCES:

- E Balagurusamy," Problem Solving and Python Programming", McGraw Hill Education, 2018 1.
- G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers 2. and Data Scientists", 1stEdition, Notion Press, 2021.

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e-RESOURCES:

- 1. https://swayam.gov.in/course/4178-spoken-tutorial-python-english, "Introduction to Python", Prof. Prabhu Ramachandran, IIT Bombay.
- 2. https://onlinecourses.nptel.ac.in/noc18_cs21, "Programming, Data Structures and Algorithms Using Python", Prof.Madhavan Mukund, IIT-Bombay.

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Use the basics of algorithmic problem solving techniques (pseudo code, flow chart, language basics) for a given problem.
- CO2 Apply suitable python conditional and looping statements to solve a given problem.
- CO3 Define Python functions and use function calls to solve problems.
- CO4 Use Python data structures (lists, tuples, and dictionaries) to represent complex data.
- CO5 Create python packages, modules and files for a given scenario.

COs/POs	PO 1	PO 2	PO 3	РО 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	2	1	-	-	-	-	-	1	1	-	-
CO2	3	2	2	2	1	-	-	-	-	-	1	1	-	-
CO3	3	2	2	2	1	-	-	-	-	-	1	1	-	-
CO4	3	2	2	2	1	-	-	-	-	-	1	1	-	-
CO5	3	2	2	2	1	-	-	-	-	-	1	1	-	-

Mapping of COs with POs and PSOs

Preamble

The knowledge of Engineering graphics is essential for the Engineering graduates in proposing new product designs through drawings and interpreting data from existing drawings. Engineering Design inculcates into an Engineer the creativity and knowledge on various aspects to be considered while designing and realizing the functional products and processes. This course deals with Engineering curves, orthographic and pictorial projections, sectional views and development of surfaces.

UNIT 1 INTRODUCTION AND PLANE CURVES

Importance of graphics in Engineering applications – Use of drafting instruments – BIS conventions and specifications –Size, layout and folding of drawing sheets – Diagonal scales and vernier scales-Lines, lettering and dimensioning - Basic geometrical constructions (circular and polygonal surfaces). (PRACTICE ONLY AND NOT FOR EXAMINATIONS). Curves used in Engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – Construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

UNIT 2 PROJECTION OF POINTS, LINES AND PLANE SURFACES

Orthographic projection- principles-Principal Planes - First angle projection- Projection of points in four quadrants – End point projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and trapezoidal method. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT 3 PROJECTION OF SOLIDS

Projection of simple solids- Cube, prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane and parallel to the other by rotating object method.

UNIT 4 SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES

Sectioning of above solids in simple vertical position when cut by a cutting plane which is inclined to one of the reference planes and perpendicular to the other – Obtaining true shape of section. Development of lateral surfaces of simple and truncated solids in simple vertical position – Cube, prisms, pyramids, cylinder and cone.

UNIT 5 ISOMETRIC AND FREE HAND SKETCHING

Principles of isometric projection – Isometric scale –Isometric projections of simple solids - Prisms, pyramids, cylinder and cone- Combination of two solid objects in simple vertical position.

Visualization concepts- Free hand sketching – Conversion of Isometric view to orthographic views. Perspective projection of simple solids (Qualitative only).

Introduction to CAD software (Not for Examinations)

LECTURE : 45, PRACTICAL : 15, TOTAL : 60 PERIODS

TEXT BOOKS:

- 1. Venugopal K and Prabhu Raja V., "Engineering Graphics", New Age International (P) Ltd, 13th Edition, 2015.
- 2. Jeyapoovan T., "Engineering Graphics with AUTOCAD", Vikas Publishing House Pvt., Ltd., 7th Edition, 2015.

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REFERENCES:

- 1. Bhatt N.D., Panchal, V.M. and Ingle P.R., "Engineering Drawing", Charotar Publishing House Pvt. Ltd., 53rd Edition, 2014.
- 2. Parthasarathy N.S. and Vela Murali, "Engineering Drawing", Oxford University Press, 1st Edition, Second Impression 2015.
- 3. Luzzader W..J. and Duff J.M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production", Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.

e-RESOURCES:

- 1. http://nptel.ac.in/courses/105104148, "Engineering Graphics" Dr. Nihar Ranjan Patra , IIT Kanpur
- 2. http://cfd.annauniv.edu/webcontent.htm, "Engineering Graphics" Dr. Velamurali

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Draw the various conic sections and Engineering curves
- CO2 Sketch projections of lines and planes with vertical and inclined positions
- CO3 Draw the projections of solids kept in various positions.
- CO4 Sketch sectioned views of solids and development of surfaces.
- CO5 Draw the isometric and orthographic views from given pictorial views.

COs/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1	-	-	-	-	-	-	2	-	1	-	-
CO2	3	2	1	-	-	-	-	-	-	2	-	1	-	-
CO3	3	2	1	-	-	-	-	-	-	2	-	1	-	-
CO4	3	2	1	-	-	-	-	-	-	3	-	2	-	-
CO5	3	2	1	-	-	-	-	-	-	3	-	2	-	-

Mapping of COs with POs and PSOs

16.03.2024

HERITAGE OF TAMILS

UNIT 1 LANGUAGE AND LITERATURE

22HST11

Language Families in India - Dravidian Languages – Tamil as a Classical Language – Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land

- Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

UNIT 2 HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making -- Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT 3 FOLK AND MARTIAL ARTS

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT 4 THINAI CONCEPT OF TAMILS

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT 5 CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND 3 INDIANCULTURE

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

TEXT-CUM-REFERENCE BOOKS

- தமிழக வரலாறு மக்களும் பண்பாடும் கே .கே. பிள்ளை (வெளியீடு :தமிழ்நாடு
- 1 பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
- 2 கணினித் தமிழ் முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
- 3 கீழடி வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வளியீடு)
- 4 பொருநை ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
- 5 Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL (in print) Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by:
- 6 International Institute of Tamil Studies.
- Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu)
 (Published by: International Institute of Tamil Studies).
- The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by:
- 8 International Institute of Tamil Studies).
 Keeladi 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by:
- 9 Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
- 10 Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)

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Total : 15

- Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text
- Book and Educational Services Corporation, Tamil Nadu)
 Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) Reference
- 12 Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) Reference Book.

Preamble

This course aims to impart knowledge in the determination of the physical parameters such as wavelength of laser and mercury spectrum, Numerical aperture and acceptance angle of an optical fiber, velocity of ultrasonic waves and thermal conductivity of bad conductor and additionally necessitate the practical skills in determination of rate of corrosion in mild steel, water quality parameters and amount of iron in the given sample.

PHYSICS LABORATORY I

LIST OF EXPERIMENTS

- 1. Determination of Optical property of Laser and Particle size of Lycopodium powder.
- 2. Determination of Numerical aperture and acceptance angle of an optical fiber.
- 3. Determination of velocity of ultrasonic waves- Ultrasonic Interferometer.
- 4. Determination of wavelength of mercury spectrum- Spectrometer grating.
- 5. Determination of Thermal conductivity of Bad conductor.

CHEMISTRY LABORATORY I LIST OF EXPERIMENTS

- 1. Determination of alkalinity in water sample
- 2. Determination of Calcium and Magnesium hardness in water by EDTA method.
- 3. Determination of rate of corrosion in Mild steel by weight loss method.
- 4. Determination of iron content of the water sample using spectrophotometer (1,10-phenanthroline / thiocyanate method).
- 5. Determination of iron content of the given solution using a potentiometer

TOTAL: 45 PERIODS

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Experiment and determine the optical property of light sources and acceptance angle of optical fiber using Laser and Spectrometer.
- CO2 Experiment and determine the velocity of ultrasonic waves and thermal conductivity of a given bad conductor using ultrasonic interferometer and Lee's disc.
- CO3 Experiment and estimate type and amount of alkalinity, Calcium and Magnesium hardness in water sample using titrimetry.
- CO4 Experiment and determine the rate of corrosion in mild steel by weight loss method.
- CO5 Experiment and determine the amount of iron content present in the given sample using potentiometer and spectrophotometer.

Mapping of COs with POs and PSOs

COs\POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1	-	3	-	1	1	-	1	1	1	1	-	-
CO2	2	1	-	3	-	1	1	-	1	1	1	1	-	-
CO3	2	1	-	3	-	1	1	-	1	1	1	1	-	-
CO4	2	1	-	3	-	1	1	-	1	1	1	1	-	-
CO5	2	1	-	3	-	1	1	-	1	1	1	1	-	-

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

No correlation

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PYTHON PROGRAMMING LABORATORY

L T P C 0 0 2 1

(Common to all B.E, B.Tech Programmes)

Preamble:

Python is a dynamic and powerful programming language that focuses on code readability. The Python language has diversified application in the software development companies such as in gaming, web frameworks and applications, language development, prototyping, graphic design applications, etc. This provides the language a higher plethora over other programming languages used in the industry.

LIST OF EXPERIMENTS

- Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same.
 (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)
- 2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points)
- 3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
- Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list & tuples)
- Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)
- 6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
- 7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
- 8. Implementing programs using written modules and Python Standard Libraries Libraries (pandas, numpy. Matplotlib, scipy)
- 9. Implementing real-time/technical applications using File handling
- 10. Developing a game activity using Pygame like bouncing ball, car race

SOFTWARE

- Python 3 interpreter / open source IDE
- Raptor Tool
- Libre Office Packages

TOTAL: 45 PERIODS

Course Outcomes: Upon completion of the course, students will be able to:

- CO1 Design flowcharts using Raptor.
- CO2 Develop programs using expressions and Control statements in Python.
- CO3 Develop programs using functions, packages for a given problem..
- CO4 Process compound data using Python data structures
- CO5 Utilize Python packages in developing software applications.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	2	3	-	-	-	-	1	-	-	1	-	-
CO2	2	2	2	3	-	-	-	-	1	-	-	1	-	-
CO3	2	2	2	3	-	-	-	-	1	-	-	1	-	-
CO4	2	2	2	3	-	-	-	-	1	-	-	1	-	-
CO5	2	2	2	3	-	-	-	-	1	-	-	1	-	-
22CSL11

PYTHON PROGRAMMING LABORATORY

L T P C 0 0 2 1

(Common to all B.E, B.Tech Programmes) (For Students admitted from AY:2024-2025 onwards)

Preamble:

Python is a dynamic and powerful programming language that focuses on code readability. The Python language has diversified application in the software development companies such as in gaming, web frameworks and applications, language development, prototyping, graphic design applications, etc. This provides the language a higher plethora over other programming languages used in the industry.

LIST OF EXPERIMENTS

1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same.

(Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuit, etc.)

- 2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points)
- 3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns, pyramid pattern)
- Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building – operations of list & tuples)
- Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)
- 6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
- 7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
- 8. Implementation of searching algorithms using linear and binary search technique.
- 9. Implementation of sorting algorithms using selection sort and insertion sort method.
- 10. Implementing programs using written modules and Python Standard Libraries Libraries (pandas, numpy. Matplotlib, scipy)
- 11. Implementing real-time/technical applications using File handling.
- 12. Developing a game activity using Pygame like bouncing ball, car race.

SOFTWARE

- Python 3 interpreter / open source IDE
- Raptor Tool
- Libre Office Packages

TOTAL: 45 PERIODS

Course Outcomes: Upon completion of the course, students will be able to:

CO1Design flowcharts using Raptor.CO2Develop programs using expressions and Control statements in Python.CO3Develop programs using functions, packages for a given problem..CO4Process compound data using Python data structuresCO5Utilize Python packages in developing software applications.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	2	3	-	-	-	-	1	-	-	1	-	-
CO2	2	2	2	3	-	-	-	-	1	-	-	1	-	-
CO3	2	2	2	3	-	-	-	-	1	-	-	1	-	-
CO4	2	2	2	3	-	-	-	-	1	-	-	1	-	-
CO5	2	2	2	3	-	-	-	-	1	-	-	1	-	-

Mapping of COs with POs and PSOs

UNIVERSAL HUMAN VALUES

Preamble:

22MCT02

• To develop the understanding as physical health and factors for strengthening life force.

• To expose the students on to areas of mediation and impart the knowledge on social virtues and morals.

UNIT 1 Physical Health

SKY – Introduction – Education as a means for youth empowerment – Greatness of Education – Yoga for Youth Empowerment – Simplified Physical Exercises: Explanation – Hand, Leg, Breathing and Eye exercises – Kapalabathi, Makarasanam, Massaging, Acupressure and Relaxation practices –Yogasanas-Explanation – Benefits.

UNIT 2 Strengthening Life Forces

Reasons for Diseases: Natural Reasons (Hereditary, Planetary Position, Natural Calamities and Climatic changes) – Artificial Reasons (Food, Thought, Deed). Philosophy of Kayakalpa: Physical Body –Life Force – Biomagnetism – Mind. Maintaining Youthfulness – Postponing Aging – Transformation of Food into seven Body constituents.

UNIT 3 Wellness of Mind

Classification of Mind Waves – Beta, Alpha, Theeta, Delta – Agna Meditation – Benefits. Shanthi Mediation – Benefits. Thuriya Meditation – Benefits. Blessing and its Benefits: Auto Suggestion – Blessing the family and others – Blessings the World – Divine Protection

UNIT 4 Virtues

Individual Virtues: Self Control – Self Confidence – Speaking Truth – Contentment – Humility – Mind Control. Tolerance – Adjustment – Sacrifice – Forgiveness. Cleanliness (Body, Dress, Surrounding)-External, Mental, Inner Cleanliness. **Societal Virtues** :Ahimsa – Services, Patriotism – Equality, Respecting the parents and elders – Caring for them – Respecting Teachers. Punctuality – Time Management.

UNIT 5 Morals

Importance of introspection: I and Mine (Ego, Possessiveness), Six Temperaments: Greed – Anger – Miserliness – Immoral Sexual Passion – Inferior Superior complex – Vengeance. Maneuvering the Six Temperaments: Contentment – Tolerance – Charity – Chastity – Parity – Forgiveness. Five important Benefits of Meditation: Perspicacity – Magnanimity – Adaptability – Receptivity – Creativity. (Enhancing memory) (Effective Examination Preparation)

TOTAL : 30 PERIODS

TEXT BOOKS:

- 1. "Yoga for Youth Empowerment" compiled by Vethathiri Maharishi Institute for Spiritual and Institutional Education, Aliyar, Pollachi, 1st Edition 2016.
- 2. "Yoga for Human Excellence", compiled by Vethathiri Maharishi Institute for Spiritual and Institutional Education, Aliyar, Pollachi 1st Edition 2009.

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e-RESOURCE:

1. www.online.vethathiri.edu.in "online in (Virtual) Programme on Yoga and Human Excellence".

Course Outcomes: Upon completion of the course, students will be able to:

- CO1 Demonstrate the knowledge on physical health
- CO2 Discuss the various factors for strengthening life force
- CO3 Classify mind waves and explain the benefits of meditation
- CO4 Explain individual and social virtues
- CO5 Identify and explain the importance of morals.

Mapping of COs with POs and PSOs

COs/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	-	-	-	-	-	3	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	3	-	2	-	-	-	-	-	-
CO3	-	-	-	-	-	3	-	2	-	-	-	-	-	-
CO4	-	-	-	-	-	3	-	2	2	-	-	-	-	-
CO5	-	-	-	-	-	3	-	-	2	-	-	-	-	-

1: Slight (Low)

- 2: Moderate (Medium)
- 3: Substantial (High)
- "-"No correlation

PROFESSIONAL ENGLISH

(Common to all B.E. B.Tech Programmes) (Students admitted during 2022-23 only)

22ENT21 **Preamble:**

The course Professional English aims at developing LSRW skills which are essential for the learners to communicative effectively and appropriately in professional contexts through acquisition of grammar and vocabulary.

UNIT 1 ANALYTICAL READING

Listening: Listening to Podcasts - Anecdotes - Stories - Event Narration - Documentaries and Interviews with Celebrities - Evaluative Listening - Advertisements - Listening and Filling a Graphic Organizer Speaking: Conversation Skills - Opening - Turn Taking - Closing - Explaining how something works -Marketing a Product - Persuasive Speech Techniques **Reading:** Reading Advertisements - User Manuals - Analytical Reading - Deductive and Inductive Reasoning Writing: Professional E-mails - E-mail Etiquette - Compare and Contrast Essays Grammar & Vocabulary: Prepositional Phrases - Impersonal Passive Voice - Product Description.

SUMMARISING UNIT 2

Listening: Listening to Lectures - Talks and Completing Gap Filling Exercises on Science and Technology - Listening Technical Information from Podcasts Speaking: Summarizing - Oral Reporting -Narrating Personal Experiences - Events - Interviewing a Celebrity Reading: Reading Scientific and Technical Articles - Texts Writing: Lab Reports - Summary Writing Grammar & Vocabulary: Purpose Expressions - Same Word used as Different Parts of Speech. 9

DESCRIBING VISUAL MATERIALS UNIT 3

Listening: Listening to the Panel Discussion Speaking: Speaking at Formal Situations - Mini Presentation and Making Recommendations Reading: Reading Journal Articles - Speed Reading - Interpretation of Graphics - Tables - Pie Chart - Flow Chart - Bar Chart Writing: Data Commentaries - Describing Visual Materials - Mechanics of Writing - Writing Complaints to Editorial Columns Grammar & Vocabulary: Subject-Verb Agreement - Pronouns - Relative Pronouns.

UNIT 4 WRITING E-MAILS AND JOB APPLICATION LETTERS

Listening: Listening to Model Interviews Speaking: Speaking at Different Types of Interviews - Role Play Practice Reading: Reading Job Advertisements and Company Profile - Statement of Purpose (SOP) Writing: Filling up the Job Application Letter - Cover Letter - Résumé Preparation - Internship Application Grammar & Vocabulary: Error Correction – 'If' Conditionals - Infinitives - Gerunds.

UNIT 5 **REPORT WRITING**

Listening: Viewing a Model Group Discussion Speaking: Participating in a Group Presentation -Presentation Reading: Cause and Effect Essays – Letters and E-mails of Complaint Writing: Types of Reports - Report Format - Industrial Accident Report - Industrial Visit Report - Feasibility Report -Designing and Reporting Surveys - Writing Discursive Essays Grammar & Vocabulary: Reported Speech - Numerical Adjectives - Idioms and Phrases.

TOTAL: 45 PERIODS

TEXT BOOK:

- 'English for Engineers and Technologists' Volume 1 published by Orient Black Swan Limited. 1. 2019.
- Sanjay Kumar and Pushp Lata, "Communication Skills: A Workbook, Oxford University Press, 2. 2020.

REFERENCES:

- 1. Richards, Jack. C with Jonathan Hull and Susan Proctor New Interchange: English for International Communication. (Level2, Student's Book) Cambridge University Press, New Delhi: 2017.
- 2. J K Gangal, "A Practical course in Spoken English", PHI Learning Pvt. Ltd., 1st Edition, Delhi, 2014.

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e -RESOURCES :

- 1. <u>www.eslgold.com</u>
- 2. <u>www.usingenglish.com</u>

Course Outcomes: Upon completion of the course, students will be able to:

- CO1 Read for gathering and understanding information using narrative techniques.
- CO2 Develop and demonstrate listening skills for academic and professional purposes.
- CO3 Apply apt vocabulary and construct grammatically correct sentences in professional situations.
- CO4 Face interviews with communicative competence and confidence with a good knowledge of career skills.
- CO5 Enhance writing skills for essays and for preparing reports.

Mapping of COs with POs and PSOs

COs/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	-	-	-	1	3	-	-	2	3	-	1	-	-
CO2	-	-	-	-	1	3	-	-	2	3	-	1	-	-
CO3	-	-	-	-	1	3	-	-	2	3	-	1	-	-
CO4	-	-	-	-	1	3	-	-	2	3	-	1	-	-
CO5	-	-	-	-	1	1	-	-	2	3	-	1	-	-

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Preamble:

The course Professional English aims at developing LSRW skills which are essential for the learners to communicative effectively and appropriately in professional contexts through acquisition of grammar and vocabulary.

UNIT 1 ANALYTICAL READING

Listening: Listening to Anecdotes - Stories - Event Narration – Documentaries and Interviews with Celebrities - Advertisements - Listening and Gap Filling Exercises **Speaking**: Conversation Skills – Initiating - Turn Taking - Closing – Explaining how something works - Persuasive Speech Techniques **Reading:** Reading Advertisements - User Manuals - Analytical Reading - Deductive and Inductive Reasoning **Writing**: Professional E-mails – E-mail Etiquette – Compare and Contrast Essays **Grammar & Vocabulary**: Prepositional Phrases –Same Word used as Different Parts of Speech.

UNIT 2 SUMMARISING

Listening: Listening to Lectures - Talks and Completing Gap Filling Exercises on Science and Technology – Listening Technical Information from Podcasts **Speaking**: Summarizing - Oral Reporting – Narrating Personal Experiences – Events – Interviewing a Celebrity **Reading**: Reading Scientific and Technical Articles - Texts **Writing**: Lab Reports - Summary Writing. **Grammar & Vocabulary**: Impersonal Passive Voice - Purpose Expressions.

UNIT 3 DESCRIBING VISUAL MATERIALS

Listening: Listening to the Panel Discussion **Speaking**: Speaking at Formal Situations –Mini Presentation and Making Recommendations **Reading**: Reading Journal Articles - Speed Reading - Interpretation of Graphics – Flow Chart - Bar Chart **Writing**: Data Commentaries - Describing Visual Materials – Mechanics of Writing - Writing Complaints to Editorial Columns **Grammar & Vocabulary:** Subject-Verb Agreement – Pronouns - Relative Pronouns - Numerical Adjectives.

UNIT 4 WRITING E-MAILS AND JOB APPLICATION LETTERS

Listening: Listening to Model Interviews **Speaking**: Speaking at Interviews – Role Play Practice **Reading:** Reading Job Advertisements and Company Profile - Statement of Purpose (SOP) **Writing:** Filling up the Job Application – Cover Letter – Résumé Preparation – Internship Application **Grammar & Vocabulary:** 'If' Conditionals – Infinitives – Gerunds - Compound Nouns.

UNIT 5 REPORT WRITING

Listening: Viewing a Model Group Discussion Speaking: Participating in a Group Talk –

Reading: Cause and Effect Essays – Business Letters **Writing:** Types of Reports - Report Format -Industrial Accident Report - Industrial Visit Report – Feasibility Report - Designing and Reporting Surveys – Writing Discursive Essays **Grammar & Vocabulary:** Reported Speech – Idioms and Phrases. **TOTAL:** 45 PERIODS

TEXT BOOK:

1. 'English for Engineers and Technologists' Volume 1 published by Orient Black Swan Limited .2019.

REFERENCES:

- 1. Richards, Jack. C with Jonathan Hull and Susan Proctor New Interchange: English for International Communication. (Level2, Student's Book) Cambridge University Press, New Delhi: 2017.
- 2. Sanjay Kumar and Pushp Lata, "Communication Skills: A Workbook , Oxford University Press, 2020.
- 3. J K Gangal, "A Practical course in Spoken English", PHI Learning Pvt. Ltd., 1st Edition, Delhi, 2014.

e. RESOURCES :

- 1. <u>www.eslgold.com</u>
- 2. <u>www.usingenglish.com</u>

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Course Outcomes: Upon completion of the course, students will be able to:

- CO1 Read for gathering and understanding information using narrative techniques.
- CO2 Develop and demonstrate listening skills for academic and professional purposes.
- CO3 Apply apt vocabulary and construct grammatically correct sentences in professional situations.
- **CO4** Face interviews with communicative competence and confidence with a good knowledge of career skills.
- CO5 Enhance writing skills for essays and for preparing reports.

Cos/POs	РО 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	-	-	-	-	1	3	-	-	2	3	-	1	-	-
CO 2	-	-	-	-	1	3	-	-	2	3	-	1	-	-
CO 3	-	1	-	-	1	3	-	-	2	3	-	1	-	-
CO 4	-	-	-	-	1	3	-	-	2	3	-	1	-	-
CO 5	-	-	_	-	1	1	-	-	2	3	-	1	-	-
Mapping Average	-	1	-	-	1	2.6	-	-	2	3	-	1	-	-

Mapping of COs with POs and PSOs

Pre-requisites : Matrices and Differential Calculus

Preamble

Probability theory is an important foundation for computer science field such as machine learning, artificial intelligence, computer graphics and randomized algorithms. Statistics is the language of the uncertainties in the modern information age. It's descriptive and inferential roles not only formulate the basis of the growth of almost all the disciplines of the contemporary world, but also provide an array of non-traditional employment avenues ranging from that of sport analysis to business analysis.

UNIT 1 PROBABILITY THEORY

Basic definitions and rules for probability, conditional probability-independence of events-Baye's theorem- Random variables - Discrete and continuous random variables. Distributions : Discrete distributions - Binomial, Poisson - Continuous distributions - Uniform, Exponential and Normal distributions.

TWO DIMENSIONAL RANDOM VARIABLES UNIT 2

Joint distributions - Marginal and conditional distributions - Covariance - Correlation and Linear regression

UNIT 3 ESTIMATION THEORY

Estimation :Point and interval estimation-Confidence Interval for the population Mean for Large and Small Samples, Confidence Interval for the Population Proportion for Large Samples

UNIT 4 TESTING OF HYPOTHESIS

Large sample test based on Normal distribution for single mean and difference of means - Small sample tests based on t distributions for testing of means and F distributions for testing of variances test - Contingency table (Test for Independency) - Goodness of fit.

UNIT 5 ANALYSIS OF VARIANCE

Assumptions, One way and two way classifications - Completely randomized design - Randomized block design –Latin square design.

LECTURE : 45; TUTORIAL : 15; TOTAL : 60 PERIODS

TEXT BOOKS:

- Ibe.O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 2nd Edition 1. 2014.
- Walpole, S.C., Myers, R.H., Myers, S.L., and Ye.K., "Probability and Statistics for Engineerrs 2. and Statistics",9th Edition,Pearson Education India,2013.

REFERENCES:

- Johnson R.A., and Gupta.C.B., 'Miller and Freund's Probability and Statistics for Engineers," 8th 1. Edition, Pearson Education India, 2015.
- Peebles. P.Z., "Probability, Random Variables and Random Signal Principles", Tata Mc Graw 2. Hill, 4th Edition, New Delhi, 2002.
- Veerarajan T., "Probability Statistics and Random Processes with Queueing theory and 3. Queueing Networks", 4th Edition, Tata McGraw Hill Edition, New Delhi, 2015.

e-RESOURCES:

16.03.2024

http://nptel.ac.in/courses/111104075/13, "Analysis of Variance and Design of Experiments, 1.

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Module-III, Dr. Shalabh, Department of Mathematics and Statistics, Indian Institute of Technology, Kanpur.

2. http://nptel.ac.in/courses/111105041/40/, "Probability and Statistics", Prof. Dr. Somesh Kumar, Department of Mathematics, Indian Institute of Technology, Kharagpur.

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Solve the problems involving discrete and continuous distributions using the properties of Probability.
- CO2 Measure the degree of relationship between the two dimensional random variables using correlation and regression.
- CO3 Analyze the estimation problems using suitable estimators.
- CO4 Test the hypothesis for given small and large samples and determine the Goodness of fit of the sample using Chi-square test.
- CO5 Analyze the given samples based on their variance.

COs/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	-	-	-	-	-	-	-	1	-	-
CO2	3	3	2	2	-	-	-	-	-	-	-	1	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	1	-	-
CO4	3	3	2	2	-	-	-	-	-	-	-	1	-	-
CO5	3	3	2	2	-	-	-	-	-	-	-	1	-	-

Mapping of COs with POs and PSOs

Prerequisites : Engineering Physics **Preamble**

Knowledge about the electronic structure of metals and semiconductors has manifested as a technology to design materials of desired properties. The knowledge of magnetic materials, superconductors and optical behavior of materials form the basis of solid state devices. Nanomaterials are envisioned in self-replicating robots at the molecular scale, in engines of creation.

UNIT 1 CONDUCTING MATERIALS

Conductors – Classical free electron theory of metals – Electrical and thermal conductivities -Wiedemann – Franz law – Lorentz number – Draw backs of classical theory – Quantum theory –Fermi distribution function – Effect of temperature on Fermi function – Density of energy states –Carrier concentration in metals.

UNIT 2 SEMICONDUCTING MATERIALS

Classification of Semiconductors - Intrinsic semiconductor – Carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – Electrical conductivity – Band gap determination – Derivation of carrier concentration in n-type and p-type semiconductor– Variation of Fermi level with temperature and impurity concentration - Hall effect – Determination of Hall coefficient – Zener diode-Varactor diode.

UNIT 3 MAGNETIC AND SUPERCONDUCTING MATERIALS

Origin of magnetic moment – Bohr magneton – Comparison of Dia, Para and Ferro magnetism – Domain theory – Hysteresis – Soft and hard magnetic materials – Antiferromagnetic materials-Uses of Magnetic materials in computers-Hard disk drive-CRT motors-Cooling fans-Optical disc drives.

Superconductivity : Properties – Type I and type II superconductors –BCS theory of superconductivity (qualitative) – High Tc superconductors – Josephson effect -Applications of superconductors –SQUID, cryotron, magnetic levitation.

UNIT 4 OPTICAL MATERIALS

Classification of optical materials – Absorption in metals, insulators & Semiconductors (concept only)carrier generation and recombination processes-LED's – Organic LED's – Polymer light emitting materials – Plasma light emitting devices— Laser diodes – Optical data storage techniques, LCD.

UNIT 5 NANOMATERIALS

Nanomaterials: Introduction-properties –Classification of synthesis routes- Methods of Synthesis- Ball milling – Sol gels –Chemical Vapour Deposition (CVD) – Applications of Nanomaterials. Nanoforms of Carbon - Buckminster fullerene- graphene –Carbon nanotubes : Fabrication – Arc method – Pulsed Laser Deposition (PLD)- Quantum wires, Quantum dots-preparation, properties and applications.

TOTAL : 45 PERIODS

TEXT BOOKS:

- Palanisamy P.K, "Materials Science", 2nd Edition, Scitech publications (India) Pvt. Ltd., Chennai, 2015.
- 2. S.O.Pillai "Solid State Physics",9th Edition,New Age International(P) Ltd,Publishers New Delhi,2020.

VCET, B.Tech-AI&DS, R2022, Curriculum and Syllabus.

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REFERENCES:

- 1. Balasubramaniam R, "Callister's Materials Science and Engineering", 2nd Edition, Wiley-India 2014.
- 2. Charles P. Poole and Frank J.Owens, "Introduction to Nanotechnology", 1st Edition, Wiley, New Delhi, December 2020.
- Donald A.Neamen, "Semiconductor Physics and Devices: Basic Principles",4th Edition, Tata McGraw-Hill, 2012

e-RESOURCES

- 1. http://nptel.ac.in/courses/122102008, "Materials Science" Dr. S. K. Gupta, IIT Delhi
- 2. https://www.khanacademy.org/science/physics/magnetic-forces-and-magnetic-fields

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Explain the behaviour of conducting materials based on classical and Quantum theory for Electrical and Thermal conductors.
- CO2 Demonstrate the knowledge on semiconductors with respect to carrier concentration and hall effect using density of energy states.
- CO3 Compare the properties of magnetic materials for dia, para and ferro magnets and discuss the applications of Magnetic materials and superconductors using CRT Motors, Cooling fans SQUID, Cryotron and MAGLEV.
- CO4 Discuss the functioning of optical materials in metals, insulators and semiconductors for optical data storage devices.
- CO5 Describe the synthesis and characterization of nano materials using CVD, PLD, Arc method for carbon nano tubes.

COs/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1	1	1	1	1	-	-	1	1	1	-	-
CO2	3	2	1	1	1	1	1	-	-	1	1	1	-	-
CO3	3	2	1	1	1	1	1	-	-	1	1	1	-	-
CO4	3	2	1	1	1	1	1	-	-	1	1	1	-	-
CO5	3	2	1	1	1	1	1	-	-	1	1	1	-	-

Mapping of COs with POs and PSOs

22EET11BASIC ELECTRICAL AND ELECTRONICS ENGINEERINGLTPC(Common to B.E-CE,CS,ME, B.Tech-AI&DS and IT Programmes)3003

Preamble

The course covers the fundamentals of basic electrical circuit parameters of both ac and dc circuits, structure of power system and the characteristics of motors and generators. The basics of semiconductor devices and logic gates provides the necessary initiative for the students to acquire the knowledge in basic electronics

UNIT 1 DC CIRCUITS AND AC CIRCUITS

DC Circuits: Basic Definitions - Resistance: Resistors in Series and Parallel - Ohm,,s Law - Kirchoff*s laws - Mesh analysis. AC Circuits: Basic Definitions - Alternating Voltage and Current, R.M.S and Average Value, Power Factor, Form Factor and Peak Factor - Analysis of AC Circuits: R, L, C, Series RL, RC & RLC Circuits.

UNIT 2 POWER SYSTEMS

Structure of Power System - Generation: Introduction to Conventional and Non Conventional Energy Sources - Transmission: Overhead and Underground Systems - Distribution: Single phase 2-wire system, three phase 3-wire and three phase 4-wire system - Basic principles of Earthing - Types: Plate earthing and Pipe earthing.

UNIT 3 ELECTRICAL MACHINES

Laws of Electromagnetic Induction - Fleming''s Right and Left hand rule - Lenz''s law. DC Generator: Construction and working principle - DC Shunt Motor: Construction, working principle and Characteristics - Single Phase Induction Motor: Split Phase and Capacitor Start Induction Motor.

UNIT 4 ELECTRONICS DEVICES

PN junction Diode and Characteristics - Zener Diode and Characteristics - Half and Full wave Rectifiers - Bipolar Junction Transistor - CE configuration and characteristics.

UNIT 5 DIGITAL ELECTRONICS

Boolean Algebra - Theorems and Laws - De-Morgan's theorem - Logic Gates - Universal Gates - Implementation of Boolean functions. Binary Arithmetic: Addition - Subtraction - Multiplication - Division - Half adder and Full adder circuits.

TOTAL : 45 PERIODS

TEXT BOOKS:

- 1. Muthusubramanian R and Salivahanan S, "Basic Electrical and Electronics Engineering", McGraw Hill Education, 1st Edition, 2014.
- 2. Mittle V N and Aravind Mittal, "Basic Electrical engineering", McGraw Hill Education, 2nd Edition, 2006.

REFERENCES:

- 1. V.K.Mehta and Rohit Mehta, "Principles of Electrical Engineering and Electronics", S.Chand& Company Ltd, 2015.
- 2. SedhaR.S.,"Applied Electronics", S.Chand& Company Ltd, 2006.
- 3. Thomas L.Floyd.,"DigitalFundamentals",PearsonEducation,PrenticeHall,Tenth Edition,2010.

e-RESOURCES:

- 1. NPTEL, http://nptel.ac.in/courses/117106101/, "Basic Electrical Circuits", Prof. NagendraKrishnapura, IIT,Madras.
- 2 NPTEL, http://nptel.ac.in/downloads/108105053/, "Basic Electrical Technology", Prof. Dr. L. Umanand, IIS,Bangalore.
- 3. NPTEL, http://nptel.ac.in/courses/117103063/, "Basic Electronics", Dr. Chitralekha Mahanta, IIT, Guwahati.

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Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Analyze the various DC and AC circuits and find the circuit parameters.
- CO2 Describe the principles of power system engineering.
- CO3 Illustrate the construction and working principle of electrical machines.
- CO4 Explain the basics of semiconductor devices and its applications.
- CO5 Describe the basics of Number systems and Logic gates.

COs/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1	-	-	-	1	-	-	-	-	1	-	-
CO2	3	2	1	-	-	-	1	-	-	-	-	1	-	-
CO3	3	2	1	-	-	-	1	-	-	-	-	1	-	-
CO4	3	2	1	-	-	-	1	-	-	-	-	1	-	-
CO5	3	2	1	-	-	-	1	-	-	-	-	1	-	-

Mapping of COs with POs and PSOs

e-RESOURCES:

- **TEXT BOOKS: TOTAL: 45 PERIODS**
- 1. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016.
- 2. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", 3rd Edition, Oxford University Press, 2013.

REFERENCES:

- 1. Paul Deitel and Harvey Deitel, C How to Program with an Introduction to C++, Eighth edition, Pearson Education, 2018.
- 2. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.
- 3.Byron S Gottfried, "Programming with C", Schaum's Outlines, Second Edition, Tata McGraw-Hill, 2006.

UNIT 1 BASICS OF C PROGRAMMING

fundamentals of C programming to solve Engineering problems.

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Preamble:

9 Introduction to Programming - Introduction to C - Structure of C program - Compilation and Execution - C Tokens -Keywords, Variables, Constants - Data Types - Input/output statements - Operators: Precedence and Associativity - Expressions - Type Conversion and Typecasting - Decision control and Looping statements - Preprocessor directives. Case study: EB Bill Generation

C PROGRAMMING

(Common to B.E-CS, B.Tech-AI&DS and IT Programmes)

This course aims at giving adequate exposure to students on the principles of procedural programming language. The course is intended to introduce the students to computational thinking and make the students develop C Programs using basic programming constructs. The course will enable the students to apply the

UNIT 2 ARRAYS AND STRINGS

Introduction to Arrays: Declaration, Initialization – One dimensional array –Linear Search, Binary Search. Two dimensional arrays - Matrix Operations (Addition, Multiplication and Transpose) - Strings - String operations: length, compare, concatenate, copy, reverse - Array of Strings. Case Study: Sorting of student namelist in a classroom

UNIT 3 FUNCTIONS AND POINTERS

Introduction to functions - Built-in functions (string functions, math functions) - User-defined functions -Function prototype, function definition, function call – Parameter passing: Pass by value, Pass by reference -Recursion. Pointers – Declaration – Pointer expression and Pointer arithmetic – Array of pointers –Function Pointers - Case Study: Scientific calculator using built-in functions and user defined functions

UNIT 4 STRUCTURES, UNION AND ENUMERATED DATATYPES

Structure - Nested structures - Pointer and Structures - Array of structures - Structure and Functions -Union - Example Programs using structures and Unions - Enumerated Data types. Case Study: Create employee datasheet using Structure, Union.

UNIT 5 FILE PROCESSING

Introduction to Files – Using Files in C – Reading and writing Files – Types of file processing: Sequential access, Random access - Functions for selecting a record - Command line arguments - Storage classes -Dynamic memory allocation. Case study: Processing stock details of Library.

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- 1. https://onlinecourses.nptel.ac.in/noc22_cs40/preview
- 2. https://onlinecourses.nptel.ac.in/noc22_cs45/preview

Course Outcomes: Upon completion of the course, students will be able to:

- 1. Apply suitable data type and control statements in C language to solve the given problem.
- 2. Experiment the given list of data through sorting or searching techniques in C.
- 3. Develop C programs using functions and pointers to access arrays.
- 4. Apply user defined data types like structures and unions to solve problems.
- 5. Develop C programs to store and process the given data using files.

COs/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	3	2	-	2	1	-	-	-	-	1	-	-
CO2	3	2	3	2	-	2	1	-	-	-	-	1	-	-
CO3	3	2	3	2	-	2	1	-	-	-	-	1	-	-
CO4	3	2	3	2	-	2	1	-	-	-	-	1	-	-
CO5	3	2	3	2	-	2	1	-	-	-	-	1	-	-

Mapping of COs with POs and PSOs

UNIT 1 WEAVING AND CERAMIC TECHNOLOGY

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Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries

TAMILS AND TECHNOLOGY

UNIT 2 DESIGN AND CONSTRUCTION TECHNOLOGY

Designing and Structural construction House & Designs in household materials during Sangam Age

- Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places -Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal -Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

UNIT 3 MANUFACTURING TECHNOLOGY

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

UNIT 4 AGRICULTURE AND IRRIGATION TECHNOLOGY

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry -Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl -Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

UNIT 5 SCIENTIFIC TAMIL & TAMIL COMPUTING

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

TEXT-CUM-REFERENCE BOOKS

16.03.2024

- தமிழக வரலாறு மக்களும் பண்பாடும் கே .கே. பிள்ளை (வெளியீடு : தமிழ்நாடு பாடநால் மற்றும் கல்வியியல் பணிகள் கழகம்).
- 2. கணினித் தமிழ் முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
- கீழடி வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
- 4. பொருநை ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
- 5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL (in print)
- 6. Social Life of the Tamils The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
- 7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
- 8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
- 9. Keeladi 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by:

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Total : 15

Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

- 10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
- 11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
- 12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) ReferenceBook.

22PHL21

PHYSICS AND CHEMISTRY LABORATORY II L T P C

(Common to all B.E, B.Tech Programmes)

Preamble

This course aims to impart knowledge in the determination of the physical parameters such as young's modulus, band gap, Co-efficient of viscosity, thickness of thin wire and Rigidity modulus of wire. This course also aims to impart the significance and estimation of DO and Cl⁻ content in water sample by titrimetric method. Amount of Na⁺, Ba²⁺and acid with electroanalytical techniques such as flame photometry, conductometry and pH meter in the aqueous solutions has been quantitatively analyzed.

PHYSICS LABORATORY II

LIST OF EXPERIMENTS

- 1. Determination of Young's modulus by Uniform bending method.
- 2. Determination of bandgap of semiconductors.
- 3. Determination of co-efficient of viscosity by Poiseuille's method.
- 4. Determination of thickness of thin wire by Air wedge method.
- 5. Determination of rigidity modulus-torsion pendulum.

CHEMISTRY LABORATORY II LIST OF EXPERIMENTS

- 1. Determination of Dissolved Oxygen content of waste water sample by Winkler's method.
- 2. Determination of chloride content of wastewater sample by Argentometric method.
- 3. Estimation of dissolved metal ions present in wastewater using flame photometer.
- 4. Conductometric precipitation titration of BaCl₂ vs Na₂SO₄ using conductivity meter.
- 5. Determination of acid strength in waste water using pH meter.

TOTAL : 45 PERIODS

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Experiment and determine the physical characteristics of given solid materials using Young's modulus-Uniform bending method, Air wedge and Torsion Pendulum
- CO2 Experiment and determine the band gap energy of a given semiconducting material using Zener diode.
- CO3 Experiment and determine the physical characteristics of a given liquid using Poiseuille's method.
- CO4 Experiment and estimate the amount of dissolved oxygen by Winkler's method and Chloride content by Mohr's method.
- CO5 Analyse the concentration of metal ions and acid present in the wastewater with the aid of Flame photometer, Conductivity meter and pH meter.

Mapping of COs with POs and PSOs

COs\POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1	-	3	-	1	1	-	1	1	1	1	-	-
CO2	2	1	-	3	-	1	1	-	1	1	1	1	-	-
CO3	2	1	-	3	-	1	1	-	1	1	1	1	-	-
CO4	2	1	-	3	-	1	1	-	1	1	1	1	-	-
CO5	2	1	-	3	-	1	1	-	1	1	1	1	-	-
1: Slight (Low	/)	2:	Mode	rate (N	ledium	n)	3	: Subst	antial	(High)	۰۰_››	No co	rrelation	•

22ITL21

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(Common to B.E-CS, B.Tech-AI&DS and IT Programmes)

Preamble:

This laboratory course is intended to provide students with opportunities to get hands on training to solve Engineering problems using C programming language.

LIST OF EXPERIMENTS

- 1. If the three sides of a triangle are entered through the keyboard, write a program to check whether the triangle is valid or not. The triangle is valid if the sum of two sides is greater than the largest of the three sides.
- 2. A university has the following rules for a student to qualify for a degree with A as the main subject and B as the subsidiary subject:

(a) He should get 55 percent or more in A and 45 percent or more in B.

(b) If he gets than 55 percent in A he should get 55 percent or more in B. However, he should get at least 45 percent in A.

(c) If he gets less than 45 percent in B and 65 percent or more in A he is allowed to reappear in an examination in B to qualify.

(d) In all other cases he is declared to have failed.

Write a program to receive marks in A and B and Output whether the student has passed, failed or is allowed to reappear in B.

- 3. Twenty-five numbers are entered from the keyboard into an array. Write a program to find out how many of them are positive, how many are negative, how many are even and how many odd.
- 4. Write a program that extracts part of the given string from the specified position. For example, if the sting is "Working with strings is fun", then if from position 4, 4 characters are to be extracted then the program should return string as "king". Moreover, if the position from where the string is to be extracted is given and the number of characters to be extracted is 0 then the program should extract entire string from the specified position.
- 5. A positive integer is entered through the keyboard, write a program to obtain the prime factors of the number. Modify the function suitably to obtain the prime factors recursively.
- 6. Write a function to compute the distance between two points and use it to develop another function that will compute the area of the triangle whose vertices are A(x1, y1), B(x2, y2), and C(x3, y3). Use these functions to develop a function which returns a value 1 if the point (x, y) lines inside the triangle ABC, otherwise a value 0.
- 7. An animal could be a canine (dog, wolf, fox, etc.), a feline (cat, lynx, jaguar, etc.), a cetacean (whale, narwhal, etc.) or a marsupial (koala, wombat, etc.). The information whether a particular animal is canine, feline, cetacean, or marsupial is stored in bit number 0, 1, 2 and 3 respectively of a integer variable called type. Bit number 4 of the variable type stores the information about whether the animal is Carnivore or Herbivore. For the following animal, complete the program to determine whether the animal is a herbivore or a carnivore. Also determine whether the animal is a canine, feline, cetacean or a marsupial.
- 8. There is a structure called employee that holds information like employee code, name, date of joining. Write a program to create an array of the structure and enter some data into it. Then ask the user to enter current date. Display the names of those employees whose tenure is 3 or more than 3 years according to the given current date.
- 9. Given a list of names of students in a class, write a program to store the names in a file on disk. Make a provision to display the nth name in the list (n is data to be read) and to display all names starting with S.

10. Assume that a Master file contains two fields, Roll no. and name of the student. At the end of the year, a set of students join the class and another set leaves. A Transaction file contains the roll numbers and an appropriate code to add or delete a student. Write a program to create another file that contains the updated list of names and roll numbers. Assume that the Master file and the Transaction file are arranged in ascending order by roll numbers. The updated file should also be in ascending order by roll numbers.

TOTAL: 45 PERIODS

Course Outcomes:

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

- CO1 Develop and test the C program to solve a given problem statement using suitable data types, decision making and control statements.
- CO2 Write the C program to process the given list of data using the concepts of arrays and strings
- CO3 Develop and test the C program for the given problem statement using functions and Apply CHE Signeepts of structure and union to solve a given problem statement in C.
- CO4 Apply the concepts of structure and union to solve a given problem statement in C.
- CO5 Construct the C program to store and process the given data using files.

COs/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3	3	3	2	1	1	-	1	-	-	2	-	-
CO2	2	3	3	3	2	1	1	-	1	-	-	2	-	-
CO3	2	3	3	3	2	1	1	-	1	-	-	2	-	-
CO4	2	3	3	3	2	1	1	-	1	-	-	2	-	-
CO5	2	3	3	3	2	1	1	-	1	-	-	2	-	-

Mapping of COs with POs and PSOs

22EEL22

ENGINEERING PRACTICES LABL T P C(Common to CS, AI&DS and IT Branches)0 0 2 1

Preamble:

The students are given the introduction upon the basics of computer which comprises of the study of Motherboard and interfacing components and operating system. They were given the practice for assembling a PC, assembling RAM in a motherboard, assembling hard disk drive in a cabinet, assembling CD/DVD ROM in a cabinet, establishing data connection and fixing wires. The basic knowledge of electrical and electronics is mandatory and it is practiced with the wiring experiments and by verification of the basic logic gates.

LIST OF EXPERIMENTS

COMPUTER

- 1) Study and identification of standard desktop personal computer.
- 2) Study of Motherboard and interfacing components.
- 3) Install, upgrade and configure Windows operating systems.
- 4) Install, upgrade and configure Linux operating systems.
- 5) Computer Assembly and Configuration : Steps for assembling a PC, assembling RAM in a motherboard, assembling hard disk drive in a cabinet, assembling CD/DVD ROM in a cabinet, establishing data connection and fixing wires.
- 6) System Installation: Steps for installing different softwares (including antivirus software, printer andscanner software).

ELECTRICAL AND ELECTRONICSELECTRICAL

- 7) Residential house wiring using switches, fuse, indicator and lamps.
- 8) Fluorescent lamp wiring.
- 9) Stair case wiring.
- 10) Reading of voltage, current, power, energy and other parameters with 1 phase digital energy meter
- 11) Measurement of earth resistance

ELECTRONICS

- 12) Identification and Study of Electronic components and equipments Resistors, capacitors, inductors, colour coding and measurement.
- 13) Measurement of AC signal parameters (peak-peak, RMS value, period, frequency) using CRO.
- 14) Verification of the truth tables of logic gates: AND, OR, XOR and NOT.
- 15) Construction of Half Wave and Full Wave Rectifiers and study their output waveforms.
- 16) Soldering practice Using general purpose PCB.

TOTAL: 45 PERIODS

Course Outcomes: Upon completion of the course, students will be able to:

- 1. Study the basics of personal computer and also its interfacing components.
- 2. Install and update windows and Linux operating systems.
- 3. Explain basics of Computer assembly and configuration and also system installation with different software.
- 4. Construct various types of domestic wiring and measure the various electrical parameters.
- 5. Develop and test circuits with active elements and verify truth table of logic gates.

COs/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	2	1	3	-	-	1	-	1	1	-	1	-	-
CO2	1	2	1	3	-	-	1	-	1	1	-	1	-	-
CO3	1	2	1	3	-	-	1	-	1	1	-	1	-	-
CO4	1	2	2	3	-	-	1	-	1	1	-	1	-	-
CO5	1	2	2	3	-	-	1	-	1	1	-	1	-	-

Preamble

The study of biodiversity reflects the level of national interest in natural resources and heritage, which is considered as an important part of a country's wealth. As India is one of the world's 12 giant diversity hubs, we need to focus on understanding, preserving and utilizing the biodiversity of our biological resources. Environmental protection is an important issue for today's society, as scientific research provides evidence of increased global warming, ozone depletion and increased pollution. Engineers need to learn the importance of green synthesis in the design, development and evaluation of structures, devices and systems to provide practical solutions to the problems caused by the pollution and depletion of natural resources.

UNIT 1 NATURAL RESOURCES, ECOSYSTEM AND BIODIVERSITY

Forest Resources – use and over exploitation – Water Resources – use and over utilization – Dams – benefits and problems – Ecosystem – structure and function – Biodiversity – types – threats to biodiversity – Biodiversity conservation–In-situ and Ex-situ – Role of an individual in conservation of natural resources.

UNIT 2 ENVIRONMENTAL POLLUTION

Definition – causes, effects and control measures – Air Pollution, Water Pollution, Soil Pollution – Solid waste – methods of disposal – sanitary landfill, incineration and composting – Environmental Impact Assessment and ISO 14000.

UNIT 3 E-WASTE AND ITS MANAGEMENT

E-Waste – sources of e-waste – hazardous substances in e-waste – effects of e-waste on environment and human health – need for e-waste management – disposal treatment methods of e-waste – Global scenario of e-waste – e-waste in India- case studies.

UNIT 4 SOCIAL ISSUES AND THE ENVIRONMENT

Social issues – Sustainable development – Water conservation – rain water harvesting. Disaster Management – floods, earthquake, cyclone and landslides. Role of IT in environment and human health. UNIT 5 GREEN CHEMISTRY 6

Green Chemistry – twelve principles of green chemistry – Importance of green synthesis – Green synthesis – dimethyl carbonate – Bio-catalysts – extraction of gold – Applications of green synthesis.

TOTAL : 30 PERIODS

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TEXT BOOKS:

- 1. Environmental Science, 5th Edition. P. N. Palanisamy, P. Manikandan, A. Geetha, K. Manjula Rani, V. N. Kowshalya, Pearson India Education services Private Limited, 2020.
- 2. Environmental Science and Engineering, 2nd edition, Dr.T. Arun Luiz, V K publications, 2018.

REFERENCES:

- 1. Environmental Science and Engineering, 3rd reprint, Benny Joseph, McGraw Hill Education (India) Private Limited, New Delhi, 2015.
- 2. Engineering Chemistry, 1st Impression, K. Sesha Maheswaramma, Mridula Chugh, Pearson India Education Services Private Limited, 2016.
- 3. Introduction to Environmental Engineering and Science, 2nd edition, Gilbert M. Masters, Prentice Hall of India Private Limited, 2015.

e-RESOURCES:

- https://www.digimat.in/nptel/courses/video/105105169/L01.html, "Electronic waste managementissues and challenges"- Prof. Brajesh Kumar Dubey, Department of Civil Engineering, IIT Kharagpur.
- 2. https://archive.nptel.ac.in/courses/105/103/105103205/, "Municipal solid waste management"- Prof. Ajay Kalamdhad, Department of Civil Engineering, IIT Guwahati.

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Recognize the biodiversity threats, overexploitation of forest and overutilization of water to conserve biodiversity.
- CO2 Analyze sources, impacts, air and water pollution control measures and solid waste management to maintain a green environment.
- CO3 Identify the Environmental impacts of e-waste and its management.
- CO4 Explain human health, environment and disaster management through information technology.
- CO5 Apply the principles of green chemistry to green synthesis for a sustainable environment.

COs\POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1	1	1	2	3	2	1	1	1	2	-	-
CO2	3	2	1	1	1	2	3	2	1	1	1	2	-	-
CO3	3	2	1	1	1	2	3	2	1	1	1	2	-	-
CO4	3	2	1	1	1	2	3	2	1	1	1	2	-	-
CO5	3	2	1	1	1	2	3	2	1	1	1	2	-	-
Mapping Average	3	2	1	1	1	2	3	2	1	1	1	2	-	-

Mapping of COs with POs and PSOs

PROPOSITIONAL CALCULUS UNIT 1

Propositions – Logical connectives–Compound propositions-Conditional and biconditional propositions -Truth tables-Tautologies and contradictions-Contra positive-Logical equivalences and implications -Normal forms-Principal conjunctive and disjunctive normal forms-Rules of inference.

UNIT 2 **PREDICATE CALCULUS**

Predicates-Statement functions -Variables-Free and bound variables-Quantifiers -Universe of discourse-Logical equivalences and implications for quantified statements-Theory of inference -The rules of universal specification and generalization.

COMBINATORICS UNIT 3

Mathematical induction – Strong induction and well ordering – The basics of counting – The pigeonhole principle - Permutations and combinations - Recurrence relations - Solving linear recurrence relations -Generating functions – Inclusion and exclusion principle and its applications

UNIT 4 GRAPHS

Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism - Connectivity - Euler and Hamilton paths.

GROUP THEORY UNIT 5

Groups - Subgroups - Permutation groups - Normal subgroup and cosets - Lagrange's theorem -Homomorphism - First fundamental theorem of homomorphism- - Cayley's Theorem.

LECTURE : 45 TUTORIAL : 15 TOTAL : 60 PERIODS

TEXT BOOKS:

- Kenneth H.Rosen, "Discrete Mathematics and its Applications", 7th Edition, Tata Mc Graw Hill 1. Private Limited, New Delhi, Special Indian Edition, 2014
- Tremblay J.P. and Manohar R, "Discrete Mathematical Structures with Applications to Computer 2. Science", Tata Mc Graw Hill Pub. Co. Ltd, New Delhi, 47th Reprint, 2015.

REFERENCES:

Ralph.P.Grimaldi., "Discrete and Combinatorial Mathematics: An Applied Introduction", 5th 1. Edition, Pearson Education(Singapore) Private Limited, New Delhi, 8th Impression 2016

DISCRETE MATHEMATICS

(Common to B.E. Computer Science and Engineering, B.Tech Artificial Intelligence and Data Science and B.Tech Information Technology

Programmes in third Semester)

Pre-requisites: 22MAT12-Matrices and Differential Calculus, 22MAT22-Probability and Statistics

Preamble:

22MAT34

Discrete Mathematics is a branch of mathematics involving discrete elements that uses algebra and arithmetic. It is increasingly being applied in the practical fields of computer science. Propositional calculus is a formal system whose expressions represent formal objects which can be used in the design of combinational digital circuits. The predicate logic is a part of artificial intelligence which is applicable in the field of robotics, medicine and it is used in intelligent database in order to solve some complex problems. *Combinatorics is a fundamental mathematical discipline which provides a foundation in counting techniques* that can be applied to algorithm analysis. Graph is a formal way to represent a network. Many problems in computer system can be analyzed using models based on graphs. Concepts of Groups provide the background essential to the study of finite state machines, switching theory and logic design.

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- 2. Thomas Koshy., "Discrete Mathematics with Applications", Elsevier Academic Press, UK, Reprinted 2014.
- 3. Narsingh Deo, "Graph Theory with Applications to Engineering and Computer Science", Learning Private Limited, Delhi, 2016.
- 4. Bernard Kolman, Robert Busby, Sharon C. Ross "Discrete Mathematical Structures" 6th Edition, Pearson Education (Singapore) Private Limited, New Delhi, 2014.

e-RESOURCES:

- <u>http://nptel.ac.in/courses/106106094/1</u>, "Propositional Logic" ,
 <u>http://nptel.ac.in/courses/106106094/3</u>, "Predicate Calculus" and
 <u>https://nptel.ac.in/courses/106106094/40</u> "Lattices" Dr.Kamala Krithivasan, Department of
 Computer Science and Engineering, Indian Institute of Technology, Madras.
- <u>http://nptel.ac.in/courses/111107058/20</u>, "Graph Theory", and <u>http://nptel.ac.in/courses/111107058/38</u>, "Inroduction to Recurrence Relations", Dr.Sugata Gangopadhyay, Department of Mathematics, Indian Institute of Technology, Roorkee.

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Construct and check the validity of mathematical arguments using propositional calculus
- CO2 Compute the logical structures of ordinary language statements using predicate calculus.

Compute combinatorial problems by applying Pigeonhole Principle, Permutations and

- CO3 Combinations and solve Linear Recurrence Relations using Generating functions
- CO4 Determine whether the graphs are Hamiltonian and/or Eulerian and check Isomorphism between graphs
- CO5 Classify the given set as Semigroup, Monoid or Group by using the properties of groups.

Mapping of COs with POs and PSOs

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	3	2	2								1		
CO 2	3	3	2	2								1		
CO 3	3	3	2	2								1		
CO 4	3	3	2	2								1		
CO 5	3	3	2	2								1		

FOUNDATIONS OF DATA SCIENCE

Pre-requisites : Python Programming Preamble

The main objective of data science is to discover patterns in data. It makes sense of the data through a variety of statistical techniques. After data extraction, wrangling, and pre-processing, a data scientist must carefully examine the data.

UNIT 1 INTRODUCTION

22ADT31

Data Science: Benefits and uses - facets of data - Data Science Process: Overview - Defining research goals - Retrieving data - Data preparation - Exploratory Data analysis - build the model- presenting findings and building applications - Data Mining - Data Warehousing - Basic Statistical descriptions of Data.

UNIT 2 DESCRIBING DATA

Types of Data - Types of Variables -Describing Data with Tables and Graphs –Describing Data with Averages - Describing Variability - Normal Distributions and Standard (z) Scores.

UNIT 3 DESCRIBING RELATIONSHIPS

Correlation -Scatter plots -correlation coefficient for quantitative data -computational formula for correlation coefficient - Regression - regression line - least squares regression line - Standard error of estimate – interpretation of r2 –multiple regression equations –regression towards the mean.

UNIT 4 PYTHON LIBRARIES FOR DATA WRANGLING

Basics of Numpy arrays -aggregations -computations on arrays -comparisons, masks, boolean logic fancy indexing - structured arrays - Data manipulation with Pandas - data indexing and selection operating on data - missing data - Hierarchical indexing - combining datasets - aggregation and grouping – pivot tables.

UNIT 5 DATA VISUALIZATION

Importing Matplotlib - Line plots - Scatter plots - visualizing errors - density and contour plots -Histograms - legends - colors - subplots - text and annotation - customization - three dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn.

TEXT BOOKS:

- David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning 1. Publications, 2016.
- Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017. 2.
- Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016. 3.

REFERENCES:

Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014. 1.

e-RESOURCES:

- https://nptel.ac.in/courses/106106179 1.
- 2. https://www.coursera.org/learn/foundations-of-data-science

Total : 45 Periods

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Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Interpret data science basics, exploratory data analysis and its tools.
- CO2 Explain different types of data description for data science process.
- CO3 Interpret the usage of statistical inference and regression models.
- CO4 Use the Python Libraries for Data Wrangling.
- CO5 Apply visualization Libraries in Python to interpret and explore data.

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1	2	3	1	-	-	-	-	-	1	2	3
CO2	3	2	2	1	3	1	-	-	-	-	-	1	2	3
CO3	3	2	1	2	3	1	-	-	-	-	-	1	2	3
CO4	3	2	2	1	3	1	-	-	-	-	-	1	2	3
CO5	3	2	1	2	3	1	-	-	-	-	-	1	2	3

Mapping of COs with POs and PSOs

22ADC31 DATA STRUCTURES USING PYTHON

Pre-requisites : Python Programming, Python Programming Laboratory Preamble

Data structure is an arrangement of data in computer's memory in such a way that it could make the data quickly available to the processor for required calculations. Lists, arrays, stacks, queues, heaps, trees, and graphs are the more commonly used data structures. Choosing an appropriate data structure to solve the given problem greatly influences the characteristics of the obtained solution.

UNIT 1 ABSTRACT DATA TYPES

Abstract Data Types (ADTs) - Introduction to OOP concepts - classes in Python - Inheritance.

UNIT 2 LINEAR STRUCTURES

List ADT - Array-based Implementations - Linked List Implementations - Singly Linked Lists - Circularly Linked Lists - Doubly Linked Lists - Applications of Lists - Stack ADT - Queue ADT - Applications of Stacks and Queues.

UNIT 3 TREES

Tree ADT - Tree Traversals - Binary Tree ADT - Expression trees - Binary Search Tree ADT - AVL Trees. Binary Heap - Heap Sort.

UNIT 4 GRAPHS

Graph Definition - Representation of Graphs - Types of Graph - Breadth-first traversal - Depth-first traversal - Topological Sort - Dijkstra's algorithm - Minimum Spanning Tree - Prim's algorithm - Kruskal's algorithm.

UNIT 5 SEARCHING, SORTING AND HASHING

Searching - Linear Search - Binary Search. Sorting - Bubble sort - Selection sort - Insertion sort - Shell sort. Hashing - Hash Functions - Separate Chaining - Open Addressing - Rehashing - Extendible Hashing.

LIST OF EXPERIMENTS

- 1. Program to implement Singly Linked List /Doubly Linked list of ordered integers (ascending/descending) with insert, search and display operations.
- 2. Program to simulate Stack and Queue using array and linked list.
- 3. Program to insert, delete and search for a node in a Binary Search Tree.
- 4. For the given route map with cost of transportation between different cities, find the shortest route from a source to all the other cities using Dijkstra's Algorithm.
- 5. Consider the motor racing game in which there are n participants. Get the points scored by each participant. Write a program to sort the positions of players in ascending order based on points scored using heap sort and print the highest score.

Total : (L:45+P:15) 60 PERIODS

TEXT BOOKS:

- 1. Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, "Data Structures and Algorithms in Python" (An Indian Adaptation), Wiley, 2021.
- 2. Lee, Kent D., Hubbard, Steve, "Data Structures and Algorithms with Python" Springer Edition 2015.

REFERENCES:

1. Narasimha Karumanchi, "Data Structures and Algorithmic Thinking with Python" Careermonk, 2015

VCET, B.Tech-AI&DS, R2022, Curriculum and Syllabus.

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- 2. Rance D. Necaise, "Data Structures and Algorithms Using Python", John Wiley & Sons, 2011.
- 3. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning, 2010.

e-RESOURCES:

- 1. <u>https://onlinecourses.nptel.ac.in/noc22_cs26/preview</u>, "Programming, Data Structures and Algorithms Using Python", Prof. Madhavan Mukund, IIT-Bombay.
- 2. <u>https://nptel.ac.in/courses/106106133</u>, "Programming, Data structures and Algorithms", Prof. Hema A Murthy, Dr. N S. Narayanaswamy, Prof. Shankar Balachandran, IIT Madras.

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Create appropriate class suitable for an application to solve the given problem.
- CO2 Create list, stack and queue ADT for a given set of elements using array and linked list implementation and apply specific ADT for a given application.
- CO3 Construct a tree for a given list of data by ensuring tree properties and analyze inorder, preorder, postorder traversal for a constructed tree.
- CO4 Implement a suitable shortest path algorithm and identify the minimum spanning tree for the given graph such that the sum of the edges weights is minimum.
- CO5 Apply a suitable searching, sorting and hashing algorithms for a given list of data considering the size and ordering of data.

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	2	1	-	1	-	-	1	1	1	2	2
CO2	3	2	2	2	1	-	1	-	-	1	1	1	2	2
CO3	3	2	2	2	1	-	1	-	-	1	1	1	2	2
CO4	3	2	2	2	1	-	1	-	-	1	1	1	2	2
CO5	3	2	2	2	1	-	1	-	-	1	1	1	2	2

Mapping of COs with POs and PSOs

22ADT32

JAVA PROGRAMMING

Pre-requisites: -Preamble

This course focuses on the fundamentals of object-oriented programming and Java programming language. Students will also be able to understand the fundamentals of packages, inheritance, and interfaces. The ability to create Java applications with threads, generic classes, exceptions, and I/O streams will be taught to the students. Additionally, using JAVAFX, students will be able to create graphic user interface applications.

UNIT 1 INTRODUCTION TO OOP AND JAVA

Overview of OOP - Object oriented programming paradigms - Features of Object Oriented Programming – Java Buzzwords – Overview of Java – Data Types, Variables and Arrays – Operators – Control Statements - Programming Structures in Java - Defining classes in Java - Constructors-Methods -Access specifiers - Static members- JavaDoc comments

UNIT 2 INHERITANCE, PACKAGES AND INTERFACES

Overloading Methods - Objects as Parameters - Returning Objects - Static, Nested and Inner Classes. Inheritance: Basics- Types of Inheritance -Super keyword -Method Overriding - Dynamic Method Dispatch -Abstract Classes - final with Inheritance. Packages and Interfaces: Packages - Packages and Member Access - Importing Packages - Interfaces.

UNIT 3 EXCEPTION HANDLING AND MULTITHREADING

Exception Handling basics - Multiple catch Clauses - Nested try Statements - Java's Built-in Exceptions - User defined Exception. Multithreaded Programming: Java Thread Model-Creating a Thread and Multiple Threads – Priorities – Synchronization – Inter Thread Communication Suspending – Resuming, and Stopping Threads – Multithreading. Wrappers – Auto boxing.

UNIT 4 I/O, GENERICS, STRING HANDLING

I/O Basics - Reading and Writing Console I/O - Reading and Writing Files. Generics: Generic Programming - Generic classes - Generic Methods - Bounded Types - Restrictions and Limitations. Strings: Basic String class, methods and String Buffer Class.

UNIT 5 JAVAFX EVENT HANDLING, CONTROLS AND COMPONENTS

JAVAFX Events and Controls: Event Basics - Handling Key and Mouse Events. Controls: Checkbox, ToggleButton - RadioButtons - ListView - ComboBox - ChoiceBox - Text Controls - ScrollPane. Lavouts - FlowPane - HBox and VBox - BorderPane - StackPane - GridPane. Menus - Basics - Menu - Menu bars - MenuItem.

TEXT BOOKS:

- Herbert Schildt, "Java: The Complete Reference", 11 th Edition, McGraw Hill Education, New 1. Delhi, 2019
- Herbert Schildt, "Introducing JavaFX 8 Programming", 1 st Edition, McGraw Hill Education, 2.

New Delhi. 2015

REFERENCES:

Cay S. Horstmann, "Core Java Fundamentals", Volume 1, 11 th Edition, Prentice Hall, 2018 1.

e-RESOURCES:

- https://archive.nptel.ac.in/courses/106/105/106105191/ 1.
- 2. https://www.w3resource.com/java-tutorial/java-object-oriented-programming.php

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Total: 45 Periods

Course Outcomes: Upon completion of this course, students will be able to

- CO1 Apply the concepts of classes and objects to solve simple problems
- CO2 Develop programs using inheritance, packages and interfaces
- CO3 Make use of exception handling mechanisms and multithreaded model to solve real world problems
- CO4 Build Java applications with I/O packages, string classes, Collections and generics concepts
- CO5 Integrate the concepts of event handling and JavaFX components and controls for developing GUI based applications

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	3	1	3	-	-	-	2	1	2	2	3	1
CO2	3	2	3	2	1	-	-	-	2	1	2	3	3	1
CO3	3	2	1	2	2	-	-	-	2	1	2	2	3	1
CO4	3	2	2	2	2	-	-	-	2	1	2	3	3	1
CO5	3	2	2	2	2	-	-	-	2	1	2	2	3	1

Mapping of COs with POs and PSOs

22ADC32 DIGITAL PRINCIPLES AND COMPUTER ORGANISATION $\begin{array}{ccc} L & T & P & C \\ 3 & 0 & 2 & 4 \end{array}$

Pre-requisites : -

Preamble

This course aims at giving adequate exposure to students on the design of combinational circuits and design sequential circuits. Students can understand the basic structure and operation of a digital computer and the design of data path unit, control unit for processor and to familiarize with the hazards. Students can can also understand the concept of various memories and I/O interfacing.

UNIT 1 COMBINATIONAL LOGIC

Combinational Circuits – Karnaugh Map - Analysis and Design Procedures – Binary Adder – Subtractor – Decimal Adder - Magnitude Comparator – Decoder – Encoder – Multiplexers – Demultiplexers.

UNIT 2 SYNCHRONOUS SEQUENTIAL LOGIC

Introduction to Sequential Circuits – Flip-Flops – operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Design – Moore/Mealy models, state minimization, state assignment, circuit implementation - Registers – Counters.

UNIT 3 COMPUTER FUNDAMENTALS

Functional Units of a Digital Computer: Von Neumann Architecture – Operation and Operands of Computer Hardware Instruction – Instruction Set Architecture (ISA): Memory Location, Address and Operation – Instruction and Instruction Sequencing – Addressing Modes, Encoding of Machine Instruction – Interaction between Assembly and High Level Language.

UNIT 4 PROCESSOR

Instruction Execution – Building a Data Path – Designing a Control Unit – Hardwired Control, Micro programmed Control – Pipelining – Data Hazard – Control Hazards.

UNIT 5 MEMORY AND I/O

Memory Concepts and Hierarchy – Memory Management – Cache Memories: Mapping and Replacement Techniques – Virtual Memory – DMA – I/O – Accessing I/O: Parallel and Serial Interface – Interrupt I/O – Interconnection Standards: USB, SATA.

List of Experiments

- 1. Verification of Boolean theorems using logic gates
- 2. Design and implementation of Half Adder, Full Adder and binary to gray code converter.
- 3. Design and implementation of multiplexers/ Demultiplexers.
- 4. Design and implementation of Synchronous counters.
- 5. Simulator based study of Computer Architecture

TEXT BOOKS:

- 1. M. Morris Mano, Michael D. Ciletti, "Digital Design : With an Introduction to the Verilog HDL, VHDL, and System Verilog", Sixth Edition, Pearson Education, 2018
- 2. David A. Patterson, John L. Hennessy, "Computer Organization and Design, The
- ^{2.} Hardware/Software Interface", Sixth Edition, Morgan Kaufmann/Elsevier, 2020

REFERENCES:

- 1. William Stallings, "Computer Organization and Architecture Designing for Performance", Tenth Edition, Pearson Education, 2016.
- 2. M. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 2016.

Total : (L:45+P:15) 60 PERIODS

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e-RESOURCES:

- 1. Digital Circuits [Prof. Anil Mahanta IIT Guwahati] http://nptel.ac.in/courses/117103064/#
- 2. Digital Circuits and Systems [Prof. S. Srinivasan IIT Madras]
- ². http://nptel.ac.in/courses/117106086/

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Design various combinational digital circuits using K-map to reduce Boolean expression.
- CO2 Design sequential circuits and analyze the design procedures to implement shift registers.
- CO3 Analyze the performance and describe the instruction set using different addressing modes for a given computer architecture.
- CO4 Construct the data path and describe the effect of data hazard, control hazard for a given pipeline processor.
- CO5 Compare the standard I/O interfaces and data transfer techniques to access I/O devices for the given computer system.

COs/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	-	-	-	1	-	-	1	2	2
CO2	3	3	2	2	2	-	-	-	1	-	-	1	2	2
CO3	3	3	2	2	2	-	-	-	1	-	-	1	2	2
CO4	3	3	2	2	2	-	-	-	1	-	-	1	2	2
CO5	3	3	2	2	3	-	-	-	1	-	-	1	2	2

Mapping of COs with POs and PSOs
22ADL31

Preamble:

The goal of the course is to give students the ability to construct software using Java programming for practical applications. The ideas of classes, packages, interfaces, inheritance, exception handling, and file processing will be understood and applied by the students. Students are also capable of creating applications using event handling and general programming.

LIST OF EXPERIMENTS

1. Solve problems by using sequential search, binary search, and quadratic sorting algorithms (selection, insertion)

2. Develop stack and queue data structures using classes and objects.

3. Develop a java application with an Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club funds. Generate pay slips for the employees with their gross and net salary.

4. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named printArea(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method printArea() that prints the area of the given shape.

5. Solve the above problem using an interface.

6. Implement exception handling and creation of user defined exceptions.

7. Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.

8. Write a program to perform file operations.

9. Develop applications to demonstrate the features of generics classes.

10. Develop applications using JavaFX controls, layouts and menus.

SOFTWARE

- Operating Systems: Linux / Windows
- Front End Tools: Eclipse IDE / Netbeans IDE

TOTAL: 45 PERIODS

Course Outcomes: Upon completion of the course, students will be able to:

- 1. Design and develop java programs using object oriented programming concepts
- 2. Develop simple applications using object oriented concepts such as package, exceptions
- 3. Implement multithreading, and generics concepts
- 4. Create GUIs and event driven programming applications for real world problems
- 5. Implement and deploy web applications using Java

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C01	3	2	2	1	2	-	-	-	1	2	2	2	3	1
CO2	3	2	3	1	2	-	-	-	2	3	3	2	3	1
CO3	3	2	1	2	2	-	-	-	1	2	1	2	3	1
CO4	3	2	1	3	2	-	-	-	3	1	1	1	3	1
CO5	3	3	3	1	3	-	-	-	1	1	1	1	3	1

Preamble:

The main objective of data science lab is to understand the python libraries and basic Statistical and Probability measures for data science.

LIST OF EXPERIMENTS

- 1. Download, install and explore the features of NumPy, SciPy, Jupyter, Statsmodels and Pandas packages.
- 2. Working with Numpy arrays
- 3. Working with Pandas data frames
- 4. Reading data from text files, Excel and the web and exploring various commands for doing descriptive analytics on the Iris data set.
- 5. Use the diabetes data set from UCI and Pima Indians Diabetes data set for performing the following:
 - a. Univariate analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis.
 - b. Bivariate analysis: Linear and logistic regression modeling
 - c. Multiple Regression analysis
 - d. Also compare the results of the above analysis for the two data sets.
- 6. Apply and explore various plotting functions on UCI data sets.
 - a. Normal curves
 - b. Density and contour plots
 - c. Correlation and scatter plots
 - d. Histograms
 - e. Three dimensional plotting
- 7. Visualizing Geographic Data with Basemap

SOFTWARE

• Python 3 interpreter / open source IDE

TOTAL: 45 PERIODS

Course Outcomes: Upon completion of the course, students will be able to:

- 1. Make use of the python libraries for data science
- 2. Make use of the basic Statistical and Probability measures for data science.
- 3. Perform descriptive analytics on the benchmark data sets.
- 4. Perform correlation and regression analytics on standard data sets
- 5. Present and interpret data using visualization packages in Python.

Mapping of COs with POs and PSOs

COs/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	3	2	1	1	-	2	-	1	1	2	3
CO2	3	2	2	3	2	1	1	-	2	-	1	1	2	3
CO3	3	2	2	3	2	1	1	-	2	-	1	1	2	3
CO4	3	2	2	3	2	1	1	-	2	-	1	1	2	3
CO5	3	2	2	3	2	1	1	-	2	-	1	1	2	3

OPTIMIZATION TECHNIQUES AND QUEUEING THEORY 22MAT42 С L T Р (Common to B.E CSE & B.TECH – AI&DS, IT) 3 1 0 4

Pre-requisites: 22MAT12-Matrices and Differential Calculus, 22MAT22- Probability and Statistics Preamble

Optimization Techniques is a discipline to aid decision making and improving efficiency of the system by applying advanced analytical methods. Simplex Algorithm is a powerful method for solving linear programming problems. The Transportation and Assignment problems deal with assigning sources and jobs to destinations and machines and minimize the Transportation cost. PERT and CPM are techniques of project management useful in the basic managerial functions of planning, scheduling and control. Oueuing theory provides a rich and useful set of mathematical models for the analysis and design of service process for which there is contention for shared resources.

UNIT 1 LINEAR PROGRAMMING PROBLEM

Introduction to Optimization Techniques, General mathematical formulation for Linear Programming Problem-Canonical and Standard form of LPP, Solution of LPP by graphical Method, simplex method and Big-M method.

UNIT 2 TRANSPORTATION AND ASSIGNMENT PROBLEM

Transportation Models- Balanced and unbalanced Problems - Initial Basic feasible solution by N-W Corner Rule, Least cost and Vogel's approximation methods. Check for optimality. Solution by MODI method. Case of Degeneracy. Assignment Models - Balanced and Unbalanced Problems. Solution by Hungarian method

UNIT 3 NETWORK MODELS

Introduction - determining the critical path, project scheduling by Critical Method (CPM), Programme Evaluation and Review Technique (PERT).

UNIT 4 QUEUEING THEORY

Markovian queues - Single server with infinite capacity-Multiple server with infinite capacity - Single server with finite capacity – Multiple server with finite capacity –Little's formula.

UNIT 5 ADVANCED QUEUEING MODELS

M/G/1 gueue - PollaczekKhinchin formula - M/D/1 and M/EK/1 as special cases – Series queues without blocking - Open Jackson networks

TEXT BOOKS:

- Hamdy A.Taha, "Operations Research", 8th Edition, Pearson Prentice Hall, Chennai, 2007 1.
- D.Gross, John F.Shortle, James M.Thompson and C.M.Harris, "Fundamentals of Queueing 2. Theory", Wiley India Pvt Ltd,4thReprint,2013.

REFERENCES:

- A. Ravindran, Don T. Phillips, James J. Solberg, "Operations Research: Principles and Practice", 1. 2nd Edition, Wiley India Edition, New Delhi, 2007.
- 2. Trivedi.K.S., "Probability and Statistics with Reliability, Queueing and Computer Science Applications", 2nd Edition, Wiley Dream Tech. India (P) Ltd, New Delhi, 2013.

e-RESOURCES:

- https://onlinecourses.nptel.ac.in/noc22 ma48/preview "OPERATION RESEARCH " by 1. Dr. Kusum Deep, Department of Mathematics, Indian Institute of Technology Roorkee, India
- http://nptel.ac.in/courses/112106131/30"Queueing Models", Prof. G. Srinivasan, Department of 2. Management Studies Indian Institute of Technology, Chennai.

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Total: 45 + 15 = 60 Periods

Course Outcomes: Upon completion of this course, students will be able to:

Formulate the LPP and solve the LPP using graphical method, simplex method and Big M

- CO1 method.
- CO2 Solve Balanced and Unbalanced transportation and assignment Problems and get the optimal solutions.
- $\frac{\text{CO3}}{\text{PERT.}}$
- CO4 Identify and solve the queueing systems with finite and infinite population using Markovian queueing models.
- CO5 Identify and solve the Non Markovian queueing system, series queues and Open Jackson Networks using Markovian queueing models.

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	-	-	-	-	-	-	-	1	-	-
CO2	3	3	2	2	-	-	-	-	-	-	-	1	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	1	-	-
CO4	3	3	2	2	-	-	-	-	-	-	-	1	-	-
CO5	3	3	2	2	-	-	-	-	-	-	-	1	-	-

Mapping of COs with POs and PSOs

22ADT41 DESIGN AND ANALYSIS OF ALGORITHMS

Pre-requisites: Probability and Statistics, Data Structures using Python. **Preamble**

This course enables the student to understand various algorithm design techniques, and know how to apply those techniques to various problems. The analysis of various algorithms can be performed and select the best algorithm for solving a problem.

UNIT 1 ALGORITHM ANALYSIS

Introduction – Notion of Algorithm – Fundamentals of Algorithmic problem Solving – Important Problem types – Fundamentals of the Analysis of Algorithm Efficiency - Analysis Framework – Asymptotic notations and Basic Efficiency Classes - Mathematical Analysis of Recursive and Nonrecursive algorithms - Empirical analysis of Algorithms-Algorithm Visualization.

UNIT 2 BRUTE FORCE AND DIVIDE & CONQUER

Brute Force: Selection and Bubble Sort, Sequential search and String Matching – closest pair and convex hull problem. Divide and Conquer: Merge sort – Quick sort – Binary tree traversals and related properties – Strassen's Matrix Multiplication – closest pair and convex hull problem.

UNIT 3DECREASE & CONQUER AND TRANSFORM & CONQUER9 + 3

Decrease and Conquer: Insertion Sort - Topological Sorting – Fake coin problem – Computing a Median and the Selection Problem. Transform and Conquer: Presorting – Balanced search trees – AVL trees - 2-3 Trees - Heaps and Heap sort

UNIT 4 DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE 9+3

Introduction to Dynamic Programming - Warshall's and Floyd's Algorithms - Optimal Binary Search Trees – 0/1 Knapsack Problem and Memory functions. Introduction to Greedy Technique – Prim's algorithm – Kruskal's algorithm – Dijkstra's algorithm- Huffman Trees.

UNIT 5 BACKTRACKING & BRANCH AND BOUND

Backtracking- n-Queens problem - Hamiltonian Circuit Problem - Subset Sum problem - Branch and Bound -0/1 Knapsack problem - Traveling Salesman Problem-Introduction to P, NP and NP-complete Problems.

Total : 45 + 15 = 60 Periods

TEXT BOOKS:

- 1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.
- 2. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.

REFERENCES:

- 1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Second edition, Galgotia Publications, New Delhi, 2010.
- 2. Donald E. Knuth, "The Art of Computer Programming", Pearson Education, 2009.
- 3. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.

e-RESOURCES:

- 1. https://nptel.ac.in/courses/106101060/ "Design and Analysis of Algorithms", Prof. Abhiram Ranade, IITBombay
- 2. http://nptel.ac.in/courses/106106131/, "Design and Analysis of Algorithms", Prof.Madhavan Mukund, IITMadras

VCET, B.Tech-AI&DS, R2022, Curriculum and Syllabus.

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Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Differentiate recursive and non-recursive algorithms using asymptotic notations.
- CO2 Evaluate the performance of Selection sort, Bubble sort, Merge sort and Quick sort considering input data set properties, running time and code size.
- CO3 Implement and analyze the problems using Decrease & Conquer and Transform & Conquer techniques.
- CO4 Analyze the efficiency of solving graphical problems using dynamic programming and greedy technique
- CO5 Illustrate the design strategies to solve various combinatorial problems with backtracking and branch & bound techniques.

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3	2	2	-	-	1	-	-	-	1	1	3	3
CO2	2	3	2	2	-	-	1	-	-	-	1	1	3	3
CO3	2	3	2	2	-	-	1	-	-	-	1	1	3	3
CO4	2	3	2	2	-	-	1	-	-	-	1	1	3	3
CO5	2	3	2	2	-	-	1	-	-	-	1	1	3	3

Mapping of COs with POs and PSOs

TEXT BOOKS:

- 1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 10th Edition, John Wiley and Sons Inc., 2018
- 2. Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 5th Edition, 2022 New Delhi.

22ADC41

OPERATING SYSTEMS

Pre-requisites : C Programming Preamble

The main aim of this course is to introduce the concepts of operating system abstractions, mechanisms and implementations. The course makes the students to develop the optimal solution for CPU scheduling, synchronization problems and deadlocks. This course will enable the students to apply the appropriate memory, file and disk management technique for effective resource utilization.

UNIT 1 INTRODUCTION

Computer System - Elements and organization; Operating System Overview - Objectives and Functions -Evolution of Operating System; Operating System Structures – Operating System Services - User Operating System Interface - System Calls – System Programs - Design and Implementation -Structuring methods. Case Study: Linux Process and Thread Management.

UNIT 2 PROCESS MANAGEMENT

Processes - Process Concept - Process Scheduling - Operations on Processes - Inter-process Communication; CPU Scheduling - Scheduling criteria - Scheduling algorithms: Threads - Multithread Models – Threading issues; Process Synchronization - The Critical-Section problem - Synchronization hardware – Semaphores – Mutex - Classical problems of synchronization - Monitors; Deadlock - Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

UNIT 3 MEMORY MANAGEMENT

Main Memory - Swapping - Contiguous Memory Allocation – Paging - Structure of the Page Table -Segmentation, Segmentation with paging; Virtual Memory - Demand Paging – Copy on Write - Page Replacement - Allocation of Frames –Thrashing.

UNIT 4 STORAGE MANAGEMENT, FILE & I/O SYSTEMS

Mass Storage system – Disk Structure - Disk Scheduling and Management; File-System Interface - File concept - Access methods - Directory Structure - Directory organization - File system mounting - File Sharing and Protection; File System Implementation - File System Structure - Directory implementation - Allocation Methods - Free Space Management; I/O Systems – I/O Hardware, Application I/O interface, Kernel I/O subsystem.

UNIT 5 VIRTUAL MACHINES AND MOBILE OS

Virtual Machines – History, Benefits and Features, Building Blocks, Types of Virtual Machines and their Implementations, Virtualization and Operating-System Components; Mobile OS - iOS and Android. List of Experiments

- 1. Study and execute the basic commands of UNIX operating system for resource management.
- 2. Write a C program to implement FCFS, SJF and Round Robin (time quantum=2) CPU scheduling algorithms for process Scheduling.
- 3. Write a C program to implement the FIFO and LRU page replacement algorithm for the following reference string:1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6.
- 4. Write a C program to implement single and two-level directory structure for effective file organization.
- 5. Write a C program to create 2 threads named Th1 and Th2 and establish synchronization between two threads using mutex lock.

Total : (L:45+P:15) 60 PERIODS

16.03.2024

L T P C 3 0 2 4

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REFERENCES:

- 1. Ramaz Elmasri, A. Gil Carrick, David Levine, "Operating Systems A Spiral Approach", Tata McGraw Hill Edition, 2010.
- 2. William Stallings, "Operating Systems: Internals and Design Principles", 7 th Edition, Prentice Hall, 2018
- Achyut S.Godbole, Atul Kahate, "Operating Systems", McGraw Hill Education, 2016.

e-RESOURCES:

- 1. <u>http://nptel.ac.in/courses/106108101/</u> "Introduction to operating system", Prof P.C.P. Bhatt , IISc-Bangalore.
- 2. https://nptel.ac.in/courses/106106144/2/ "Introduction to operating system", Prof Chester Rebeiro,IIT-Madras.

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Explain the structure and functions of Operating Systems for multiuser environment considering Linux process and thread management as a case study.
- CO2 Evaluate the FIFO, SJF, Priority scheduling, Round Robin process scheduling algorithms for a given set of process considering the arrival time, burst time and resources.
- CO3 Analyze the memory allocation techniques and page replacement algorithms for a given reference strings with minimum page fault.

Evaluate the FIFO, SSTF, SCAN, CSCAN, LOOK, CLOOK disk scheduling algorithms with CO4 minimum seek time for a given disk request and analyze file allocation methods for efficient file organization

CO5 Explain the functionality of Virtualization and compare iOS and Android Operating Systems.

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3	2	1	1	-	-	-	1	-	-	1	2	2
CO2	2	3	2	2	1	-	-	-	1	-	-	1	2	2
CO3	2	3	2	2	1	-	-	-	1	-	-	1	2	2
CO4	2	3	2	2	1	-	-	-	1	-	-	1	2	2
CO5	2	3	2	2	1	-	-	-	1	-	-	1	2	2

Mapping of COs with POs and PSOs

Relational Query languages – Relational Operations.

22ADT42

Preamble

Pre-requisites : -

UNIT 3 SQL SQL Standards-Data types-structure of

UNIT 1 DATABASE SYSTEMS

UNIT 2 DATABASE DESIGN

SQL Standards-Data types-structure of SQL queries-additional basic operations-set operations-null values- aggregate functions-nested sub queries-modification of the database. Intermediate SQL: Joins-Views- Transactions-Integrity constraints-Authorization. Advanced SQL.

UNIT 4 NORMALIZATION AND QUERY OPTIMIZATION

Relational database design: Functional Dependencies -Normalization and its normal forms-Denormalization- Data Storage: RAID – Tertiary Storage – File organization – Organization of records in files. Query Processing - Query optimization

UNIT 5 TRANSACTION MANAGEMENT

Transaction concepts- Transaction recovery-Properties of Transaction-Serializability-Concurrency Control – Locking Mechanisms-Two Phase Commit Protocol-Dead lock. Case study: Database connectivity using SQL.

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Sixth Edition, Tata McGraw Hill, 2011.

REFERENCES:

- 1. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.
- 2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Fourth Edition, Pearson / Addision wesley, 2007.
- 3. Atul Kahate, "Introduction to Database Management Systems", Pearson Education, New Delhi, 2006.

e-RESOURCES:

1. http://www.nptelvideos.in/2012/11/database-management-system.html, Database Management Systems, Dr.S.Srinath, IIT Madras.

DATABASE MANAGEMENT SYSTEMS

The course aims to provide an understanding about the fundamentals of database, database system architecture and various database design technique. It also helps to familiarize SOL standards and various SOL operations. An

Overview of File processing system- Purpose of Database System-Views of data-Data Models-Database

overview of normalization, query optimization and transaction management is also provided.

Languages-Database System Architecture-Database users and Administrator.

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Total: 45 Periods

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Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Compare File processing system with Database systems in terms of performance, scalability and data storage for efficient access of data.
- CO2 Design a database schema using E-R model, Relational model and apply relational algebra operations like selection, projection, join and Cartesian product to solve the given problem.
- CO3 Develop SQL queries using aggregate functions, nested sub queries, joins and views for the given problem.
- CO4 Apply suitable normalization and query optimization techniques to normalize the give relation and to optimize the query for efficient access of data.
- CO5 Explain serialization and concurrency control mechanisms to avoid deadlock problem in transaction processing.

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	1	-	-	-	-	-	-	-	1	2	2
CO2	3	3	2	1	1	-	-	-	-	-	2	1	2	2
CO3	3	3	2	1	1	-	-	-	-	-	2	1	2	2
CO4	3	3	2	1	1	-	-	-	-	-	2	1	2	2
CO5	3	3	2	1	1	-	-	-	-	-	1	1	2	2

Mapping of COs with POs and PSOs

Types of Data -Data Mining Functionalities - Interestingness of Patterns-Classification of Data Mining Systems - Data Mining Task Primitives - Integration of a Data Mining System with a Data Warehouse-Descriptive Data Summarization-Data Preprocessing Overview- Data Cleaning- Data Integration and Transformation-Data Reduction- Discretization and Concept Hierarchy Generation.

UNIT 2 ASSOCIATION RULE MINING

9+3 Frequent Itemsets, Closed Itemsets, and Association Rules- Frequent Pattern Mining- The Apriori Algorithm- Generating Association Rules from Frequent Itemsets- Mining Frequent Itemsets without Candidate Generation- Mining Frequent Itemsets Using Vertical Data Format- Mining Closed Frequent Itemsets.

UNIT 3 CLASSIFICATION

Classification and Prediction - Basic Concepts - Decision Tree Induction - Bayesian Classification - Rule Based Classification - Nearest Neighbor Classifiers-Estimating Predictive accuracy of classification methods- Improving accuracy of classification methods- Evaluation criteria for classification methods.

UNIT 4 CLUSTER ANALYSIS

Overview- Features of cluster analysis- Data similarity and dissimilarity measures -Types of cluster analysis methods-Partitioning Methods: K-Means and K-Medoids- Hierarchical Methods: Agglomerative and Divisive Hierarchical Clustering-Outlier Analysis.

UNIT 5 DATA MINING TRENDS

Mining Complex Data Types - Statistical Data Mining - Views on Data Mining Foundations-Visual and Audio Data Mining - Data Mining Applications - Data Mining and Society - Data Mining Trends.

TEXT BOOKS:

- Jiawei Han, Micheline Kamber and Jian Pei, Data Mining Concepts and Techniques, Third 1. Edition, Elsevier, 2012.
- Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson, First 2. impression,2014.

REFERENCES:

- Ian H.Witten, Eibe Frank, Mark A.Hall, "Data Mining: Practical Machine Learning Tools and 1. Techniques", 3rd Edition, Elsevier, 2011.
- 2. EMC Education Services, "Data Science and Big Data Analytics Discovering, Analyzing, Visualizing and Presenting Data", Wiley, 2015.

e-RESOURCES:

- 1. https://www.edx.org/learn/data-mining
- 2. https://www.coursera.org/specializations/data-mining

DATA MINING TECHNIQUES

Pre-requisites : Foundations of Data Science Preamble

The main objective of data mining is the automatic analysis of large amounts of data. Understand the data mining functionalities, technologies and steps in preprocessing the data. Gather and analyze large sets of data using data mining algorithms, methods and tools to gain useful business understanding.

UNIT 1 DATA MINING AND DATA PREPROCESSING

22ADT43



9+3

Total: 45 + 15 = 60 Periods

9+3

9+3

9+3

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Interpret various data pre-processing techniques for efficient data mining
- CO2 Apply association rule mining for finding hidden and interesting patterns in data.
- CO3 Identify standard classification algorithms and assess the quality of classification models.
- CO4 Apply clustering algorithms for the application and generalizations for real time problems
- CO5 Apply data mining on real time applications and infer the outcomes.

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	2	-	1	-	-	-	-	-	1	2	3
CO2	3	2	2	3	1	1	-	-	-	-	-	1	2	3
CO3	3	2	2	2	-	1	-	-	-	-	1	1	2	3
CO4	3	2	2	3	1	1	-	-	-	-	2	1	2	3
CO5	3	2	2	3	1	1	-	-	-	-	2	1	2	3

Mapping of COs with POs and PSOs

TEXT BOOKS:

networks - causal networks.

Stuart Russell and Peter Norvig, "Artificial Intelligence - A Modern Approach", Fourth Edition, 1. Pearson Education, 2021.

REFERENCES:

- Dan W. Patterson, "Introduction to AI and ES", Pearson Education, 2007 1.
- 2. Kevin Night, Elaine Rich, and Nair B., "Artificial Intelligence", McGraw Hill, 2008
- Patrick H. Winston, "Artificial Intelligence", Third Edition, Pearson Education, 2006 3.
- Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill Education, 2013 4.

e-RESOURCES:

- https://nptel.ac.in/courses/106106126 1.
- Course Outcomes: Upon completion of this course, students will be able to:
- Interpret intelligent agent frameworks and search strategies CO1
- Apply problem solving techniques and obtain search spaces for partially defined and unknown CO2 environments.

VCET, B.Tech-AI&DS, R2022, Curriculum and Syllabus.

- CO3 Apply game playing theory and constraint satisfaction problem solving techniques
- Apply logical reasoning and derive inferences using First Order Logic CO4
- Interpret probabilistic reasoning under uncertainty using Bayesian networks CO5

16.03.2024

Game theory - optimal decisions in games - alpha-beta search - monte-carlo tree search - stochastic games – partially observable games. Constraint satisfaction problems – constraint propagation – backtracking search for CSP.

Knowledge-based agents - propositional logic -propositional model checking - agents based on

Heuristic search strategies - heuristic functions. Local search and optimization problems - local search in continuous space - search with non-deterministic actions - search in partially observable environments online search agents and unknown environments.

Introduction to AI – Agents and Environments – concept of rationality – nature of environments – structure

22ADT44 FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE

of agents. Problem solving agents - search algorithms - uninformed search strategies.

Preamble:

UNIT II

UNIT IV

UNIT V

Intelligent machines have replaced human capabilities in many areas. Artificial intelligence is the intelligence exhibited by machines or software. It is the branch of computer science that emphasizes on creating intelligent machines that work and reacts like humans. This course is designed to span a wide variety of topics in computer science research, including machine learning, Game playing, Expert Systems etc.

UNIT I **INTELLIGENT AGENTS**

PROBLEM SOLVING

UNIT III GAME PLAYING AND CSP

LOGICAL REASONING

propositional logic. First-order logic – syntax and semantics – knowledge representation and engineering. **PROBABILISTIC REASONING**

Acting under uncertainty – Bayesian inference – naïve Bayes models. Probabilistic reasoning – Bayesian

Total : 45 Periods

85

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Mapping of COs with POs and PSOs

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	3	3	-	-	-	-	2	3	-	2	3	2
CO2	3	2	1	1	1	-	-	-	2	1	-	2	3	2
CO3	3	2	2	1	1	-	-	-	2	1	1	2	3	2
CO4	3	2	2	2	1	-	-	-	2	1	1	2	3	2
CO5	3	2	2	1	1	-	-	-	2	1	1	2	3	2

22ADL41 ARTIFICIAL INTELLIGENCE LABORATORY

Preamble:

The students should be able to understand and use AI techniques for generating efficient, intelligent behavior in artificial intelligence and machine learning algorithms. Additional attention is to be given to AI algorithms for improving game play experience. The artificial intelligence tools has diversified application in the software development companies such as in gaming, web frameworks and applications, language development, prototyping, graphic design applications, etc.

LIST OF EXPERIMENTS:

1. Implement basis search strategies in 8 puzzle problem.

2. Write a program to Implement 8 – queens problem.

3.Write a program to implement A* algorithm.

4. Write a program to implement hill climbing problem by using local search & optimization problem.

- 5. Write a program to implement alpha beta pruning.
- 6. Solve suduku puzzle by using constraint satisfaction problem.
- 7. Write a python code for knowledge representation using propositional logic.

8.Implement propositional model checking using wumpus world problem.

9. Build naive Bayes models.

10. Mini-Project

SOFTWARE : C++ / Java / Python

Course Outcomes: At the end of this course, the students will be able to:

- 1. Implement algorithms for basic search strategies in AI technologies
- 2. Implement algorithms for Game playing and Constrain satisfaction problems
- 3. Implement Resolution strategies for knowledge representation and reasoning
- 4. Design and Implement Bayes model and Bayesian networks
- 5. Design and develop application using AI Techniques to solve real world problems

TOTAL: 45 PERIODS

Mapping of COs with POs and PSOs

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	POQ	PO	PO	PO	PSO	PSO
005/105	101	102	105	104	105	100	107	100	107	10	11	12	1	2
CO1	3	2	2	3	2	-	-	-	1	1	2	1	2	1
CO2	3	2	2	3	2	-	-	-	1	1	2	1	2	2
CO3	3	2	2	3	2	-	-	-	1	1	2	1	2	2
CO4	3	2	2	3	2	-	-	-	1	1	2	1	2	2
CO5	3	2	2	3	2	-	-	-	1	1	2	1	2	2

22ADL42 DATABASE MANAGEMENT SYSTEMS LAB

Co-requisites : DATABASE MANAGEMENT SYSTEMS Preamble :

This laboratory course is intended to provide students with opportunities to get hands on training to create database with SQL queries, Joins, Aggregate functions, Triggers and Exception Handling using Oracle / MySQL.

LIST OF EXPERIMENTS

- 1. Create a database and work with SQL queries to retrieve information from the database.
- 2. Create an Employee database to set various constraints.
- 3. Work with Joins, aggregate functions
- 4. Creation of database objects: Synonyms, Sequences, Views, Indexes and save point.
- 5. Study of PL/SQL block.
- 6. Develop simple programs using PL/SQL.
- 7. Creation of Procedures.
- 8. Creation of Functions.
- 9. Work with Triggers and Exception handling
- 10. Mini project (Application Development using Oracle / MySQL)
 - Payroll processing.
 - Banking System.
 - Library Information System

Total : 45 Periods

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Make use of DDL and DML commands to store and manipulate information in the database.
- CO2 Apply the concept of views, indexes, sequences, joins and aggregate functions to perform analysis on data in the database.
- CO3 Develop simple programs using PL/SQL for the given problem.
- CO4 Work with procedure, trigger, exception handling and function to provide solutions for the given problem.
- CO5 Develop real time applications (Banking system, Payroll processing and Library Information system) using SQL.

Mapping of COs with POs and PSOs:

COs/POs	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C01	3	2	2	3	2	-	-	-	1	1	2	1	2	2
CO2	3	2	2	3	2	-	-	-	1	1	2	1	2	2
CO3	3	2	2	3	2	-	-	-	1	1	2	1	2	2
CO4	3	2	2	3	2	-	-	-	1	1	2	1	2	2
CO5	3	2	2	3	2	-	-	-	1	1	2	1	2	2
1 - Slight (1	Low), 2	2 - Moo	derate	(Mediu	ım), 3	- Subst	antial	(High)	•					

	(For the students admitted in AY 2022-2023 and 2023-2024 only)	0	0	2	0
Preamble: Communicative English is course Essential English f appropriately in profession	s a life skill necessary for all students of Engineering and for Professionals aims at enabling the learners to communic nal contexts by exposing them to LSRW tasks.	Tech cate ej	nolo _ł ffecti	gy. vely	The and
UNIT 1 LISTENING					5
Listening to Casual Conve	ersation- Note-Taking on TED Talks – Summarizing				
UNIT 2 READING Poem - Robert Frost's Roa Reading and Note Making	ad Not Taken- Decision Making- Biographies of Famous Per	rsonal	ities	-	7
UNIT 3 WRITING Letter Writing - Letters Se – Analytical Writing	eeking Permission- Letters Seeking Apology - Letters Reque	sting	Certi	ficat	5 es
UNIT 4 SPEAKING Watching Presentations - I	Presentation Techniques - Group Presentation - Group Discus	ssion			9
UNIT 5 VERBAL ABI Parajumbles - Sentence Co	LITY ompletion - Identifying Common Errors				4
	ΤΟΤΑ	AL: 3	80 PE	RIC	DDS

ENGLISH FOR PROFESSIONALS

REFERENCES:

22MCL04

- 1 M Ashraf Rizvi "Effective Technical Communication", Tata McGraw-Hill, 2st Edition, New Delhi, 2018.
- 2 Meenakshi Raman and Sangeetha Sharma., "Technical Communication: English Skills for Engineers" Oxford University Press, 1st Edition, New Delhi, 2008.

eRESOURCES :

- 1. https://agendaweb.org/listening/audio-books-mp3.html
- 2. https://www.ndtv.com/world-news
- 3. http://learnenglishteens.britishcouncil.org/skills/reading
- 4. https://www.bbc.com/

Course Outcomes: Upon completion of the course, students will be able to:

- **CO1** Analyze the given listening material and answer the questions correctly employing listening techniques.
- **CO2** Analyze the given reading material and answer the questions correctly employing reading techniques.
- **CO3** Write within the stipulated time syntactically and semantically correct sentences to present ideas in the form of essays and letters.
- **CO4** Take part effectively in group discussion, conforming no profession norms and to give extemporaneous presentation.
- **CO5** Identify within the stipulated time syntactically and semantically correct sentences for a variety of language exercises.

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Mapping of COs with POs and PSOs

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	-	-	-	-	3	-	-	-	-	3	-	-	-	-
CO 2	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO 3	-	-	-	-	-	-	-	-	3	3	-	1	-	-
CO 4	-	-	-	-	-	-	-	-	3	3	-	1	-	-
CO 5	-	-	-	-	-	-	-	-	-	3	-	1	-	-
Mapping Average	-	-	-	-	3	-	-	-	3	3	-	1	-	-

22M	CL04	ENGLISH FOR PR (Students admitted during	OFESSIONALS (2023-2024 onwards)	L 0	T O	P 2	C 0
Prear	nhle •	(,	U	U	2	U
Comm course approp	unicative English is a life Essential English for Pro priately in professional con	e skill necessary for all ressionals aims at enabli- texts by exposing them t	students of Engineering a ng the learners to communo LSRW tasks.	und Techn nicate effe	nolog ective	y. Th ly an	ne Id
UNIT	1 LISTENING						5
Liste	ening to Casual Conversat	on- Note-Taking on TEI	D Talks – Summarizing				
UNIT	2 READING						7
Read	ing for gist - Biographies	of Famous Personalities	- Reading and Note Makin	ng on Nev	ws Ar	ticles	3
UNIT Letter Writin	3 WRITING Writing - Seeking Perming and Issue based writing	ssion- Seeking Apology	- Letters Requesting Certit	ficates – A	Analy	tical	5
UNIT	4 SPEAKING						9
Prese	entation Techniques - Pres	entation with visual aids	– Extempore and Improm	ptu talk			
UNIT	5 VERBAL ABILITY						4
Paraj	umbles - Sentence Comple	etion - Identifying Com	non Errors				
			Т	OTAL: 3	30 PE	RIO	DS
REFI 1 2	ERENCES: M Ashraf Rizvi "Effectiv Delhi, 2018. Meenakshi Raman and S Engineers" Oxford Unive	e Technical Communica angeetha Sharma., "Tec ersity Press, 1 st Edition, 1	tion", Tata McGraw-Hill, chnical Communication: H New Delhi, 2008.	2 st Editio English Sl	n, Ne kills t	ew for	
eRES	OURCES :						
1.	https://agendaweb.org/lis	tening/audio-books-mp3	.html				

- 2. https://www.ndtv.com/world-news
- 3. http://learnenglishteens.britishcouncil.org/skills/reading
- 4. https://www.bbc.com/

Course Outcomes: Upon completion of the course, students will be able to:

- **CO1** Analyze the given listening material and answer the questions correctly employing listening techniques.
- CO2 Analyze the given reading material and answer the questions correctly employing reading techniques.
- **CO3** Write within the stipulated time syntactically and semantically correct sentences to present ideas in the form of essays and letters.
- **CO4** Take part effectively in group discussion, conforming no profession norms and to give extemporaneous presentation.
- **CO5** Identify within the stipulated time syntactically and semantically correct sentences for a variety of language exercises.

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	2	3	-	-	-	-	1	-	-	1	-	-
CO2	2	2	2	3	-	-	-	-	1	-	-	1	-	-
CO3	2	2	2	3	-	-	-	-	1	-	-	1	-	-
CO4	2	2	2	3	-	-	-	-	1	-	-	1	-	-
CO5	2	2	2	3	-	-	-	-	1	-	-	1	-	-

Mapping of COs with POs and PSOs

Pre-requisites: Data Mining Techniques

22ADT51

Preamble: The course provides the concepts and algorithms in machine learning and the methods to apply them in real time problems.

UNIT 1 MACHINE LEARNING LANDSCAPE

Machine learning - Need of machine learning - Machine Learning Applications - Types of Machine Learning systems - Challenges - Machine Learning Process - Data Collection, Exploration, Preparation, Training, Optimization- Performance Measures.

UNIT 2 SUPERVISED LEARNING - I

Classification and Regression Technique - Linear regression - Polynomial Regression, Logistic Regression - Generalization - Overfitting - Underfitting - Support Vector Machine - Kernels - KNN -Naïve bayes classifiers – Decision Tree.

UNIT 3 SUPERVISED LEARNING - II

Random Forest – Ensemble Learning – Bagging – Boosting – Ada Boost – Gradient Boosting – Neural Networks - Biological Neurons - logical computation with neurons - ANN - Perception - MLPs and Backpropagation – Hyperparameter Optimization – Dimensionality Reduction.

UNIT 4 UNSUPERVISED LEARNING

Clustering - Techniques - K-Means Clustering - AGNES - DIANA - Density Based Clustering (DBSCAN) - Grid based clustering - Gaussian Mixtures - Clustering High Dimensional Data - Outlier Analysis.

UNIT 5 MACHINE LEARNING APPLICATIONS

Dimensionality Reduction Applications - Factor Analysis - Model selection & evaluation -Optimization of turning parameters - Visualization of results - Contemporary Issues - Case Studies -Application of ML – Medical science, Fraud Detection, Traffic prediction, personal Assistant, Stock Prediction.

TEXT BOOKS:

- 1. Muller, Andreas C., and Sarah Guido. Introduction to machine learning with Python: a guide for data scientists. Third edition, "O'Reilly Media, Inc.", 2016.
- 2. Geron, Aurelien. Hands-on machine learning with Scikit-Learn, Keras, and TensorFlow: Concepts, tools, and techniques to build intelligent systems. First edition, O'Reilly Media, 2019.

REFERENCES:

- 1. Himanshu Singh, Yunis Ahmad Lone, Deep Neuro-Funny Systems with Python: With Case Studies and Applications from the Industry, third edition, 2019.
- 2. Leonardo De Marchi, Hands-On Neural Networks: Learn how to Build and Train Your First Neural Network Model Using Python Book, First edition, 2019.
- 3. James Loy, Neural Network Projects with Python: The ultimate guide to using Python to explore the true power of neural networks through six projects First edition, Kindle Edition, 2019.

e-RESOURCES:

- 1. https://nptel.ac.in/courses/106106139&sa=D&source=editors&ust=1707130049800751&usg=AO vVaw2d9EWfmJktE7xjZKPofxQb
- 2. https://nptel.ac.in/courses/106106198/&sa=D&source=editors&ust=1707130049787713&usg=A OvVaw2nM5G_nNVaI1nqBFS9VI5Z

VCET, B.Tech-AI&DS, R2022, Curriculum and Syllabus.

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Total: 45 Periods

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Summarize the fundamental concepts of machine learning and data collection techniques.
- CO2 Explain the classification and regression using supervised learning.
- CO3 Examine the concepts of neural networks and ensemble learning.
- CO4 Illustrate the features of unsupervised learning using various algorithms.
- CO5 Describe the applications of machine learning in different sectors.

Mapping of COs with POs and PSOs

Cos/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	2	2	-	-	-	2	1	-	1	3	3
CO2	3	3	2	3	2	-	-	-	2	1	-	1	3	3
CO3	3	3	2	2	2	-	-	-	1	1	-	1	3	2
CO4	3	3	2	2	2	-	-	-	1	1	-	1	2	2
CO5	3	2	3	2	2	-	-	-	2	1	-	1	2	2
AVG	3	3	3	2	2	-	-	-	2	1	-	1	3	3

Pre-requisites: Nil

Preamble:

The course aims to provide an understanding of computer networks architecture, various technologies available to build a network and protocols in use at different levels of network layers stack. An overview of global Internet, Internet applications and types of protocols used for mail transfer is also provided.

UNIT 1 DATA COMMUNICATIONS

Data Communication – Networks – The OSI Model – Layers in the OSI Model – TCP/IP Protocol Suite – Addressing – Transmission Media.

UNIT 2 DATA LINK LAYER

Framing – Error Detection and Correction– IEEE Standards (802.3,802.5,802.11)– MAC protocols and types.

UNIT 3 NETWORK LAYER

Internetworking: Switching and Bridging – Basic Internetworking-IPv4 - IPv6 – Routing Techniques: Distance vector (RIP) – Link state (OSPF) — Interdomain Routing (BGP).

UNIT 4 TRANSPORT LAYER

Congestion Control and Resource Allocation: TCP Congestion Control – Congestion Avoidance Mechanisms – Quality of Service: Integrated Services – Differentiated Services.

UNIT 5 APPLICATION LAYER

Domain Name System - File Transfer – Web Services and SNMP - HTTP - Electronic Mail (SMTP, POP3, IMAP, MIME).

LIST OF EXPERIMENTS:

- 1. Study of Network simulator 2 (NS2).
- 2. Program to simulate Distance Vector Routing algorithm.
- 3. Program to simulate Stop & Wait protocol.
- 4. Socket program to implement echo client and echo server using TC
- 5. Establish a LAN in Cisco Packet Tracer and perform traffic analysis for FTP using Traffic Generator.

Total : (L:45+P:15) 60 PERIODS

TEXT BOOKS:

- 1. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth Edition, Morgan Kaufmann Publishers, 2011.
- **2.** Behrouz A. Forouzan, "Data Communications and Networking", Fourth Edition, Tata McGraw Hill, Reprint 2012.
- **3.** William Stallings, "Data Communication and Networks", Pearson Education, Tenth edition, 2014.

REFERENCES:

1. William Stallings, "Data Communication and Networks", Pearson Education, Tenth edition, 2014. James.F. Kurouse& W. Rouse, "Computer Networking: A Topdown Approach Featuring", Sixth edition, Pearson Education, 2013.

e-RESOURCES:

- 1. http://www.nptel.ac.in/downloads/106105080, "Computer Networks", Prof.Sujoy Ghosh, IIT Kharagpur.
- 2. https://www.elsevier.com/journals/subjects/computer-science

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Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Interpret the importance of layering, addressing and annotate the protocol stack of OSI and TCP/IP model.
- CO2 Annotate MAC protocols (Ethernet, Token Ring and Wi-Fi) supported by Data Link layer to ensure hop-to-hop reliable communication.
- CO3 Use IP addressing and routing protocols to find shortest route to achieve reliable network-layer data transmission
- CO4 Classify the transport layer protocols and explain the congestion control or congestion avoidance techniques to ensure quality of service.
- CO5 Analyze the functions and services provided by the application layer protocols (HTTP, SMTP and DNS).

Cos/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	1	1	1	-	1	-	-	-	-	1	1	1
CO2	2	3	2	1	1	-	1	-	-	-	-	1	1	1
CO3	2	3	2	1	1	-	1	-	-	-	-	1	1	1
CO4	2	3	2	1	1	-	1	-	-	-	-	1	1	1
CO5	2	3	1	1	1	-	1	-	-	-	-	1	1	1
AVG	3	3	1	1	1	-	1	-	-	-	-	1	1	1

Mapping of COs with POs and PSOs

Pre-requisites: Foundations of Data Science

Preamble:

This course will help to understand the knowledge on the Hadoop ecosystem components pig and Hive with its architecture. To familiarize the basics of MongoDB, Cassandra and Jasper Reports to create database.

UNIT I INTRODUCTION TO BIG DATA

Types of Digital Data-Characteristics of Data- Ethical implications of big data analytics, including biases in algorithms, data privacy concerns, and the responsible use of data -Evolution of Big Data- Definition of Big Data- Challenges of Big Data- Traditional Business Intelligence (BI) versus Big Data-A Typical Data Warehouse Environment-A Typical Hadoop Environment- Changing in the Realms of Big Data Coexistence of Big Data and Data Warehouse.

UNIT II BIG DATA ANALYTICS

Definition of Big Data Analytics-Sudden Hype Around Big Data Analytics-Classification of Analytics-Greatest Challenges that Prevent Businesses from Capitalizing on Big Data-Top Challenges Facing Big Data- Importance of Big Data Analytics- Data Science-Data Scientist-Terminologies Used in Big Data Environment- Basically Available Soft State Eventual Consistency (BASE)- Top Analytics Tools. The Big Data Technology Landscape: NoSQL, Hadoop ,Cloud Computing and Big Data - Case Studies healthcare, finance, retail, and marketing

UNIT III INTRODUCTION TO HADOOP

Introducing Hadoop: RDBMS versus Hadoop-Distributed Computing Challenges- History of Hadoop - Hadoop Overview –Hadoop Distributors- Hadoop Distributed File System- Processing Data with Hadoop-Managing Resources and Application with Hadoop YARN-Interacting with Hadoop Ecosystem-Apache Hive for SQL-like querying, and Apache HBase for real-time database operations.

UNIT IV MONGODB

Introduction to MongoDB: Definition of MongoDB-Need of MongoDB- Terms used in RDBMS and MongoDB-Data Types in MongoDB- MongoDB Query Language.

UNIT V MAP REDUCE PROGRAMMING

Introduction to Mapreduce Programming: Mapper- Reducer-Combiner-Partitioner-Searching-Sorting-Compression- Transformation, aggregation, filtering, and machine learning algorithm- Handling node failures and rerunning failed tasks on other nodes- Case Study: Connecting to MongoDB NoSQL Database.

Total: 45 Periods

TEXT BOOKS:

- 1. Seema Acharya and Subhashini C: Big Data and Analytics, First Edition, Wiley India Pvt. Ltd, 2015.
- 2. Judith Hurwitz, Alan Nugent, Fern Halper, Marcia Kaufman: Big data for dummies, First Edition, John Wiley & Sons Inc, 2013.

REFERENCES:

- 1. Tom White: Hadoop The Definitive Guide, Third Edition, O"Reilly Media, 2012.
- 2. Chuck Lam: Hadoop in action, First Edition, Manning Publications, 2010.
- 3. Dirk Deroos, Paul C. Zikopoulos, Roman B. Melnyk, Bruce Brown: Hadoop for dummies, First Edition, John Wiley & Sons Inc, 2014.

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e-RESOURCES:

1. http://nptel.ac.in/courses/110106064/Introduction to Data Analytics, Dr. Nandan Sudarsanam, IIT Madras.

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Describe the need for big data and different types of digital data.
- CO2 Explain big data analytic techniques, various NoSQL systems and their features.
- CO3 Analyze Hadoop ecosystem components, Hadoop Architecture and HDFS.
- CO4 Explain the concept for MongoDB.
- CO5 Apply Map-Reduce based big data applications.

Mapping of COs with POs and PSOs

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	2	1	-	-	-	-	-	-	-	3	2
CO2	3	2	2	2	1	-	-	-	-	-	-	-	3	2
CO3	3	2	2	2	1	-	-	-	-	-	-	-	3	2
CO4	3	2	2	2	1	-	-	-	-	-	-	-	3	2
CO5	3	2	2	2	1	-	-	-	-	-	-	-	3	2

Preamble:

This course provides hands-on experience in applying machine learning techniques for solving real world problems.

LIST OF EXPERIMENTS:

- 1. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examplesWorking with Numpy arrays.
- 2. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
- 3. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
- 4. Implement naïve Bayesian Classifier model to classify a set of documents and measure the accuracy, precision, and recall.
- 5. Write a program to implement a Random Forest classifier using the Scikit-learn library in Python. Use a dataset of your choice and evaluate the performance of the model.
- 6. Write a program to implement K-Means clustering algorithm on a dataset of your choice. Visualize the clusters and centroids.
- 7. Write a program to implement machine learning models for various applications 1. Medical Science: Predict disease diagnosis based on patient data. 2. Fraud Detection: Detect fraudulent transactions in a credit card dataset.

TOTAL: 45 PERIODS

Software : Python / R

Course Outcomes: At the end of this course, the students will be able to:

- 1. Apply suitable algorithms for selecting the appropriate features for analysis.
- 2. Implement supervised machine learning algorithms on standard datasets and evaluate the performance.
- 3. Apply unsupervised machine learning algorithms on standard datasets and evaluate the performance.
- 4. Build the graph based learning models for standard data sets.
- 5. Assess and compare the performance of different ML algorithms and select the suitable one based on the application.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	2	3	-	-	-	2	2	3	1	3	3
CO2	3	3	3	3	3	-	-	-	2	2	3	1	3	3
CO3	3	3	2	2	2	-	-	-	2	2	2	1	3	3
CO4	3	2	2	3	2	-	-	-	2	2	2	1	3	3
CO5	3	3	3	2	2	-	-	-	2	2	2	1	3	3

22ADL52

BIG DATA ANALYTICS LABORATORY

Preamble:

This course provides hands-on experience in applying big data analytics for solving real world problems.

LIST OF EXPERIMENTS:

- 1. Working with HDFS commands.
- 2. To perform the file management tasks in Hadoop.
- 3. Practicing with mapper and reduce retrieve sum of the salary of employees in every unit.
- 4. CRUD (Create, Read, Update, and Delete) operations in MongoDB.
- 5. To practice import, export and aggregation in MongoDB.
 - Pick any public datasets from the site www.kdnuggets.com. Convert it into CSV format. Make sure at least two numeric columns.
 - Compute the average of the values in the second numeric column.

6. Top N and bottom N view on the worksheet in any kind of datasets using tableau visualization tools.

7. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.

TOTAL: 45 PERIODS

Software : Hadoop, Java, MongoDB

Course Outcomes: At the end of this course, the students will be able to:

- 1. Install, configure, and run Hadoop and HDFS.
- 2. Perform map-reduce analytics using Hadoop.
- 3. Apply MongoDB Query languages to develop applications.
- 4. Evaluate visualization techniques and tools to analyze big data.
- 5. Use efficient big data solutions for various application areas.

Mapping of COs with POs and PSOs

COs/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	3	2	-	-	-	-	-	1	1	2	3
CO2	3	2	2	3	2	-	-	-	-	-	1	1	2	3
CO3	3	2	2	3	2	-	-	-	-	-	1	1	2	3
CO4	3	2	2	3	2	-	-	-	-	-	1	1	2	3
CO5	3	2	2	3	2	-	-	-	-	-	1	1	2	3

22MCT05

APTITUDE AND LOGICAL REASONING

2000

Preamble:

Aptitude tests are used to determine an individual's ability/potential to succeed in a certain task, with no prior knowledge or training and are frequently used as part of a pre-employment assessment. Aptitude tests are a proven tool used to identify those who are best equipped to carry out any given role.

A logical reasoning test is a form of testing that is widely used by corporate employers to help assess candidates during their recruitment process.

UNIT 1	Unitary methods	6
	Number System, Time and Work, Pipes And Cisterns	
UNIT 2	Numerical Computation	6
	Ratio and Proportion, Problems on Ages	
UNIT 3	Numerical Estimation I	6
	Time and Distance, Problems on Trains, Boats and Streams	
UNIT 4	Numerical Estimation II	6
	Percentage, Profit and Loss, Simple Interest and Compound Interest	
UNIT 5	Logical Reasoning	6
	Direction Sense, Seating Arrangements, Coding and Decoding	
	TOTAL : 30 PERI	ODS

REFERENCES:

- 1 Dr.R.S.Aggarwal, "Quantitative Aptitude for Competitive Examination", S.Chand Publications, 2022
- 2 Dr.R.S.Aggarwal, "A Modern Approach to Verbal & Non-Verbal Reasoning", S.Chand Publications, 2022

Course Outcomes: Upon completion of the course, students will be able to

CO1	Solve the given equation using appropriate simplification methods and compute time, work, capacity and identify the pattern by analyzing the given problem/scenario
CO2	Apply aptitude method of ratio and proportion to solve the given scenario.
CO3	Calculate time, speed, distance by applying suitable aptitude method for the given problem statement.
CO4	Calculate percentage and profit & loss for the given problem statement and Compute simple interest, compound interest for the given problem/scenario.
	Use their logical thinking abilities to solve given problem involving direction sense

CO5 Use their logical thinking abilities to solve given problem involving direction sense, seating arrangement and coding & decoding.

Mapping of COs with POs and PSOs	Mapping	of COs	with	POs	and	PSOs
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COs/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3	-	1	-	-	-	-	-	-	-	1	-	-
CO2	2	3	-	1	-	-	-	-	-	-	-	1	-	-
CO3	2	3	-	1	-	-	-	-	-	-	-	1	-	-
CO4	2	3	-	1	-	-	-	-	-	-	-	1	-	-
CO5	2	3	-	1	-	-	-	-	-	-	-	1	-	-
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Total: 45 Periods

Preamble:

This course will help to understand the basics of Information Security. To know the legal, ethical and professional issues in Information Security. To equip the students' knowledge on digital signature, email security and web security.

UNIT I INTRODUCTION

History- What is Information Security? - Critical Characteristics of Information- NSTISSC Security Model - Components of an Information System- Securing the Components- Balancing Security and Access- The SDLC- The Security SDLC.

UNIT II SECURITY INVESTIGATION

Need for Security- Business Needs- Threats- Attacks- Legal, Ethical and Professional Issues – An Overview of Computer Security - Access Control Matrix- Policy-Security policies, Confidentiality policies, Integrity policies and Hybrid policies.

UNIT III DIGITAL SIGNATURE AND AUTHENTICATION

Digital Signature and Authentication Schemes: Digital Signature-Digital Signature Schemes and their Variants- Digital Signature Standards-Authentication: Overview- Requirements Protocols -Applications - Kerberos -X.509 Directory Services.

UNIT IV E-MAIL AND IP SECURITY

E-mail and IP Security: Electronic mail security: Email Architecture -PGP – Operational Descriptions-Key management- Trust Model- S/MIME.IP Security: Overview- Architecture - ESP, AH Protocols IPSec Modes – Security association - Key management.

UNIT V WEB SECURITY

Web Security: Requirements- Secure Sockets Layer- Objectives-Layers -SSL secure communication-Protocols - Transport Level Security. Secure Electronic Transaction- Entities DS Verification-SET processing.

TEXT BOOKS:

- 1. Michael E Whitman and Herbert J Mattord, "Principles of Information Security, Course Technology, 6th Edition, 2017.
- 2. Stallings William. Cryptography and Network Security: Principles and Practice, Seventh Edition, Pearson Education, 2017.

REFERENCES:

- 1. Harold F. Tipton, Micki Krause Nozaki, "Information Security Management Handbook, Volume 6, 6th Edition, 2016.
- 2. Stuart McClure, Joel Scrambray, George Kurtz, "Hacking Exposed", McGraw- Hill, Seventh Edition, 2012.
- 3. Matt Bishop, "Computer Security Art and Science, Addison Wesley Reprint Edition, 2015.

e-RESOURCES:

1. https://archive.nptel.ac.in/courses/106/106/106106129/

16.03.2024

- CO1 Explain security principles and components in information management using security SDLC for a business environment.
- CO2 Identify security threats and attacks and apply a security policy to overcome the threats in a give environment.
- CO3 Explain the various authentication schemes to simulate different applications.
- CO4 Identify various security practices and system security standards.
- CO5 Apply Web security protocols for E-Commerce applications.

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1	-	-	-	2	2	-	-	-	2	3	2
CO2	3	2	1	-	-	-	2	2	-	-	-	2	3	2
CO3	3	2	1	-	-	-	2	2	-	-	-	2	3	2
CO4	3	2	1	-	-	-	2	2	-	-	-	2	3	2
CO5	3	2	1	-	-	-	2	2	-	-	-	2	3	2

Mapping of COs with POs and PSOs

DEEP LEARNING

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Pre-requisites : Machine Learning

Preamble

In this course, students will learn an intuitive approach to build complex models that help machines and solve real-world problems with human-like intelligence.

UNIT 1 DEEP NETWORKS BASICS

Linear Algebra: Scalars – Vectors - Matrices and tensors. Probability Distributions- Gradient - based Optimization - Machine Learning Basics: Capacity - Overfitting and underfitting- Hyperparameters and validation sets - Estimators - Bias and variance - Stochastic gradient descent - Challenges motivating deep learning; Deep Networks: Deep feed forward networks; Regularization – Optimization.

UNIT 2 CONVOLUTIONAL NEURAL NETWORKS

Convolution Operation - Sparse Interactions - Parameter Sharing - Equivariance – Pooling - Convolution Variants: Strided – Tiled - Transposed and dilated convolutions; CNN Learning: Nonlinearity Functions -- Loss Functions - Regularization - Optimizers - Gradient Computation.

UNIT 3 RECURRENT NEURAL NETWORKS

Unfolding Graphs - RNN Design Patterns: Acceptor - Encoder - Transducer; Gradient Computation - Sequence Modeling Conditioned on Contexts - Bidirectional RNN - Sequence to Sequence RNN – Deep Recurrent Networks - Recursive Neural Networks - Long Term Dependencies; Leaky Units: Skip connections and dropouts; Gated Architecture: LSTM.

UNIT 4 MODEL EVALUATION

Performance metrics - Baseline Models - Hyperparameters: Manual Hyperparameter - Automatic Hyperparameter - Grid search - Random search - Debugging strategies.

UNIT 5 AUTOENCODERS AND GENERATIVE MODELS

Autoencoders: Undercomplete autoencoders -- Regularized autoencoders -- Stochastic encoders and decoders -- Learning with autoencoders; Deep Generative Models: Variational autoencoders -- Generative adversarial networks.

Total : 45 Periods

TEXT BOOKS:

- 1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, ``Deep Learning'', MIT Press, 2016
- 2. Andrew Glassner, "Deep Learning: A Visual Approach", No Starch Press, 2021.

REFERENCES:

- Salman Khan, Hossein Rahmani, Syed Afaq Ali Shah, Mohammed Bennamoun, ``A Guide to Convolutional Neural Networks for Computer Vision'', Synthesis Lectures on Computer Vision, Morgan & Claypool publishers, 2018
- 2. Neural Networks and Deep Learning, Michael Nielsen, Online, 2016.
- 3. Learning Deep Architectures for AI, Yoshua Bengio, First Edition, NOW Publishers, 2009.
- 4 Yoav Goldberg, ``Neural Network Methods for Natural Language Processing", Synthesis Lectures on Human Language Technologies, Morgan & Claypool publishers, 2017

e-RESOURCES:

1. <u>https://onlinecourses.nptel.ac.in/noc20_cs62/preview</u> - <u>Deep Learning by Prof.Prabir</u> Kumar Biswas

- CO1 Apply the mathematical foundations for comprehending Deep Learning concepts.
- CO2 Design and implement various deep learning models and architectures.
- CO3 Apply deep learning techniques to create efficient algorithms for real-world applications
- CO4 Evaluate machine learning models for various real world applications.
- CO5 Implement autoencoders and deep generative models for data generation in various applications.

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	РО 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	2	2	-	-	-	-	-	-	2	3	3
CO2	3	3	3	2	2	-	-	-	-	-	-	2	3	3
CO3	2	3	3	2	2	-	-	-	-	-	-	2	3	3
CO4	2	3	2	3	3	-	-	-	-	-	-	2	3	3
CO5	3	2	2	2	3	-	-	-	-	-	-	2	3	3

Mapping of COs with POs and PSOs

Pre-requisites :Nil Preamble

The aim of this course is to learn the internal architecture and programming of an embedded processor and interfacing I/O devices to the processor and evolution of the Internet of Things (IoT). This course makes the students to build a small low-cost embedded and IoT system using Arduino/Raspberry Pi/ open platform. This course will enable the students to apply the concept of Internet of Things in real world scenario.

UNIT 1 8-BIT EMBEDDED PROCESSOR

8- Bit Microcontroller – Architecture – Instruction Set and Programming – Programming Parallel Ports – Timers and Serial Port – Interrupt Handling.

UNIT 2 EMBEDDED C PROGRAMMING

Memory And I/O Devices Interfacing – Programming Embedded Systems in C – Need For RTOS – Multiple Tasks and Processes – Context Switching – Priority Based Scheduling Policies.

UNIT 3 IOT AND ARDUINO PROGRAMMING

Introduction to the Concept of IoT Devices – IoT Devices Versus Computers – IoT Configurations – Basic Components – Introduction to Arduino – Types of Arduino– Arduino Toolchain – Arduino Programming Structure – Sketches – Pins – Input/Output From Pins Using Sketches – Introduction to Arduino Shields – Integration of Sensors and Actuators with Arduino.

UNIT 4 IOT COMMUNICATION AND OPEN PLATFORMS

IoT Communication Models and APIs – IoT Communication Protocols – Bluetooth – WiFi – ZigBee – GPS – GSM modules – Open Platform (like Raspberry Pi) – Architecture – Programming – Interfacing – Accessing GPIO Pins – Sending and Receiving Signals Using GPIO Pins – Connecting to the Cloud.

UNIT 5 APPLICATIONS DEVELOPMENT

Complete Design of Embedded Systems – Development of IoT Applications – Home Automation –Smart Agriculture – Smart Cities – Smart Healthcare.

List of Experiments

- 1. Design an IOT based system.
- 2. Write Basic and arithmetic Programs Using Embedded C.
- 3. Perform ALU operations.
- 4. Introduction to Arduino platform and programming.
- 5. Introduction to Raspberry PI platform and python programming.
- 6. Communicate between Arduino and Raspberry PI using any wireless medium.
- 7. Explore different communication methods with IoT devices (Zigbee, GSM, Bluetooth).
- 8. Log Data using Raspberry PI and upload to the cloud platform.
- 9. Setup a cloud platform to log the data.
- 10. Design an IOT based system.

Total : (L:45+P:15) 60 PERIODS

TEXT BOOKS:

- 1. Muhammed Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, "The 8051 Microcontroller and Embedded Systems", Pearson Education, Second Edition, 2014.
- Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, "IoT
- 2. Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", CISCO Press,2017.

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REFERENCES:

- 1. Michael J. Pont, "Embedded C", Pearson Education, 2007.
- 2. Wayne Wolf, "Computers as Components: Principles of Embedded Computer System Design", Elsevier, 2006.

e -RESOURCES:

- 1. https://nptel.ac.in/courses/128108016/," ACM India Summer School on IoT and EmbeddedSystems,IIT Madras.
- https://nptel.ac.in/courses/106103182/," NOC:Embedded Systems-Design Verification and Test,Dr. Santosh Biswas, Prof.Jatindra Kumar Deka, Prof.Arnab sarkar - IIT Guwahati.

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Explain the architecture of embedded processors.
- CO2 Write embedded C programs.
- CO3 Design simple embedded applications.
- CO4 Compare the communication models in IOT.
- CO5 Design IoT applications using Arduino/Raspberry Pi /open platform.

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	3	-	-	-	-	1	2	3	3	2	1
CO2	2	1	3	2	2	-	-	-	1	2	2	3	3	1
CO3	3	1	3	3	1	-	-	-	1	2	1	1	2	2
CO4	3	2	3	2	1	-	-	-	1	2	2	3	2	2
CO5	2	3	3	2	2	-	-	-	1	3	3	2	3	3

Mapping of COs with POs and PSOs

22ADL61

DEEP LEARNING LABORATORY

Preamble:

The Main objective is to understand the tools and techniques to implement deep neural networks and apply different deep learning architectures for solving problems.

LIST OF EXPERIMENTS

- 1. XOR Challenge: Deep Learning for Nonlinear Problems
- 2. Character recognition using CNN
- 3. Face recognition using CNN
- 4. Language modeling using RNN
- 5. Sentiment analysis using LSTM
- 6. Parts of speech tagging using Sequence to Sequence architecture
- 7. Machine Translation using Encoder-Decoder model
- 8. Image augmentation using GANs
- 9. Mini-project on real world applications

SOFTWARE

• Python 3 interpreter / open source IDE

TOTAL: 45 PERIODS

Course Outcomes: Upon completion of the course, students will be able to:

- 1. Apply deep neural network for non linear problems
- 2. Apply Convolution Neural Network for image processing.
- 3. Apply Recurrent Neural Network and LSTM for text analysis
- 4. Apply generative models for data augmentation
- 5. Develop real-world solutions using suitable deep neural networks

COs/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	3	3	-	-	-	3	2	3	2	3	3
CO2	2	3	2	3	3	-	-	-	3	2	2	2	2	3
CO3	3	2	2	3	3	-	-	-	2	3	2	2	2	3
CO4	3	3	2	3	3	-	-	-	2	3	2	2	3	2
CO5	3	3	3	3	3	-	-	-	2	2	3	2	3	3

Mapping of COs with POs and PSOs

22ADL62

MINI PROJECT

Preamble:

This course enhances the knowledge acquired in Artificial Intelligence and Data Science to do a mini project, which allows the students to come up with new innovative techniques or algorithms and programs expressing their ideas in a novel way. It helps the students in preparing mini project reports and to face reviews and viva voce examination.

NOTE:

To identify a topic of interest in consultation with Faculty/Supervisor. Review the literature and gather information pertaining to the chosen topic. State the objectives and develop a methodology to achieve the objectives. Carryout the design and develop computer code. Demonstrate the novelty of the project through the results and outputs.

TOTAL: 60 PERIODS

Course Outcomes: Upon completion of the course, students will be able to:

- 1. Apply engineering fundamentals to analyze domain specific Issues to identify problem statement with objective and scope.
- Investigate the identified problem and review state of the art literature survey to synthesis
- 2. system requirements
- Identify the risk/impact/technique and interpret the suitable standards related to the problem
- 3. statement and design appropriate procedures/methods.
- 4. Develop modules using discipline specific tools and implement the modules to achieve valid conclusion.
- 5. Prepare documents related to their findings for detailed presentation, Defend the findings and conclude with oral / written presentation.

L T P C 0 0 6 3

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	2	2	2	2	3	3	3	3	3	3
CO2	2	3	3	3	2	2	2	2	3	3	3	3	3	3
CO3	2	3	3	3	3	2	2	2	3	3	2	3	3	3
CO4	2	3	3	3	3	3	2	2	3	3	3	3	3	3
CO5	2	3	3	3	2	3	2	3	3	3	2	3	3	3

UNIT 1

RECEPTIVE SKILLS 6 LISTENING & READING – Developing Listening & Reading Skills - Comprehension and Analysis – Listening & Reading for Main Idea - Specific Information - Cloze Test- Rearranging words and sentences

Communication Skill is a life skill necessary for all students of Engineering and Technology. The course Communicative Skills Laboratory aims at developing effective oral and written communication to facilitate their success in competitive examinations, and recruitment screening thereby ensuring

UNIT 2 **PRODUCTIVE SKILLS**

professional success and progress.

SPEAKING & WRITING - Group Discussion and Practice – Mock GD - Structure – Types - Techniques - Keywords -Vital qualities - Attitude and Opinion - Expository and Persuasive Paragraphs - Picture Description

ENGLISH FOR NATIONAL AND INTERNATIONAL EXAMINATIONS **UNIT 3** 4 Orientation to International English Language Testing System (IELTS) and other Competitive Examinations - MCQs

UNIT 4 **CAREER SKILLS**

Types of Interviews - FAQ's - Mock Interviews - Body Language - Team Work - Managing Time -Managing Stress - Negotiation Skills - Networking - Profile Creation (Linked in, Portfolio)

UNIT 5 VERBAL ABILITY

Synonyms and Antonyms - Idioms and Phrases - Sentence Construction and Improvement - Paraphrasing -Contextual Vocabulary - Verbal Analogy

REFERENCES:

- 1. M Ashraf Rizvi "Effective Technical Communication", Tata McGraw-Hill, 2st Edition, New Delhi, 2018.
- Koneru Aruna 'Professional Communication' MC Graw Hill Education, Chennai, 2008. 2.
- Upadhyay Meenakshi & Arun Sharma 'Comprehension Interpersonal & Communication Skills for 3. General Studies Civil Services Preliminary Examination' MC Graw Hill Education, New Delhi, 2012.

e. RESOURCES :

- 1. https://www.teachingenglish.org.uk/article/email-writing
- http://www.oxforddictionaries.com/words/writing-job-applications 2.
- 3. https://www.fresherslive.com/online-test/verbal-ability-test/questions-and-answers
- 4. www.cambridgeenglish.org

COMMUNICATION SKILLS LABORATORY

(Fifth / Sixth Semester)

Preamble:

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TOTAL: 30 PERIODS

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- CO1 Respond quickly and correctly to questions from different types of scripts, exhibiting good comprehension and analyzing skills
- CO2 Participate effectively in formal group discussions and prepare professional e mails, persuasive and expository paragraphs to establish and meet organizational needs and goals.
- CO3 Fare well in IELTS and other English language assessment segments of competitive examinations within the stipulated time.
- CO4 Write effective résumés, and face interviews with communicative competence and confidence, with a good knowledge of career skills.
- CO5 Select appropriate vocabulary and idiomatic expressions, identify errors in syntax, and arrange sentences to make meaningful paragraphs, without any aid.

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	-	-	-	-	3	-	-	-	-	3	-	-	-	-
CO 2	-	-	-	-	-	-	-	-	3	3	-	-	-	-
CO 3	-	-	-	-	-	-	-	-	-	3	-	1	-	-
CO 4	-	-	-	-	-	-	-	-	3	3	-	1	-	-
CO 5	-	-	-	-	-	-	-	-	-	3	-	1	-	_
Mapping Average	-	-	-	-	3	-	-	-	3	3	-	1	-	-

Mapping of COs with POs and PSOs

L ECONOMICS AND MANAGEMENT FOR ENGINEERS 22ADT71 3

Pre-requisites : Nil Preamble

The main aim of this course is to understand the concepts of Economics with respect to the demand and supply analysis. This course makes the students to analyze the theory of production and the analysis of the cost parameter by using the Elasticity. This course will enable the students to manage and plan the situation with the help of the available strategies to support the decision making process.

UNIT 1 INTRODUCTION TO ECONOMICS

Introduction to Economics – Scope of Economics – Positive and Normative Science – Methodology of Economics - Economic Laws - Economy and its basic problems: Economy and its working -Kindsof economy systems - Basic problems of economy.

UNIT 2 DEMAND AND SUPPLY ANALYSIS

The Law of Demand – The Law of Supply – Elasticities of Demand and Supply: Price Elasticity of Demand - Price Elasticity and Consumption Expenditure- Cross Elasticity of Demand - Income Elasticity of Demand – The Elasticity of Price Expectations – The uses of Elasticity– Price Elasticity of Supply.

UNIT 3 THEORY OF PRODUCTION AND ANALYSIS OF COST

Meaning of Production - Production concepts - Production Function - Laws of Production -Cost Concepts - Short-Run Cost Output Relations - Long Run Cost output relations - Economics of Scale

UNIT 4 INTRODUCTION TO MANAGEMENT

Management: An Overview - Management Defined - Managerial skills - Managerial roles -Management responsibilities - Management functions. Evolution of Management: Classical approaches to Management – Contemporary Management Perspectives.

UNIT 5 PLANNING

Planning and Forecasting: Importance of Planning - Principles of effective Planning - Planning process – Types of Plans. Strategic Planning: Strategic Planning process – Rational decision making.

TEXT BOOKS:

- D.N.Dwivedi, "Principles of Economics", Second Edition, Vikas Publishing House (P) 1. Limited, NewDelhi, 2012.
- J.S.Chandan, "Management Concepts and Strategies", Vikas Publishing House (P) Limited, 2. NewDelhi, 2003.

REFERENCES:

- Ranbir Singh," Principles of Engineering Economics and Management", S.K.Kataria& Sons, 1. New Delhi, 2013.
- Manish Varshney and VidhanBanerjee, "Engineeringand Managerial Economics", First Edition, 2. CBSPublishers and Distributors Pvt. Ltd., 2015.

e-RESOURCES:

- http://nptel.ac.in/courses/110101005/, Prof.Trupti Mishra, S.J.M. School of Management, 1. IITMumbai, Managerial Economics.
- https://nptel.ac.in/courses/122106031/slides/3_1s.pdf, Dr.M.Thenmozhi, Professor, IIT Madras. 2.

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Total : 45 Periods

- CO1 Explain how to use economics principles to solve economic problems in engineering disciplineby satisfying the economic laws.
- CO2 Discuss the demand and supply process for a market analysis using Price elasticity, Cross elasticity and Income elasticity.
- CO3 Interpret short run and long run costs in the process of production for carrying out a business.
- CO4 Apply managerial skills to make decisions and solve problems for achieving organizationalobjectives.
- CO5 Express the principles of effective planning for survival and success of all organizations usingstanding and single use planning methods.

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3	2	2	-	2	1	1	-	1	-	-	-	2
CO2	2	3	2	2	-	2	1	1	-	1	-	-	-	2
CO3	2	3	2	2	-	2	1	1	-	1	-	-	-	2
CO4	2	3	2	2	-	2	1	1	-	1	-	-	-	2
CO5	2	3	2	2	-	2	1	1	-	1	-	-	-	2

Mapping of COs with POs and PSOs

Pre-requisites : Big Data Analytics

Preamble:

This course provides an exposure on loading, transforming and handling of data. Also, it provides Knowledge about analyzing, reporting results for better decision making.

UNIT I DATA WAREHOUSING AND BUSINESS INTELLIGENCE

Different Worlds of Data Capture and Data Analysis - Goals of Data Warehousing and Business Intelligence – Dimensional Modeling Introduction - Kimball's DW/BI Architecture - Alternative DW/BI Architectures - Dimensional Modeling Myths – More Reasons to Think Dimensionally - Agile Considerations.

UNIT II DIMENSIONAL MODELING TECHNIQUES

Dimensional Modeling Techniques: Fundamental Concepts - Basic Fact Table Techniques - Basic Dimension Table Techniques - Integration via Conformed Dimensions - Dealing with Slowly Changing Dimension Attributes - Dealing with Dimension Hierarchies - Advanced Fact Table Techniques - Advanced Dimension Techniques - Special Purpose Schemas – Retail Sales: Four-Step Dimensional Design Process – Case Study - Dimension Table Details - Retail Schema in Action - Retail Schema Extensibility – Factless Fact Tables - Dimension and Fact Table Keys - Resisting Normalization Urges.

UNIT III DW/BI LIFECYCLE, PROCESS AND TASK

Lifecycle Roadmap – Launch Activities – Technology Track – Data Track – BI Applications Track – Wrap-up Activities – Dimensional Modeling Process and Task: Modeling Process – Get Organized – Design the Dimensional Model.

UNIT IV ETL SUBSYSTEMS AND TECHNIQUES

Round up the requirements – The 34 Subsystems of ETL – Extracting: Getting Data Into the Data Warehouse – Cleaning and Conforming Data – Delivering: Prepare for Presentation – Managing the ETL Environment.

UNIT V ETL SYSTEM DESIGN AND BIG DATA ANALYTICS

ETL Process Overview – Develop the ETL Plan - Develop One-Time Historic Load Processing - Develop Incremental ETL Processing - Real-Time Implications – Big Data Analytics: Big Data Overview - Recommended Best Practices for Big Data.

TEXT BOOKS:

1. Ralph Kimball, Margy Ross. "The Data Warehouse Toolkit", 3rd Edition, Wiley, 2013.

REFERENCES:

1. Ralph Kimball, Margy Ross, Warren Thornthwaite, Joy Mundy, Bob Becker. The Data Warehouse Lifecycle Toolkit, 3rd Edition, Wiley, 2008

e-RESOURCES:

1. https://www.tableau.com/learn/articles/business-intelligence

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Interpret basic business intelligence architectures.
- CO2 Build various dimensional modeling data models and experiment various data preprocessing operations.
- CO3 Apply Business Intelligence life cycle and its associated tasks.
- CO4 Perform ETL process and subsystems using ETL tools.
- CO5 Design and implement ETL plan for various real life BI applications.

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Total: 45 Periods

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Mapping of COs with POs and PSOs

Cos/POs	PO 1	PO 2	PO 3	РО 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1	1	-	-	-	-	-	-	-	2	3	2
CO2	3	2	1	1	-	-	-	-	-	-	-	2	3	2
CO3	3	2	1	1	-	-	-	-	-	-	-	2	3	2
CO4	3	2	1	1	-	-	-	-	-	-	-	2	3	2
CO5	3	2	1	1	-	-	-	-	-	-	-	2	3	2

22HST71 HUMAN VALUES AND PROFESSIONAL ETHICS

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Pre-requisites: Universal Human Values

Preamble

Universal Human Values is a life skill necessary for all students of Engineering and Technology. The course aims to identify the values and skills, and to realize the need, basic guidelines, content and process of value education. Professional Ethics For Engineers deals with the human values, integrity and work ethics in the common world. This course is mainly concerned about the theories of ethics, which form the basis for the understanding and responsibility of the various groups encountered in Engineering.

UNIT 1 INTRODUCTION TO UNIVERSAL HUMAN VALUES

Understanding the need, basic guidelines, content and process for Value Education. Self Exploration– Mechanism for self-exploration. Continuous Happiness and Prosperity- Basic Human Aspirations and its requirements for fulfillment of Human Aspirations understanding and living in harmony at various levels.

UNIT 2 HARMONY IN ONESELF, FAMILY AND SOCIETY

Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding harmony in the Family- the basic unit of human interaction. Understanding values in human-human relationships. Trust and Respect- values of relationship. Difference between intention and competence. Difference between respect and differentiation

UNIT 3 HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL 3 ETHICS

Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in Professional Ethics. Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models.

UNIT 4 ENGINEERING ETHICS

Senses of Engineering Ethics– Variety of moral issues – Types of inquiry – Moral dilemmas – Moral autonomy – Kohlberg's theory – Gilligan's theory – Consensus and controversy – Models of professional roles –Professional responsibility - Moral reasoning - Theories about right action – Self-interest – Self respect – Duty ethics – Customs and religion.

UNIT 5 ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as experimentation – Engineers as responsible experimenters – Role of codes- Codes of Ethics – Sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management, Institution of Electronics and Telecommunication Engineers (IETE) – A balanced outlook on law - Safe exits -The Bhopal gas tragedy and Challenger case study.

TOTAL: 15 PERIODS

TEXT BOOKS:

- 1. Gaur R R, Sangal R, Bagaria G P, "A Foundation Course in Human Values and Professional Ethics". 3rd Revised Edition, 2023
- 2. Govindarajan M, Natarajan S and Senthil Kumar V. S, "Engineering Ethics", PHI Learning Pvt. Ltd, New Delhi, 2017.

REFERENCES:

- 1. Banerjee B P, "Foundations of Ethics and Management", Excel Books. 2005.
- 2. Bajpai B L, "Indian Ethos and Modern Management", New Royal Book Co., Lucknow. Reprinted 2008.
- 3. Subramanian R, "Professional Ethics", Oxford university press, 2017.

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Relate the significance of value inputs in a classroom and start applying them in their life and profession.
- CO2 Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual.
- CO3 Interpret the value of harmonious relationships based on the trust and respect in their life and profession.
- CO4 Discuss the ethical issues related to Engineering.
- CO5 Discuss Engineer's work in the context of its impact on society.

COs/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	-	-	-	-	-	2	3	2	2	-	-	2	-	-
CO 2	-	-	-	-	-	3	-	3	1	-	-	2	-	-
CO 3	-	-	-	-	-	2	2	3	3	3	-	2	-	-
CO 4	1	2	-	-	-	3	-	2	-	-	-	2	-	-
CO 5	2	2	1	-	-	3	2	2	-	-	-	2	-	-

Mapping of COs with POs and PSOs

22ADL71 DATA WAREHOUSING AND BUSINESS INTELLIGENCE LABORATORY

Preamble:

This course provides hands-on experience in applying loading, transforming and handling of data. Also it provides Knowledge about analyzing, reporting results for better decision making.

LIST OF EXPERIMENTS:

- 1. Installation and Configuration of tableau.
- 2. Collecting, Cleaning and Connecting to data.
- 3. Perform ETL process for the given data source.
- 4. Create charts like bubble, bar, map using Tableau
- 5. Create your story from the charts with valid reasons.
- 6. Build a Map view using Tableau (Explore your data geographically).
- 7. Collect appropriate data, Perform ETL process and develop Scorecard using Tableau.
- 8. Collect appropriate data, Perform ETL process and develop Dashboard for Health Care using

Tableau.

- 9. Managing live data for scorecard using tableau.
- 10. Application project on design and implementation of a dashboard.

TOTAL: 45 PERIODS

Operating System: Windows / Linux Software: Tableau

Course Outcomes: At the end of this course, the students will be able to:

- 1. Install and Configure Tableau.
- 2. Experiment various data preprocessing operations.
- 3. Use ETL Tools for preprocessing the data.
- 4. Create reports for various real life BI Applications.
- 5. Design and develop application using Tableau.

COs/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	3	2	-	1	-	2	-	1	1	2	3
CO2	3	2	2	3	2	-	1	-	2	-	1	1	2	3
CO3	3	2	2	3	2	-	1	-	2	-	1	1	2	3
CO4	3	2	2	3	2	-	1	-	2	-	1	1	2	3
CO5	3	2	2	3	2	-	1	-	2	-	1	1	2	3

Preamble:

The course provides basic information on Indian Constitution and Indian Traditional knowledge. This is essential for all citizens and especially for engineers so that they become aware of Indian polity and governance. This also reminds the citizen about their obligation, adherence and up keeping of Constitutional rights.

UNIT 1

Constitution' meaning of the term, Indian Constitution: Sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy - Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajva Sabha. 6

UNIT 2

Governor: Role and Position, CM and Council of ministers, State Secretariat: organisation, Structure and Functions District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. UNIT 3 6

Panchayatraj: Introduction, PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy. 6

UNIT 4

Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women.

UNIT 5

Basic structure of Indian Knowledge System- Modern Science and Indian Knowledge -Philosophical Tradition - Indian Linguistic Tradition (Phonology, morphology, syntax and semantics) – Indian Artistic Tradition.

TOTAL: 30 PERIODS

TEXT BOOKS:

- M.Rajaram, Indian Constitution, New Age International, 2009 1.
- V.Sivaramakrishnan(Ed.) Cultural Heritage of India (CourseMaterial), Bharatiya Vidya 2 Bhavan, Mumbai. 5thEdition,2014

Course Outcomes: Upon completion of the course, students will be able to:

- CO1. Describe the emergence and evolution of Indian Constitution, structure and composition of Indian Constitution and federalism in the Indian context.
- CO2. List the functions of Centre, States and District Administrations, Fundamental rights needed to develop human personality in free society.
- CO3. Identify different levels of Panchayat Raj system and its working.
- CO4. Elaborate the role of Election Commission and its power to conduct free and fair election throughout India.
- CO5. Develop a broad understanding of Indian society and intercultural literacy through cultural immersion.

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Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO5	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	3	2	2	2	2	-	2	-	-
CO2	-	-	-	-	-	3	2	2	2	2	-	2	-	-
CO3	-	-	-	-	-	3	2	2	2	2	-	2	-	-
CO4	-	-	-	-	-	3	2	2	2	2	-	2	-	-
CO5	-	-	-	-	-	3	2	2	2	2	-	2	-	-

INTERNSHIP

2

Pre-requisites: Knowledge of Artificial Intelligence and Data Science

Preamble

Internships are educational and career development opportunities, providing practical experience in a field or discipline. Internships are far more important, as employers are looking for employees who are properly skilled and have awareness about the industry environment, practices, and culture. The internship is structured, short-term, supervised training often focused on particular tasks or projects with defined time scales.

GUIDELINE FOR REVIEW AND EVALUATION

Students have to undergo four-week practical training in Artificial Intelligence and Data Science related organizations of their choice but with the prior approval from the institution. At the end of the training student will submit a report as per the prescribed format to the department. The student shall make a power point presentation before a committee constituted by the department which will assess the student based on the report submitted and the presentation made.

Evaluation of Project Report and Viva voce examination: 100 marks

(The student will be evaluated based on the report and the viva voce examination by an internal examiner)

Total: 30

- CO1 Apply the acquired knowledge in the design of components and systems to solve the real-life problems.
- CO2 Solve the given problems by applying the concepts of living and nonliving systems.
- CO3 Apply the Artificial Intelligence and Data Science concepts to solve the engineering problems.

Mapping of COs with POs and PSOs

COs/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2
CO 1	3	3	3	3	3	3	2	3	3	3	2	2	3	3
CO 2	3	3	3	3	3	3	2	3	3	3	2	2	3	3
CO 3	3	3	3	3	3	3	2	3	3	3	2	2	3	3

PROJECT WORK

Preamble:

This course develops the ability to solve a specific problems in-depth insight into the concepts, principles, formulation of the projects and network technique right from its identification and literature review till the successful solution of the same. It also trains the students in preparing project reports and to face reviews and viva voce examination.

NOTE:

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepare a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL: 180 PERIODS

Course Outcomes: Upon completion of the course, students will be able to:

- CO1 Apply engineering fundamentals to analyze domain specific Issues to identify problem statement with objective and scope.
- CO2 Investigate the identified problem and review state of the art literature survey to synthesis system requirements.
- CO3 Identify the risk/impact/technique and interpret the suitable standards related to the problem statement and design appropriate procedures/methods.
- CO4 Develop modules using discipline specific tools and implement the modules to achieve valid conclusion.
- CO5 Prepare documents related to their findings for detailed presentation, Defend the findings and conclude with oral / written presentation.

Mapping of COs with POs and PSOs

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	2	2	2	2	3	3	3	3	3	3
CO2	2	3	3	3	2	2	2	2	3	3	3	3	3	3
CO3	2	3	3	3	3	2	2	2	3	3	2	3	3	3
CO4	2	3	3	3	3	3	2	2	3	3	3	3	3	3
CO5	2	3	3	3	2	3	2	3	3	3	2	3	3	3

22ADE11

Pre-requisites: Artificial Intelligence, Machine Learning

Preamble

Knowledge engineering is the technology behind the creation of expert systems to assist with issues related to their programmed field of knowledge. Expert systems involve a large, expandable knowledge base integrated with a rules engine that specifies how to apply information to each particular situation.

UNIT 1 REASONING UNDER UNCERTAINTY

Introduction – Abductive reasoning – Probabilistic reasoning: Enumerative Probabilities – Subjective Bayesian view – Belief Functions – Baconian Probability – Fuzzy Probability – Uncertainty methods - Evidence-based reasoning – Intelligent Agent – Mixed-Initiative Reasoning – Knowledge Engineering

UNIT 2 METHODOLOGY AND MODELING

Conventional Design and Development – Development tools and Reusable Ontologies – Agent Design and Development using Learning Technology – Problem Solving through Analysis and Synthesis – Inquirydriven Analysis and Synthesis – Evidence-based Assessment – Believability Assessment – Drill-Down Analysis, Assumption-based Reasoning, and What-If Scenarios.

UNIT 3 ONTOLOGIES - DESIGN AND DEVELOPMENT

Concepts and Instances – Generalization Hierarchies – Object Features – Defining Features – Representation – Transitivity – Inheritance – Concepts as Feature Values – Ontology Matching. Design and Development Methodologies – Steps in Ontology Development – Domain Understanding and Concept Elicitation – Modelling-based Ontology Specification.

UNIT 4 REASONIING WITH ONTOLOGIES AND RULES

Production System Architecture – Complex Ontology-based Concepts – Reduction and Synthesis rules and the Inference Engine – Evidence-based hypothesis analysis – Rule and Ontology Matching – Partially Learned Knowledge – Reasoning with Partially Learned Knowledge.

UNIT 5 LEARNING AND RULE LEARNING

Machine Learning – Concepts – Generalization and Specialization Rules – Types – Formal definition of Generalization. Modelling, Learning and Problem Solving – Rule learning and Refinement – Overview – Rule Generation and Analysis – Hypothesis Learning.

TEXT BOOKS:

Gheorghe Tecuci, DorinMarcu, Mihai Boicu, David A. Schum, Knowledge Engineering Building Cognitive
Assistants for Evidence-based Reasoning, Cambridge University Press, First Edition, 2016. (Unit 1 – Chapter 1 / Unit 2 – Chapter 3,4 / Unit 3 – Chapter 5, 6 / Unit 4 - 7, Unit 5 – Chapter 8, 9)

REFERENCES:

- 1. Ronald J. Brachman, Hector J. Levesque: Knowledge Representation and Reasoning, Morgan Kaufmann, 2004
- 2. Ela Kumar, Knowledge Engineering, I K International Publisher House, 2018
- 3. John F. Sowa: Knowledge Representation: Logical, Philosophical, and Computational Foundations, Brooks/Cole, Thomson Learning, 2000
- 4. King, Knowledge Management and Organizational Learning, Springer, 2009

e-RESOURCES:

1. https://archive.nptel.ac.in/courses/106/106/106106140/

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Total: 45 Periods

- CO1 Identify and describe knowledge Engineering and their roles in probability based reasoning operations.
- CO2 Apply methodologies and modelling for Agent Design and Development.
- CO3 Experiment with ontology development based Concepts as Feature values.
- CO4 Explain reasoning with ontologies and rules in learning and development
- CO5 Utilize Generalization and Specialization Rules for solving a given problem.

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	2	2	-	1	-	-	-	-	2	1	2	-
CO2	3	2	2	2	-	1	-	-	-	-	2	1	2	-
CO3	2	2	2	2	-	1	-	-	-	-	2	1	2	-
CO4	2	2	2	2	-	1	-	-	-	-	2	1	2	-
CO5	2	2	2	2	-	1	-	-	-	-	2	1	2	-

Mapping of COs with POs and PSOs

Preamble

UNIT 1

UNIT 2

UNIT 3

Pre-requisites: Nil

soft computing components with hybridization.

Logic-Genetic Algorithms-Hybrid systems.

FUZZY LOGIC

NEURAL NETWORKS

Resonance Theory-Third generation neural networks.

Fuzzy Rules- Fuzzy Reasoning- Fuzzy Inference Systems.

INTRODUCTION TO SOFT COMPUTING

SOFT COMPUTING

This course gives an introduction to some new fields in soft computing with its principal components of fuzzy logic, Neural networks and GA. Students are able to understand the real time applications of these

Associators- Supervised learning Networks: Adaptive linear neuron- Backpropagation Learning. Associative memory networks: Associative Memory-Unsupervised learning networks: Adaptive

Fuzzy Sets- Fuzzy membership functions-Operations on Fuzzy Sets -Fuzzy relations- Fuzzy Logic Basics-

9 Introduction to soft computing- Introduction to Artificial Intelligent Systems- Neural Networks- Fuzzy

9 Basic Concepts of Neural Networks- Neural Network Architectures-Pattern Classifiers-Pattern

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UNIT 4 **GENETIC ALGORITHMS** Basic Concepts-Working Principle-Traditional optimization and search techniques-Genetic algorithm and search space- Genetic algorithm and traditional algorithm- Operators: Encoding-Selection- Cross Over-Mutation - Fitness Computations-Swarm Intelligence- Applications of Genetic Algorithm: Optimization of Traveling Salesman problem using GA approach.

UNIT 5 **HYBRID SOFT COMPUTING TECHNIOUES**

Fuzzy-neural Systems: Fuzzy Neurons-Adaptive Neuro-fuzzy Inference System- Neuro-genetic Systems: GA based Back Propagation Network- Genetic fuzzy hybrid: Genetic fuzzy rule-based system.

TOTAL: 45 PERIODS

TEXT BOOKS:

- 1. S.N.Sivanandam and S.N.Deepa, "Principles of Soft Computing", 3rd Edition, Wiley India Pvt. Ltd, 2019.
- 2. Samir Roy, Udit Chakroborthy, "Introduction to soft computing -neuro-fuzzy and genetic algorithms", Pearson Education, 1st Edition, 2013.

REFERENCES:

- 1. David E. Goldberg, "Genetic Algorithms in Search, Optimization & Machine Learning", Pearson
- S.Rajasekaran and G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: 2. Synthesis and Applications", Prentice-Hall of India Pvt. Ltd., 2012.
- Timothy J.Ross, "Fuzzy Logic with Engineeringapplications", Tata McGraw Hill New York, Third 3. edition, 2010.

e-RESOURCES:

- 1. http://nptel.ac.in/courses/112106064/38/, "Genetic Algorithms", Prof. C. Balaji, IIT- Madras.
- 2. http://nptel.ac.in/courses/108104049/13/, "Fuzzy Sets: A Primer", Prof. Laxmidhar Behera, IIT-Kanpur.

- 1. Identify and describe soft computing techniques and their roles in building intelligent machines.
- 2. Discuss the components of neural network architecture and explain supervised and unsupervised learning algorithms using Backpropagation, Associative Memory and Adaptive Resonance.
- 3. Explain the fuzzy sets, fuzzy logic systems and its applications in real life problem solving.
- 4. Discuss the core of genetic algorithms and its application to combinatorial optimization problems.
- 5. Discuss the problem for optimal solution by hybridizing Neuro-Fuzzy and Neuro-Genetic soft computing techniques.

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1	1	-	-	-	-	-	-	-	-	3	2
CO2	3	2	1	1	-	-	-	-	-	-	-	-	3	2
CO3	3	2	1	1	-	-	-	-	-	-	-	-	3	2
CO4	3	2	1	1	-	-	-	-	-	-	-	-	3	2
CO5	3	2	1	1	-	-	-	-	-	-	-	-	3	2

Mapping of COs with POs and PSOs

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Pre-requisites: Artificial Intelligence

Preamble:

This course deals with modeling, analysis tools and techniques for problems of dynamic decision making under uncertainty. It also deals with convergence and accuracy of such algorithms.

UNIT 1 INTRODUCTION AND BASICS OF RL:

Reinforcement Learning – Examples - Elements of Reinforcement Learning - Limitations and Scope - An Extended Example: Tic- Tac-Toe - History of Reinforcement Learning.

UNIT 2 TABULAR SOLUTION METHODS:

Multi-arm Bandits - An n-Armed Bandit Problem - Action-Value Methods - Incremental Implementation- Tracking a Non stationary Problem - Optimistic Initial Values - Upper-Confidence -Bound Action Selection - Gradient Bandit - Associative Search

UNIT 3 FINITE MARKOV DECISION PROCESSES

The Agent – Environment Interface - Goals and Rewards – Returns - Unified Notation for Episodic and Continuing Tasks – Policies and Value Functions - Optimal Policies and Optimal Value Functions - Optimality and Approximation.

UNIT 4 DYNAMIC PROGRAMMING AND MONTE CARLO METHODS:

Dynamic Programming - Policy Evaluation - Policy Improvement - Policy Iteration - Value Iteration - Generalized Policy Iteration. Monte Carlo Methods: Monte Carlo Prediction - Monte Carlo Estimation of Action Values - Monte Carlo Control - Monte Carlo Control without Exploring Starts

UNIT 5 TEMPORAL-DIFFERENCE LEARNING:

TD Prediction - Advantages of TD Prediction Methods - Optimality of TD (0) - Sarsa: On-Policy TD Control - Q - Learning: Off - Policy TD Control - Games, After states, and Other Special Cases

Total: 45 Periods

TEXT BOOKS:

1. Richard S. Sutton and Andrew G. Barto, "Reinforcement Learning: An Introduction", 2nd Edition, MIT Press, London, 2018.

REFERENCES:

1. Phill winder, "Reinforcement Learning: Industrial applications of intelligent agents", 1st Edition, O'Reilly Media, 2020

e-RESOURCES:

1. https://web.stanford.edu/class/psych209/Readings/SuttonBartoIPRLBook2ndEd.pdf

- CO1 Summarize RL concepts and analyze the limitations and scopes of RL
- CO2 Apply tabular methods to solve classical control problems
- CO3 Apply Markov decision process in optimization of complex problems
- CO4 Analyze problems using dynamic programming and Monte-Carlo methods
- CO5 Use temporal-difference learning and Q-learning methods in special cases

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	-	-	-	-	-	-	-	-	-	3	2
CO2	3	2	2	-	-	-	-	-	-	-	-	-	3	2
CO3	3	2	2	-	-	-	-	-	-	-	-	-	3	2
CO4	3	2	2	-	-	-	-	-	-	-	-	-	3	2
CO5	3	2	2	-	-	-	-	-	-	-	-	-	3	2

Mapping of COs with POs and PSOs

Preamble:

Pre-requisites: Nil

22ADE14

Primary aim of the course is to introduce learners with essentials of natural language processing. The essentials cover linguistic aspects, core algorithms for solving basic tasks, statistical and shallow machine learning models for several natural language processing tasks.

UNIT 1 INTRODUCTION

Origins and challenges of NLP - Language Modeling: Grammar-based LM, Statistical LM - Regular Expressions, Finite-State Automata - English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.

UNIT 2 WORD LEVEL ANALYSIS

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff - Word Classes, Partof-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging -Hidden Markov and Maximum Entropy models.

UNIT 3 SYNTACTIC ANALYSIS

Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar -Dependency Grammar - Syntactic Parsing, Ambiguity, Dynamic Programming parsing - Shallow parsing - Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs - Feature structures, Unification of feature structures.

UNIT 4 SEMANTICS AND PRAGMATICS

Requirements for representation, First-Order Logic, Description Logics - Syntax-Driven Semantic analysis, Semantic attachments - Word Senses, Relations between Senses, Thematic Roles, selectional restrictions - Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

UNIT 5 DISCOURSE ANALYSIS AND LEXICAL RESOURCES

Discourse segmentation, Coherence - Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm - Coreference Resolution - Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

Total: 45 Periods

TEXT BOOKS:

- 1. Daniel Jurafsky, James H. Martin Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014
- 2. Steven Bird, Ewan Klein and Edward Loper, Natural Language Processing with Python, First Edition, O Reilly Media, 2009.

REFERENCES:

- 1. Breck Baldwin, Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
- 2. Richard M Reese, Natural Language Processing with Javal, O Reilly Media, 2015.
- 3. Nitin Indurkhya and Fred J. Damerau, Handbook of Natural Language Processing, Second Edition, Chapman and Hall / CRC Press, 2010.

e-RESOURCES:

- 1. http://nptel.ac.in/
- 2. https://visiondummy.com

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- CO1 Apply NLP techniques for text analysis
- CO2 Implement a rule-based system to tackle morphology/syntax of a language
- CO3 Design a tag set to be used for statistical processing for real-time applications.
- CO4 Compare and contrast the use of different statistical approaches for different types of NLP applications.
- CO5 Design innovative NLP applications by using tools to process natural language

Mapping of COs with POs and PSOs

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1	3	-	1	-	-	-	-	-	2	3	2
CO2	3	2	1	3	-	1	-	-	-	-	-	2	3	2
CO3	3	2	1	3	-	1	-	-	-	-	-	2	3	2
CO4	3	2	1	3	-	1	-	-	-	-	-	2	3	2
CO5	3	2	1	3	-	1	-	-	-	-	-	2	3	2

GENERATIVE AI

Pre-requisites: Fundamentals of Artificial Intelligence

Preamble:

22ADE15

This paper focus on the artificial intelligence technology that can produce various types of content, including text, imagery, audio and synthetic data.

UNIT 1 INTRODUCTION

An Introduction to Generative A1 — Applications of A1 — The rules of probability — Why use generative models — Unique challenges of generative models

UNIT 2 AUTOENCODERS AND AUTOREGRESSIVE MODELS

Autoencoders — Stochastic Encoders and — AutoregressiveMtxiels — Fully Visible Sigmoid Belief Network (FVSBN) — Neural Autoregressive Density Estimation (NADE) — Masked Autoencoder for **Distribution Estimation (NADE)**

UNIT 3 GENERATIVE ADVERSARIAL NETWORK

Generative Adversarial Networks — Vanilla GAN — Progressive GAN — Style transfer and transformation — Image Generation with CANs — Style Transfer with GANs

UNIT 4 TRANSFORMERS AND PROMPT ENGINEERING

Transformers — Large language models — MLWNSP — Generative Pretrained Transformers (GPT) — Task-specific GPT Fine tuning — Prompt Engineering — Hugging face Pretrained Transformers — Huggingface APIS

UNIT 5 CHATGPTs AND OPENAPI

GPT3.3.5.4 — Open Al APIs — Working with the Open Al Playground — and use Cases:Content Filtering — Generating and Transforming Text — Classifying and Categorizing Text — Building a GPT-3-Powered QuesApp

Total: 45 Periods

TEXT BOOKS:

- Steve Tingiris, Exploring GPT-3, Packt Publishing Ltd. UK, 2021 1.
- 2. Joseph Babcock Raghav Bali, Generative AI with Python and TensorFlow 2, Packt Publishing Ltd. UK. 2021

REFERENCES:

- 1. SabitEkin, Prompt Engineering for ChatGPT: A Quick Guide to Techniques, Tips. And Best Practices, DOI:10.36227/techxiv.22683919.v2, 2023
- 2 https://huggingface.co/

e-RESOURCES:

https://huggingface.co/ 1.

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- CO1 Realize the fundamental concepts of generative AI
- CO2 Explain the encoders, decoders and autoregressive models
- CO3 Apply generative models for image generation, style transfer and text generation
- CO4 Apply transformers, prompt engineering and APIs for real world problems
- CO5 Develop application using chat GPTs and open API

Cos/POs	PO	PSO	PSO											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	3	3	-	-	-	-	-	-	1	3	3
CO2	3	3	3	3	3	-	-	-	-	-	-	1	3	3
CO3	3	3	3	3	3	-	-	-	-	-	-	1	3	3
CO4	3	3	3	3	3	-	-	-	-	-	-	1	3	3
CO5	3	3	3	3	3	-	-	-	-	-	-	1	3	3

Mapping of COs with POs and PSOs
COMPUTER VISION

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Pre-requisites: Nil **Preamble:**

The course covers some fundamental aspects and ideas of computer vision and some well-known application areas. It is a specialized course useful for graduate students or for high-level undergraduate, particularly who want to work in computer vision, image analysis, visual pattern recognition etc.

UNIT 1 INTRODUCTION TO IMAGE FORMATION AND PROCESSING

Computer Vision - Geometric primitives and transformations - Photometric image formation - The digital camera - Point operators - Linear filtering - More neighborhood operators - Fourier transforms - Pyramids and wavelets - Global transformations.

UNIT 2 FEATURE DETECTION, MATCHING AND SEGMENTATION

Points and patches - Edges - Lines - Hough transforms- Segmentation - Active contours - Split and merge - Mean shift and mode finding - K-means and mixtures of Gaussians- Normalized cuts - Graph cuts and energy-based methods.

UNIT 3 FEATURE-BASED ALIGNMENT & MOTION ESTIMATION

2D and 3D feature-based alignment - Pose estimation - Geometric intrinsic calibration - Triangulation - Two-frame structure from motion - Factorization - Bundle adjustment - Constrained structure and motion - Parametric motion - Spline-based motion - Optical flow - Layered motion.

UNIT 4 3D RECONSTRUCTION

Shape from X - Active range finding - Surface representations - Point-based representations- Volumetric representations - Model-based reconstruction - Recovering texture maps and albedosos.

UNIT 5 IMAGE-BASED RENDERING AND RECOGNITION

View interpolation Layered depth images - Light fields and Lumigraphs - Environment mattes - Face recognition - Instance recognition - Category recognition - Context and scene understanding-Recognition databases and test sets.

Total: 45 Periods

TEXT BOOKS:

- 1. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer- Texts in Computer Science, Second Edition, 2022.
- 2. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, Second Edition, 2015

REFERENCES:

- 1. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
- 2. Christopher M. Bishop; Pattern Recognition and Machine Learning, Springer, 2006.
- **3.** E. R. Davies, Computer and Machine Vision, Fourth Edition, Academic Press, 2012.

e-RESOURCES:

- 1. https://onlinecourses.nptel.ac.in/noc19_cs58/preview
- 2. https://visiondummy.com

- CO1 Realize basic knowledge, theories and methods in image processing and computer vision.
- CO2 Implement the basic and some advanced image processing techniques in Open CV.
- CO3 Apply 2D feature-based image alignment by segmentation and motion estimations.
- CO4 Implement the Representation and Reconstruction by Apply 3D image reconstruction techniques
- CO5 Design and develop innovative image processing and computer vision applications.

Cos/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	2	-	-	-	-	2	1	2	2	3	-
CO2	3	3	3	2	-	-	-	-	2	1	2	2	3	-
CO3	3	3	3	2	-	-	-	-	2	1	2	2	3	-
CO4	3	3	3	2	-	-	-	-	2	1	2	2	3	-
CO5	3	3	3	2	-	-	-	-	2	1	2	2	3	-

Mapping of COs with POs and PSOs

Pre-requisites: Machine Learning

Preamble:

22ADE17

This course introduces students with a comprehensive understanding of feature engineering principles to ensure data quality by scaling, normalizing, and transforming raw data before using it in a machine learning model.

UNIT 1 INTRODUCTION TO FEATURE ENGINEERING

Overview of feature engineering – Importance in machine learning – Types of features; Numerical, Categorical, Text – Feature representation and feature vectors – Evaluation metrics for feature engineering.

UNIT 2 DATA PREPROCESSING AND HANDLING MISSING DATA

Introduction to data preprocessing – Techniques for handling missing data: Deletion, Imputation, Interpolation – Strategies for dealing with different types of missing data – Handling noisy data: Smoothing filters, Denoising algorithms – Data scaling and normalization techniques.

UNIT 3 FEATURE CREATION AND TRANSFORMATION

Polynomial features and interaction terms – Binning and discretization techniques – Feature hashing and feature embedding – Logarithmic, Exponential, Power transformations.

UNIT 4 ANOMALY DETECTION AND OUTLIER DETECTION

Introduction to anomaly detection and outlier detection – Statistical methods for anomaly detection: Z-score, Mahalanobis distance – density–based methods: Local Outlier Factor (LOF), Isolation Forest Oneclass SVM for outlier detection - Deep feature extraction: Visual Geometry Group (VGG), Residual Networks (ResNet).

UNIT 5 FEATURE SELECTION AND DIMENSIONALITY REDUCTION

Univariate feature selection methods: Chi-square test, ANOVA – Recursive Feature Elimination (RFE) – Feature importance using ensemble methods (e.g., Random Forest, XGBoost) – principal Component Analysis (PCA) for dimensionality reduction.

TEXT BOOKS:

- 1. Sinan Ozdemir, "Feature Engineering Book camp", first edition Manning Publications, 2022.
- 2. Alice Zheng and Amanda Casari, "Feature Engineering for Machine Learning: Principles and Techniques", first edition, O'Relly Media, 2018.

REFERENCES:

- 1. Alice Zheng and Amanda Casari, "Feature Engineering for Machine Learning: Principles and Techniques", first edition, O'Relly Media, 2018.
- 2. Sinan Ozdemir and DivyaSusarla, "Feature Engineering Made Easy: Identify Unique Features from Your Dataset in just 30 Minutes", first edition, Packt Publishing, 2018.

e-RESOURCES:

1. https://www.analyticsvidhya.com/blog/2021/09/complete-guide-to-feature-engineering-zero-to-hero/

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Explain continuous data and methods to handle them by using the concept of feature vectors.
- CO2 Identity the techniques for handling the missing data using normalization Techniques.
- CO3 Describe feature creation and transformation in feature engineering
- CO4 Describe the anomaly detection and outlier detection.
- CO5 Illustrate feature selection and dimensionality reduction using feature engineering

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Total: 45 Periods

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	2	2	-	-	-	-	1	-	1	3	3
CO2	3	3	3	2	2	-	-	-	-	1	-	1	3	3
CO3	3	3	3	2	2	-	-	-	-	1	-	1	3	3
CO4	3	3	3	2	2	-	-	-	-	1	-	1	3	3
CO5	3	3	3	2	2	-	-	-	-	1	-	1	3	3

UNIT 1 INTRODUCTION

22ADE18

Definition of morality and ethics in AI-Impact on society-Impact on human psychology-Impact on the legal system-Impact on the environment and the planet-Impact on trust.

ETHICS AND AI

Preamble: The main objective of this course is to understand the morality and ethics in AI by knowing AI standards and Regulations also to understand the opportunities and challenges from AI and Ethics.

UNIT 2 ETHICAL INITIATIVES IN AI

International ethical initiatives-Ethical harms and concerns-Case study: healthcare robots, Autonomous Vehicles, Warfare and weaponization.

UNIT 3 AI STANDARDS AND REGULATION

Pre-requisites: Fundamentals of Artificial Intelligence

Model Process for Addressing Ethical Concerns During System Design - Transparency of Autonomous Systems-Data Privacy Process- Algorithmic Bias Considerations - Ontological Standard for Ethically Driven Robotics and Automation Systems.

UNIT 4 ROBOETHICS: SOCIAL AND ETHICAL IMPLICATION OF ROBOTICS

Robot-Roboethics- Ethics and Morality- Moral Theories-Ethics in Science and Technology - Ethical Issues in an ICT Society- Harmonization of Principles- Ethics and Professional Responsibility Roboethics Taxonomy.

UNIT 5 AI AND ETHICS- CHALLENGES AND OPPORTUNITIES

Challenges - Opportunities- ethical issues in artificial intelligence- Societal Issues Concerning the Application of Artificial Intelligence in Medicine- decision-making role in industries-National and International Strategies on AI.

Total: 45 Periods

TEXT BOOKS:

- 1. Y. Eleanor Bird, Jasmin Fox-Skelly, Nicola Jenner, Ruth Larbey, Emma Weitkamp and Alan Winfield," The ethics of artificial intelligence: Issues and initiatives", EPRS | European Parliamentary Research Service Scientific Foresight Unit (STOA) PE 634.452 - March 2020.
- 2. Patrick Lin, Keith Abney, George A Bekey," Robot Ethics: The Ethical and Social Implications of Robotics", The MIT Press- January 2014.

REFERENCES:

- 1. Towards a Code of Ethics for Artificial Intelligence (Artificial Intelligence: Foundations, Theory, and Algorithms) by Paula Boddington, November 2017.
- 2. Mark Coeckelbergh," AI Ethics", The MIT Press Essential Knowledge series, April 2020.

e-RESOURCES:

- 1. https://sci-hub.mksa.top/10.1007/978-3-540-30301-5_65
- 2. https://www.scu.edu/ethics/all-about-ethics/artificial-intelligence-and-ethics-sixteen-challengesand-pportunities/
- 3. https://www.weforum.org/agenda/2016/10/top-10-ethical-issues-in-artificial-intelligence/
- 4. https://sci-hub.mksa.top/10.1159/000492428

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- CO1 Analyze, and reflect on psychological implications in AI applications
- CO2 Illustrate the knowledge of real time application ethics, issues and its challenges.
- CO3 Realize the ethical harms and ethical initiatives in AI
- CO4 Analyze about AI standards and Regulations like AI Agent, Safe Design of Autonomous and Semi-Autonomous Systems
- CO5 Explain the concepts of Robotics and Morality with professional responsibilities.

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	2	-	-	-	1	-	1	-	1	2	3
CO2	3	3	3	2	-	-	-	1	-	1	-	1	2	3
CO3	3	3	3	2	-	-	-	1	-	1	-	1	2	3
CO4	3	3	3	2	-	-	-	1	-	1	-	1	2	3
CO5	3	3	3	2	-	-	-	1	-	1	-	1	2	3

Mapping of COs with POs and PSOs

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Pre-requisites: Python Programming

Preamble

The main aim of this course to outline an overview of exploratory data analysis. To implement data visualization using Matplotlib. To perform univariate data exploration and analysis. To apply bivariate data exploration and analysis. To use Data exploration and visualization techniques for multivariate and time series data.

UNIT 1 EXPLORATORY DATA ANALYSIS

EDA fundamentals – Understanding data science – Significance of EDA – Making sense of data – Comparing EDA with classical and Bayesian analysis – Software tools for EDA - Visual Aids for EDA- Data transformation techniques-merging database, reshaping and pivoting, Transformation techniques.

UNIT 2 EDA USING PYTHON

Data Manipulation using Pandas – Pandas Objects – Data Indexing and Selection – Operating on Data – Handling Missing Data – Hierarchical Indexing – Combining datasets – Concat, Append, Merge and Join – Aggregation and grouping – Pivot Tables – Vectorized String Operations. Case study: Perform EDA on wine Quality Data set.

UNIT 3 UNIVARIATE ANALYSIS

Introduction to Single variable: Distribution Variables - Numerical Summaries of Level and Spread - Scaling and Standardizing – Inequality.

UNIT 4 BIVARIATE ANALYSIS

Relationships between Two Variables - Percentage Tables - Analysing Contingency Tables - Handling Several Batches - Scatterplots and Resistant Lines.

UNIT 5 MULTIVARIATE AND TIME SERIES ANALYSIS

Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tables and Beyond – Fundamentals of TSA – Characteristics of time series data – Data Cleaning – Timebased indexing – Visualizing – Grouping – Resampling. Case study: Perform Time Series Analysis and apply the various Visualization techniques.

Total: 45 Periods

TEXT BOOKS:

- 1. Suresh Kumar Mukhiya, Usman Ahmed, "Hands-On Exploratory Data Analysis with Python", Packt Publishing, 2020.
- 2. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", First Edition, O Reilly, 2017.
- 3. Catherine Marsh, Jane Elliott, "Exploring Data: An Introduction to Data Analysis for Social Scientists", Wiley Publications, 2nd Edition, 2008.

REFERENCES:

- 1. Eric Pimpler, Data Visualization and Exploration with R, GeoSpatial Training service, 2017.
- 2. Claus O. Wilke, "Fundamentals of Data Visualization", O'reilly publications, 2019.

e-RESOURCES:

1. https://analyticsindiamag.com/

- CO1 Explain the concepts of exploratory data analysis and data transformation techniques for merging, reshaping and pivoting using software tools of EDA.
- CO2 Implement the data manipulation, indexing and selection using Panda's Matplotlib for wine quality data set.
- CO3 Apply univariate data exploration and analysis for a given data.
- CO4 Apply bivariate data exploration and analysis for the given scenario.
- CO5 Apply Data exploration and visualization techniques for multivariate and time series data using Pandas.

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	3	2	2	-	1	-	-	-	2	2	3	3
CO2	3	2	3	2	2	-	1	-	-	-	2	2	3	2
CO3	3	2	3	2	2	-	1	-	-	-	2	2	2	2
CO4	3	2	3	2	2	-	1	-	-	-	2	2	2	2
CO5	3	2	3	2	2	-	1	-	-	-	2	2	2	2

Mapping of COs with POs and PSOs

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Preamble

Information Retrieval is part of data science/AI/Data Mining. It deals with retrieving information from data that is stored in systems. An IR system is software that provide access to books, journals and other documents, stores them and manages the document. Web search engines are the most visible IR applications.

UNIT 1 INTRODUCTION

Information Retrieval – Early Developments – The IR Problem – The Users' Task – Information versus Data Retrieval - The IR System – The Software Architecture of the IR System – The Retrieval and Ranking Processes - The Web – The e-Publishing Era – How the web changed Search – Practical Issues on the Web – Components of a Search Engine.

UNIT 2 MODELING AND RETRIEVAL EVALUATION

Basic IR Models - Boolean Model - TF-IDF (Term Frequency/Inverse Document Frequency) Weighting - Vector Model – Probabilistic Model – Latent Semantic Indexing Model – Neural Network Model – Retrieval Evaluation – Retrieval Metrics – Precision and Recall – Reference Collection – User-based Evaluation – Relevance Feedback and Query Expansion – Explicit Relevance Feedback.

UNIT 3 TEXT CLASSIFICATION AND CLUSTERING

A Characterization of Text Classification – Unsupervised Algorithms: Clustering – Naïve Text Classification – Supervised Algorithms – Decision Tree – k-NN Classifier – SVM Classifier – Feature Selection or Dimensionality Reduction – Evaluation metrics – Accuracy and Error – Organizing the classes – Indexing and Searching – Inverted Indexes – Sequential Searching – Multi-dimensional Indexing.

UNIT 4 WEB RETRIEVAL AND WEB CRAWLING

The Web – Search Engine Architectures – Cluster based Architecture – Distributed Architectures – Search Engine Ranking – Link based Ranking – Simple Ranking Functions – Learning to Rank – Evaluations -- Search Engine Ranking – Search Engine User Interaction – Browsing – Applications of a Web Crawler – Taxonomy – Architecture and Implementation – Scheduling Algorithms – Evaluation.

UNIT 5 WEB SEARCH- LINK ANALYSIS AND SPECIALIZED SEARCH

Link Analysis –hubs and authorities – Page Rank and HITS algorithms - Hadoop & Map Reduce – Personalized Search-Collaborative filtering and content-based recommendation of documents and products – handling "invisible" Web-Snippet generation, Summarization, Question Answering, Cross-Lingual Retrieval.

TOTAL: 45 PERIODS

TEXT BOOKS:

- 1. Ricardo Baeza-Yates and Berthier Ribeiro-Neto, —Modern Information Retrieval: The Concepts and Technology behind Search, Second Edition, ACM Press Books, 2011.
- 2. Ricci, F, Rokach, L. Shapira, B.Kantor, —Recommender Systems Handbookl, First Edition, 2011

REFERENCES:

- 1. C. Manning, P. Raghavan, and H. Schütze, —Introduction to Information Retrieval, Cambridge University Press, 2008.
- 2. Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, —Information Retrieval: Implementing and Evaluating Search Engines, The MIT Press, 2010.

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e-RESOURCES:

1. https://cse.iitkgp.ac.in/~pabitra/course/ir06/ir06.html.

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Explain the components and frameworks of IR and its role towards AI and web to fetch relevant information from web resources.
- CO2 Apply suitable information retrieval models for a given web application to retrieve required information efficiently.
- CO3 Apply document text mining techniques in information retrieval to categorize and clustering the information.
- CO4 Analyzewebsearcharchitectureforagivenwebapplicationtocheckoptimizedsearchengine.
- Use Link analysis, Hadoop and Map reduce to evaluate relevant scoring and ranking web CO5 search for quality results.

PO PSO **PSO** COs/POs 7 2 3 4 5 8 9 10 11 12 2 1 6 1 3 3 1 1 1 1 2 2 --_ _ -_ **CO1** 2 2 2 2 3 3 1 1 **CO2** _ _ _ _ _ _ 2 2 2 2 3 3 1 2 **CO3** _ -_ ---3 3 2 2 2 2 2 1 **CO4** ---_ -_ 3 2 2 2 2 2 3 **CO5** 1 _ _ _ _

Mapping of COs with POs and PSOs

Pre-requisites: Deep Learning

Preamble

Text analysis is a machine learning technique used to automatically extract valuable insights from unstructured text data. Companies use text analysis tools to quickly digest online data and documents, and transform them into actionable insights. Speech analysis is the process of analyzing voice recordings or live customer calls to contact centers with speech recognition software to find useful information and provide quality assurance.

UNIT 1 NATURAL LANGUAGE BASICS

Foundations of natural language processing – Language Syntax and Structure- Text Preprocessing and Wrangling – Text tokenization – Stemming – Lemmatization – Removing stop-words – Feature Engineering for Text representation – Bag of Words model- Bag of N-Grams model – TF-IDF model.

UNIT 2 TEXT CLASSIFICATION

Vector Semantics and Embeddings - Word Embeddings - Word2Vec model – Glove model – FastText model – Overview of Deep Learning models – RNN – Transformers – Overview of Text summarization and Topic Models. Case study: Use a transformer for implementing classification.

UNIT 3 QUESTION ANSWERING AND DIALOGUE SYSTEMS

Information retrieval – IR-based question answering – knowledge-based question answering – language models for QA – classic QA models – chatbots – Design of dialogue systems -- evaluating dialogue systems. Case study: Design a chatbot with a simple dialog system.

UNIT 4 TEXT-TO-SPEECH SYNTHESIS

Overview. Text normalization. Letter-to-sound. Prosody, Evaluation. Signal processing - Concatenative and parametric approaches, WaveNet and other deep learning-based TTS systems. Case study: Convert text to speech and find accuracy.

UNIT 5 AUTOMATIC SPEECH RECOGNITION

Speech recognition: Acoustic modelling – Feature Extraction - HMM, HMM-DNN systems. Case study: Design a speech recognition system and find the error rate.

TEXT BOOKS:

- 1. Daniel Jurafsky and James H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", Third Edition, 2022.
- 2. Dipanjan Sarkar, "Text Analytics with Python: A Practical Real-World approach to Gaining Actionable insights from your data", APress,2018

REFERENCES:

- 1. Tanveer Siddiqui, Tiwary U S, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.
- 2. Lawrence Rabiner, Biing-Hwang Juang, B. Yegnanarayana, "Fundamentals of Speech Recognition" 1st Edition, Pearson, 2009.

e-RESOURCES:

- 1. https://nptel.ac.in/courses/106101007," Natural Language Processing", Prof. Pushpak Bhattacharyya, IIT Bombay.
- **2.** https://nptel.ac.in/courses/106105158," Natural Language Processing",Prof. Pawan Goyal, IIT Kharagpur.

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TOTAL: 45 PERIODS

- CO1 Explain existing and emerging deep learning architectures for text and speech processing
- CO2 Classify the features of text documents using text classification algorithms
- CO3 Develop question-answering systems, chatbots and dialogue systems for a given application.
- CO4 Apply deep learning-based text to speech systems to develop a speech synthesizer for a given application.
- CO5 Develop a speech recognition system for a given application using deep learning models.

COs/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	2	2	-	-	-	-	-	-	2	3	3
CO2	3	3	3	2	2	-	-	-	-	-	-	2	3	3
CO3	3	3	3	2	2	-	-	-	-	-	-	2	3	3
CO4	3	3	3	2	2	-	-	-	-	-	-	2	3	3
CO5	3	3	3	2	2	-	-	-	-	-	-	2	3	3

Mapping of COs with POs and PSOs

Pre-requisites: Deep Learning

Preamble

In this course, we will learn about Convolutional Neural Networks (CNNs), which are essential for today's artificial intelligence and deep learning.

UNIT 1 INTRODUCTION TO NEURAL NETWORK

Introduction to Artificial Intelligence, Machine learning, Deep Learning – Neural Networks – Basics of CNN Architecture: Convolution, Pooling, Activations Functions – Convolutional layers:Filters,Strides, Padding – Pooling Layers:Max Pooling, Average Pooling – Activation Functions: ReLU, Sigmoid, Tanh – Loss Functions – Back Propogations in CNNs

UNIT 2 CNN ARCHITECTURE AND MEMORY COMPUTATION

Popular CNN Architectures:LeNet,AlexNet,VGGNet,GoogLenet,ResNet – Understanding Memory Computation in CNNs: Parameter Sharing, Weight Sharing, Receptive Fields – Calculating the number of parameters in CNNs – Trade – offs between model complexity and memory requirements –Efficient Architecture for Memory – Constrained environments.

UNIT 3 TRAINING AND FINE TUNING IN CNN

Loss function for classification tasks: Cross-entrophyloss,Softmax activation – Optimization Algorithms:Stochastic Gradient Descent(SGD),Adam, RMSprop – Regularization techniques:Dropout, Weight decay – Transfer learning and fine-tuning: Using pretrained models, Freezing layers, Adapting to new tasks.

UNIT 4 EVALUATIONPARAMETERS OF CNN

Performance evaluation metrics for classification tasks: Accuracy, Precision, Recall , F1 score – Confusion matrix and its interpretation – Receiver Operating Characteristic (ROC) curve and Area Under the Curve(AUC) – Evaluation metrics for object detection and localization tasks: Intersection over Union(IoU), Mean Average Precision – Handling class imbalance – Evaluation challenges.

UNIT 5 ADVANCED CNN ARCHITECTURES

Convolutional layers with different receptive field sizes: Dilated Convolutions, Atrous Convolutions – Attention Mechanism in CNNs: Self-attention, Spatial attention, Advanced CNN Architectures for specific tasks: Semantic Segmentation, Instance Segmentation and Image captioning.

Total: 45 Periods

TEXT BOOKS:

- 1. Charu C. Aggarwal "Neural Networks and Deep Learning a Textbook" 1st Edition, Springer International Publishing, 2018.
- 2. Hasmik Osipyan, Bosede Edwards, Adrian David Cheok "Deep Neural Network Applications" 1st Edition, CRC Press 2022.
- 3 Ian Goodfellow and YoshuaBengio and Aaron Courville, "Deep Learning" 1st Edition, MIT Press,2016.

REFERENCES:

- 1. Salman Khan, Hossein Rahmani, Syed Afaq Ali Shah, Mohammed Bennamoun, ``A Guide to Convolutional Neural Networks for Computer Vision", Synthesis Lectures on Computer Vision, Morgan & Claypool publishers, 2018.
- 2. James A Freeman, David M S Kapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Addison Wesley, 2003

e-RESOURCES:

- 1. https://www.iitp.ac.in/~shad.pcs15/data/NN-DL.pdf
- 2. https://nptel.ac.in/courses/106106184

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- CO1 Apply Convolution Neural Network in image processing using AI, ML and Deep Learning
- CO2 Analyze CNN architectures for optimizing memory usage in applications.
- CO3 Apply feature-based image alignment, segmentation and motion estimations.
- CO4 Apply advanced techniques for 3D image reconstruction and interpretation.
- CO5 Develop innovative image processing and computer vision applications.

Mapping of COs with POs and PSOs

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO2	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO3	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO4	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO5	3	3	3	2	2	-	-	-	-	-	-	2	2	2

22ADE25

PATTERN RECOGNITION

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Pre-requisites: Nil

Preamble: Pattern recognition is a branch of machine learning that focuses on the recognition of patterns and regularities in data, although it is in some cases considered to be nearly synonymous with machine learning. Recently, Machine Learning has gained great importance for the design of search engines, robots, and sensor systems, and for the processing of large scientific data sets.

UNIT 1 INTRODUCTION

Pattern recognition system — Design cycle — Learning and adaptation Mathematical foundations: Linear algebra— Conditional probability — Expectations, mean and covariance — Gaussian derivatives and integrals — Hypothesis testing

UNIT 2 BAYESIAN DECISION THEORY

Continuous Features — Minimum-Error-Rate classification — Classifiers. discriminant functions and decision surfaces — Normal density — Discrete features — Missing and noisy features — Bayesian belief networks

UNIT 3 MODELS

Maximum Likelihood estimation — Bayesian parameter estimation — Principal component analysis — Expectation-Maximization — Hidden Markov models

UNIT 4 NON-PARAMETRIC TECHNIQUES

Density estimation — Parzen windows — K-Nearest Neighbor estimation — Nearest neighbor rule — Fuzzy classification

UNIT 5 CLUSTERING TECHNIQUES

Unsupervised Bayesian learning — Criterion functions for clustering: Sum-of-Squared-Error — Related minimum variance — Hierarchical clustering: Agglomerative — Step-wise optimal Contact Periods

Total: 45 Periods

TEXT BOOKS:

 Richard O. Duda, P. E. Hart, David G. stork, "pattern Classification", 2nd Edition, JohnWiley,2006

REFERENCES:

- 1. Andrew Webb. "Statistical Pattern Recognition". 2nd Edition. Arnold publishers, London, 1999
- 2. Bishop, Christopher M., "Pattem Recognition and Machine Learning", 1st Edition, Springer, 2009
- 3. S. Theodoridis, K. Koutroumbas, "Pattern Recognition', 4th Edition, Academic Press, 2009

e-RESOURCES:

- 1. <u>http://surl.li/rkphq</u>
- 2. https://nptel.ac.in/courses/117105101
- 3. https://archive.nptel.ac.in/courses/106/106/106106046/

- CO1 Describe pattern recognition and its mathematics fundamentals
- CO2 Realize the pattern recognition process
- CO3 Explain the models of pattern recognition for estimation of parameters
- CO4 Illustrate non-parametric techniques in pattern recognition
- CO5 Recognize unsupervised learning by using clustering techniques

Mapping of COs with POs and PSOs

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	2	-	-	-	-	-	-	-	1	2	2
CO2	3	3	3	2	-	-	-	-	-	-	-	1	2	2
CO3	3	3	3	2	-	-	-	-	-	-	-	1	2	2
CO4	3	3	3	2	-	-	-	-	-	-	-	1	2	2
CO5	3	3	3	2	-	-	-	-	-	-	-	1	2	2

22ADE26

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Pre-requisites: Nil

Preamble: As a branch of data science for business, the growth of predictive and augmented analytics coincides with that of big data systems, where larger, broader pools of data enable increased data mining activities to provide predictive insights.

UNIT 1 INTRODUCTION TO PREDICTIVE ANALYTICS

Overview of Predictive Analytics — Setting up the Problem — Data Understanding — Single Variable —Data Visualization in One Dimension — Data Visualization, Two or Higher Dimensions — The Value of Statistical Significance — Pulling It All Together into a Data Audit

UNIT 2 DATA PREPARATION AND ASSOCIATION RULES

Data Preparation — Variable Cleaning — Feature Creation — Item sets and Association Rules — Terminology — Parameter Settings — How the Data Is Organized — Measures of Interesting Rules — Deploying Association Rules- Problems with Association Rules-Building Classification Rules from Association Rules

UNIT 3 MODELLING

Descriptive Modelling — Data Preparation Issues with Descriptive Modelling— Principal Component Analysis— Clustering Algorithms — Interpreting Descriptive Models— Standard Cluster Model Interpretation

UNIT 4 PREDICTIVE MODELLING

Decision Trees — Logistic Regression — Neural Network Model— K-Nearest Neighbours — Naïve Bayes — Regression Models — Linear Regression — Other Regression Algorithms

UNIT 5 TEXT MINING

Motivation for Text Mining — A Predictive Modelling Approach to Text Mining— Structured vs. Unstructured Data — Why Text Mining Is Hard— Data Preparation Steps — Text Mining Features — Modeling wilh Text Mining Features— Regular Expressions— Case Studies: — Survey Analysis

Total: 45 Periods

TEXT BOOKS:

- 1. Dean Abbott, "Applied Predictive Analytics-principles and Techniques for the Professional Data Analyst', Wiley, 2014
- Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques" 3rd Edition, Elsevier, 2012

REFERENCES:

- 1. Conrad Carlberg. "Predictive Analytics: Microsoft Excel", 1st Edition, Que Publishing, 2012.
- 2 Alberto Cordoba, "understanding the Predictive Analytics Lifecycle", Wiley, 2014
- 3 Anasse Bari, Mohamed Chaouchi, Tommy Jung, Predictive Analytics for Dummies, 2nd Edition, Wiley, 2017.

e-RESOURCES:

1. https://archive.nptel.ac.in/courses/111/106/111106164/

Course Outcomes:

Upon completion of this course, students will be able to:

- CO1 Explain the data understanding and data visualization to analyze the data.
- CO2 Apply data preparation techniques to effectively interpret big data
- CO3 Apply the descriptive models and cluster algorithms to interpret the standard cluster model
- CO4 Explain the principles of predictive analytics and apply them to achieve real, pragmatic solutions.
- CO5 Illustrate the features and applications of text mining

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO2	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO3	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO4	3	3	3	-	-	-	-	-	-	-	-	-	3	3
CO5	3	3	3	-	-	-	-	-	-	-	-	-	3	3

Mapping of COs with POs and PSOs

COGNITIVE SCIENCE

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Pre-requisites: Nil **Preamble**

Information as representation of knowledge is the object of study of an emergent scientific field - Cognitive Science. Increasing applications in Human-centered design, the structural, functional and computational mechanisms of the brain are engaged. Understanding and predicting human behavior will help humans in exerting more control over situations. This will be useful in tackling everyday problems and attaining optimal solutions.

UNIT 1 PHILOSOPHY, PSYCHOLOGY AND NEUROSCIENCE

Philosophy: Mental-physical Relation – From Materialism to Mental Science – Logic and the Sciences of the Mind – Psychology: Place of Psychology within Cognitive Science – Science of Information Processing – Cognitive Neuroscience – Perception – Decision – Learning and Memory – Language Understanding and Processing.

UNIT 2 COMPUTATIONAL INTELLIGENCE

Machines and Cognition – Artificial Intelligence – Architectures of Cognition – Knowledge Based Systems – Logical Representation and Reasoning – Logical Decision Making –Learning – Language – Vision- Case Study on reasoning algorithms

UNIT 3 PROBABILISTIC PROGRAMMING LANGUAGE

WebPPL Language – Syntax – Using Javascript Libraries – Manipulating probability types and distributions – Finding Inference – Exploring random computation – Co-routines: Functions that receive continuations – Enumeration- Case Study on Mathematical functions using WebPPL.

UNIT 4 INFERENCE MODELS OF COGNITION

Generative Models – Conditioning – Causal and statistical dependence – Conditional dependence – Data Analysis – Algorithms for Inference-Case Study on Conditional inference learning model and Generative Model.

UNIT 5 LEARNING MODELS OF COGNITION

Learning as Conditional Inference – Learning with a Language of Thought – Hierarchical Models– Learning (Deep) Continuous Functions – Mixture Models- Case Study on hierarchical model and Mixture model.

TEXT BOOKS:

- 1. Vijay V Raghavan, Venkat N. Gudivada, VenuGovindaraju, C.R. Rao, Cognitive Computing: Theory and Applications: (Handbook of Statistics 35), Elsevier publications, 2016
- 2. Jose Luis Bermúdez, Cognitive Science -An Introduction to the Science of the Mind, Cambridge University Press 2020.

REFERENCES:

- 1. Judith Hurwitz, Marcia Kaufman, Adrian Bowles, Cognitive Computing and Big Data Analytics, Wiley Publications, 2015
- 2. Robert A. Wilson, Frank C. Keil, "The MIT Encyclopedia of the Cognitive Sciences", The MIT Press, 1999.

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Total: 45 Periods

e-RESOURCES:

- https://onlinecourses.nptel.ac.in/noc20_hs29/preview, "Introduction to Cognitive Psychology", By Prof. Naveen Kashyap, IIT Guwahati.
- https://onlinecourses.nptel.ac.in/noc22_ee122/preview, "Cognition and its computation", Prof. Sharba Bandyopadhyay and Prof. Rajlakshmi Guha, IIT- Kharagpur.

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Explain the underlying theory behind cognition from materialism to mental Science.
- CO2 Apply suitable Logical Representation and Reasoning to the cognition elements computationally
- CO3 Implementing mathematical functions through WebPPL by using probabilistic programming language.
- CO4 Develop applications using cognitive inference model and generative models for interactions
- CO5 Develop applications using cognitive learning model using hierarchical and mixture Models to learn new things faster.

	PO	РО	PO	РО	PSO	PSO								
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
C01	3	3	3	2	2	-	-	-	-	-	-	1	3	3
CO2	3	3	3	2	2	-	-	-	-	-	-	1	3	3
CO3	3	3	3	2	2	-	-	-	-	-	-	1	3	3
CO4	3	3	3	2	2	-	-	-	-	-	-	1	3	2
CO5	3	3	3	2	2	-	-	-	-	-	-	1	3	2

Mapping of COs with POs and PSOs

Pre-requisites: NIL

Preamble

This course enables the students to learn and understand health data formats, frameworks and work with clinical prediction models.

UNIT 1 INTRODUCTION TO HEALTHCARE ANALYSIS

Overview - History of Healthcare Analysis Parameters on medical care systems- Health care policy-Standardized code sets – Data Formats – Machine Learning Foundations: Tree Like reasoning, Probabilistic reasoning and Bayes Theorem, Weighted sum approach.

UNIT 2 ANALYTICS ON MACHINE LEARNING

Machine Learning Pipeline – Pre-processing –Visualization – Feature Selection – Training model parameter – Evaluation model: Sensitivity, Specificity, PPV, NPV, FPR, Accuracy, ROC, Precision Recall Curves, Valued target variables –Python: Variables and types, Data Structures and containers, Pandas Data Frame: Operations – Scikit –Learn: Pre-processing, Feature Selection.

UNIT 3 HEALTH CARE MANAGEMENT

IOT- Smart Sensors – Migration of Healthcare Relational database to NoSQL Cloud Database – Decision Support System – Matrix block Cipher System – Semantic Framework Analysis – Histogram bin Shifting and Rc6 Encryption – Clinical Prediction Models – Visual Analytics for Healthcare.

UNIT 4 HEALTHCARE AND DEEP LEARNING

Introduction on Deep Learning – DFF network CNN- RNN for Sequences – Biomedical Image and Signal Analysis – Natural Language Processing and Data Mining for Clinical Data – Mobile Imaging and Analytics – Clinical Decision Support System.

UNIT 5 CASE STUDIES

Predicting Mortality for cardiology Practice –Smart Ambulance System using IOT –Hospital Acquired Conditions (HAC) program- Healthcare and Emerging Technologies – ECG Data Analysis.

TEXT BOOKS:

1. Chandan K.Reddy, Charu C. Aggarwal, "Health Care data Analysis", First edition, CRC, 2015.

- 2. Vikas Kumar, "Health Care Analysis Made Simple", Packt Publishing, 2018.
- 3. Nilanjan Dey, Amira Ashour, Simon James Fong, Chintan Bhatl, "Health Care Data Analysis and Management, First Edition, Academic Press, 2018.

REFERENCES:

1. Hui Jang, Eva K.Lee, "HealthCare Analysis : From Data to Knowledge to Healthcare Improvement", First Edition, Wiley, 2016.

2. Kulkarni, Siarry, Singh, Abraham, Zhang, Zomaya, Baki, "Big Data Analytics in HealthCare", Springer, 2020.

e-RESOURCES:

- 1. http://www.coursera.org/in/articles/healthcare-analytics
- 2. http://www.kaggle.com/code/srikarkashyap/analyzing-healthcare-data-tutorial

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Total: 45 Periods

- CO1 Use machine learning and deep learning algorithms for health data analysis.
- CO2 Apply the data management techniques for healthcare data.
- CO3 Evaluate the need of healthcare data analysis in e-healthcare, telemedicine and other critical care applications.
- CO4 Design health data analytics for real time applications.
- CO5 Design emergency care system using health data analysis.

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	3	3	-	-	-	-	1	-	1	3	2
CO2	3	3	3	3	3	-	-	-	-	1	-	1	3	2
CO3	3	3	3	3	3	-	-	-	-	1	-	1	3	2
CO4	3	3	3	3	3	-	-	-	-	1	-	1	3	2
CO5	3	3	3	3	3	-	-	-	-	1	-	1	3	2

Mapping of COs with POs and PSOs

22ADE31

CLOUD COMPUTING

Pre-requisites: Computer Networks

Preamble: Cloud computing involves delivering different types of services over the Internet. From software and analytics to secure and safe data storage and networking resources, everything can be delivered via the cloud. It became a hot issue for its advantages such as "reduce costs", "increase business flexibility" and/or "provide business continuity". Nowadays, all of the legacy systems are being moved to the cloud platform and its demand is increasing day by day. In future, all web or mobile applications will be available on the cloud.

UNIT 1 UNDERSTANDING CLOUD COMPUTING

Origins and Influences–Basic Concepts and Terminology – Goals and Benefits–Risks and Challenges– Roles and Boundaries– Cloud Characteristics–Cloud Delivery Models: IaaS, PaaS, SaaS – Cloud Deployment Models: Public, Private, Community, Hybrid Clouds.

UNIT 2 CLOUD ENABLING TECHNOLOGY

Data Center Technology – Virtualization Technology– Web Technology– Multitenant Technology– Service Technology– Case study: VM installation and deployment.

UNIT 3 CLOUD COMPUTING MECHANISM

Cloud Infrastructure Mechanism: Cloud Storage, Cloud Usage Monitor, Resource Replication – Specialized Cloud Mechanism: Load Balancer, SLA Monitor, Pay-per-use Monitor, Audit Monitor, Failover System, Hypervisor, Resource Cluster, Multi Device Broker, State Management Database – Cloud Management Mechanism: Remote Administration System, Resource Management System, SLA Management System, Billing Management System.

UNIT 4 CLOUD COMPUTING ARCHITECTURE

Fundamental Cloud Architectures: Workload Distribution Architecture– Resource Pooling Architecture– Dynamic Scalability Architecture– Elastic Resource Capacity Architecture– Service Load Balancing Architecture– Cloud Bursting Architecture – Elastic Disk Provisioning Architecture– Redundant Storage Architecture– Advanced Cloud Architectures: Hypervisor Clustering Architecture– Load Balanced Virtual Server Instances Architecture– Dynamic Failure Detection and Recovery Architecture – Case Study : AWS, Microsoft Azure.

UNIT 5 BASIC SECURIOTY IN CLOUD

Basic Terms and Concepts – Threat Agents – Cloud Security Threats – Cloud Security Mechanism: Encryption, Hashing, Digital Signature, Public Key Infrastructure, Identity and Access Management, Single Sign-on, Cloud Based Security Groups, Hardened Virtual Server Images – Case study examples.

Total: 45 Periods

TEXT BOOKS:

- 1. Thomas Erl, ZaighamMahood, Ricardo Puttini, "Cloud Computing, Concept, Technology and Architecture", Prentice Hall, 2013.
- 2. K.Chandrasekaran, "Essentials of Cloud Computing", CRC Press, 2015.

REFERENCES:

- 1. Kai Hwang, Geoffrey C Fox, Jack J.Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
- 2. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, —Mastering Cloud Computingl, Tata McGraw-Hill, 2013.

e RESOURCES

1. https://nptel.ac.in/courses/106/105/106105223/, "Google Cloud Computing Foundation Course", Prof. Soumya Kanti Ghosh, IIT Kharagpur.

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- CO1 Analyze and identify a specific cloud deployment model and delivery model to adopt for any given cloud application.
- CO2 Discuss the role of data center, virtualization, web, multitenant and service technologies in providing resilient, elastic and cost-efficient computing for a given cloud system.
- CO3 Assess and identify the required cloud computing mechanisms to deploy in cloud architectures when developing a given cloud application.
- CO4 Compare and evaluate the ability of cloud computing architectures to meet a set of requirements for a given business application.
- CO5 Choose suitable security mechanism to provide security for a given cloud application.

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	1	-	1	1	1	1	-	-	-	1	1	3
CO2	3	3	1	-	1	1	1	-	-	-	-	1	1	3
CO3	3	3	1	-	1	1	1	-	-	-	2	1	1	3
CO4	3	3	1	1	1	1	1	-	-	-	2	1	1	3
CO5	3	3	1	1	1	1	1	1	-	-	2	1	1	3

Mapping of COs with POs and PSOs

APP DEVELOPMENT

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Pre-requisites: NIL

Preamble

To learn development of native applications with basic GUI Components. To develop cross-platform applications with event handling. To develop applications with location and data storage capabilities.

UNIT 1 FUNDAMENTALS OF MOBILE & WEB APPLICATION DEVELOPMENT

Basics of Web and Mobile application development-Native App-Hybrid App- Cross-platform App-What is Progressive Web App-Responsive Web design.

UNIT 2 NATIVE APP DEVELOPMENT USING JAVA

Native Web App- Benefits of Native App- Scenarios to create Native App- Tools for creating NativeApp-Cons of Native App, Popular Native App Development Frameworks- Java & Kotlin for Android- Swift & Objective-C for iOS, Basics of React Native- Native Components, JSX, State, Props.

UNIT 3 HYBRID APP DEVELOPMENT

Hybrid Web App- Benefits of Hybrid App- Criteria for creating Native App- Tools for creating Hybrid App- Cons of Hybrid App- Popular Hybrid App Development Frameworks- Ionic, Apache Cordova.

UNIT 4 CROSS-PLATFORM APP DEVELOPMENT USING REACT-NATIVE

What is Cross-platform App- Benefits of Cross-platform App- Criteria for creating Cross-platform App-Tools for creating Cross-platform App- Cons of Cross-platform App- Popular Crossplatform App Development Frameworks- Flutter- Xamarin, React-Native- Basics of React Native- Native Components-JSX, State, Props.

UNIT 5 NON-FUNCTIONAL CHARACTERISTICS OF APP FRAMEWORKS

Comparison of different App frameworks- Build Performance- App Performance- Debugging Capabilities- Time to Market- Maintainability- Ease of Development- UI/UX- Reusability.

Total: 45 Periods

TEXT BOOKS:

- 1. Dawn Griffiths, "Head First Android Development", O'Reilly, 1st edition.
- 2. Anthony Accomazzo, HousseinDjirdeh, Sophia Shoemaker, Devin Abbott, "Full Stack React
- ^{2.} Native: Create beautiful mobile apps with JavaScript and React Native", FullStack publishing.
- 3. Raymond K. Camdent, "Apache Cordova in Action", Manning. 2015.

REFERENCES:

- 1. Android Programming for Beginners, John Horton, Packt Publishing, 2nd Edition.
- 2. Native Mobile Development by Shaun Lewis, Mike Dunn.
- 3. Apache Cordova 4 Programming, John M Wargo, 2015
- 4. Building Cross-Platform Mobile and Web Apps for Engineers and Scientists: An Active
- ⁺. Learning Approach, Pawan Lingras, Matt Triff, Rucha Lingras.

e-RESOURCES:

1. https://developer.android.com/guide/topics/resources/providing-resources

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Describe the Native applications with GUI Components.
- CO2 Interpret hybrid applications with basic event handling.
- CO3 Apply the cross-platform applications with location and data storage capabilities.
- CO4 Apply cross platform applications with basic GUI and event handling.
- CO5 Apply the web applications with cloud database access.

Mapping of COs with POs and PSOs

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1	1	1	2	-	-	-	1	-	-	1	1	-
CO2	3	2	2	2	3	-	-	-	1	-	-	1	1	-
CO3	3	2	2	2	3	-	-	-	1	-	-	1	1	-
CO4	3	2	2	2	3	-	-	-	1	-	-	1	1	-
CO5	3	2	2	2	3	-	-	-	1	-	-	1	1	-

UI/UX DESIGN

Pre-requisites: Nil

Preamble

The course UI/UX Design introduces a sound knowledge in UI & UX to understand the need for UI and UX, the various Research Methods used in Design, explore the various Tools used in UI & UX and Creating a wireframe and prototype.

UNIT 1 FOUNDATIONS OF DESIGN

UI vs. Design - Core Stages of Design Thinking - Divergent and Convergent Thinking - Brainstorming and Game storming - Observational Empathy.

UNIT 2 FOUNDATIONS OF UI DESIGN

Visual and UI Principles - UI Elements and Patterns - Interaction Behaviors and Principles – Branding - Style Guides.

UNIT 3 FOUNDATIONS OF UX DESIGN

Introduction to User Experience - About User Experience - UX Design Process and its Methodology - Research in User Experience Design - Tools and Method used for Research - User Needs -Business Goals.

UNIT 4 WIREFRAMING, PROTOTYPING AND TESTING

Sketching Principles - Sketching Red Routes - Responsive Design – Wireframing - Creating Wireflows -Building a Prototype - Building High-Fidelity Mockups - Designing Efficiently with Tools - Interaction Patterns - Conducting Usability Tests - Other Evaluative User Research Methods - Synthesizing Test Findings - Prototype Iteration.

UNIT 5RESEARCH, DESIGNING, IDEATING, & INFORMATION ARCHITECTURE9

Identifying and Writing Problem Statements - Identifying Appropriate Research Methods - Creating Personas - Solution Ideation - Creating User Stories - Creating Scenarios - Flow Diagrams - Flow Mapping - Information Architecture.

Total: 45 Periods

TEXT BOOKS:

- 1. Joel Marsh, "UX for Beginners", O'Reilly, 2022.
- 2. Jon Yablonski, "Laws of UX using Psychology to Design Better Product & Services" O'Reilly 2021.

REFERENCES:

- 1. Jenifer Tidwell, Charles Brewer, Aynne Valencia, "Designing Interface" 3rd Edition, O'Reilly 2020.
- 2. Steve Schoger, Adam Wathan "Refactoring UI", 2018.

e-RESOURCES:

- 1. https://www.nngroup.com/articles/
- 2. https://www.interaction-design.org/literature

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Build user interfaces for user applications using divergent and convergent thinking.
- CO2 Design user interface with necessary elements and patterns for user applications using UI style guides.
- CO3 Evaluate UX design skills and design Process and its Methodology in product development.
- CO4 Implement Sketching principles in responsive design for user interface.
- CO5 Design user research methods of Personas, Solution Ideation, Scenarios using UI and UX.

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Mapping of COs with POs and PSOs

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	2	2	-	1	-	-	-	2	1	3	-
CO2	3	3	3	2	2	-	1	-	-	-	2	1	3	-
CO3	3	3	3	2	2	-	1	-	-	-	2	1	3	-
CO4	3	3	3	2	2	-	1	-	-	-	2	1	3	-
CO5	3	3	3	2	2	-	1	-	-	-	2	1	3	-

Pre-requisites: Java Programming Preamble

This course offers a comprehensive overview of full-stack web development, covering essential technologies and frameworks used in modern web applications.

UNIT 1 BASICS OF FULL STACK

Web Development Framework — User — Browser — Webserver — Backend Services — MVC Architecture — Understanding the different stacks —The role of Express — Angular —Node — Mongo DB — React

UNIT 2 NODE JS

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Node JS — Installation — Working with Node packages — Using Node package manager — Web Development with Node — Using Events — Listeners — Timers — Callbacks — Handling Data 1/0 — HTTP implementation services in Node.js.

UNIT 3 MONGO DB

NoSQL and MongoDB — Building MongoDB Environment — User accounts — Access control — Administering databases — Managing collections — Connecting to MongoDB from Node.js —simple applications.

UNIT 4 EXPRESS AND ANGULAR

Express in Node.js implementation— Configuring routes — Using Request and Response objects — Angular — Typescript — Angular Components — Expressions — Data binding — Built in directives.

UNIT 5 REACT

MERN STACK - Basic React applications - React Components - React state - Express REST APIs — Modularization and Webpack — Routing with React Router — Server—side rendering.

TEXT BOOKS:

- 1. Node.js, MongoDB and Angular Web Development, Brad Dayley. Brendan Dayley. Caleb Dayley, 2nd Edition, Pearson Education, Inc., 2018
- 2. Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React and Node, Vasan Subramanian, Apress, 2017

REFERENCES:

- 1. Chris Northwood, "The Full Stack Developer. Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer", Apress; 1M edition (19 November 2018)
- 2 KirupaChinnathambi . "Learning React: A Hands—On Guide to Building Web Applications Using React and Redux", 200 editions. Addison—Wesley Professional, (26 April 2018).
- 3. Shannon Bradshaw, Eoin Brazil, Kristina Chodorow, "MongoDB: The Definitive Guide: Powerful and Scalable Data Storage-. Edition, O'Reilly publication. December.31. 2019.

e-RESOURCES:

1. https://nptel.ac.in/courses/106106156

Course Outcomes: Upon completion of this course, students will be able to:

- $CO1 \quad \text{Apply full-stack technologies to develop web applications.}$
- CO2 Create a web application Using Node.js
- CO3 Develop an application using MongoDB as backend process
- CO4 Build a simple web application with express and Angular
- CO5 Design a single page application using React.

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Total: 45 Periods

Mapping of COs with POs and PSOs

Cos/POs	PO	PSO	PSO											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	3	3	-	-	-	-	-	-	2	3	-
CO2	3	3	2	3	3	-	-	-	-	-	-	3	3	-
CO3	3	3	2	3	3	-	-	-	-	-	-	3	3	-
CO4	3	3	2	3	3	-	-	-	-	-	-	3	3	-
CO5	3	3	2	3	3	-	-	-	-	-	-	3	3	-

Pre-requisites: Nil

Preamble

This course enables the student to understand the XML fundamental concepts, its usage in data exchanges, XML related technologies, protocols and find out way to communicate with databases. This course makes the students to define "service" and "architecture" and establishes a strong understanding of the concepts needed to have an effective working knowledge of SOA methodologies, modeling, design, SOA technologies, orchestration and architectural frameworks.

UNIT 1 INTRODUCTION TO XML

XML document structure – Well-formed and valid documents – Name spaces – DTD – XML Schema – X-Files-Case study: XML Vocabulary.

UNIT 2 BUILDING XML- BASED APPLICATIONS

Parsing XML – using DOM, SAX – XML Transformation and XSL – XSL Formatting – Modeling Databases in XML-Case study: Raw AJAX.

UNIT 3 SERVICE ORIENTED ARCHITECTURES

Characteristics of SOA, Comparing SOA with Client-Server, Distributed Internet architectures – Benefits of SOA – Anatomy of SOA - Principles of Service orientation.

UNIT 4 WEB SERVICES

Service descriptions – WSDL – Messaging with SOAP – Service discovery – Message Exchange Patterns-Orchestration – Choreography – Service layers - WS Transactions – Web Services Enhancements.

UNIT 5 BUILDING SOA-BASED APPLICATIONS

Service Oriented Analysis and Design – Service Modeling – WS-BPEL – WS-Coordination – WS-Policy-WS-Security – SOA support in J2EE.

TEXT BOOKS:

- Guy Harrison, Next Generation Database: NoSQL and big data, Apress.
 Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence,
- 2. Wiley Publications,1st Edition ,2019.

REFERENCES:

- 1. Christopher D.manning, Prabhakar Raghavan, Hinrich Schutze, An introduction to Information Retrieval, Cambridge University Press
- 2. Daniel Abadi, Peter Boncz and Stavros Harizopoulas, The Design and Implementation of Modern Column-Oriented Database Systems, Now Publishers.

e-RESOURCES:

- 1. https://www.ibm.com/cloud/learn/nosql-databases
- 2. https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp
- 3. https://www.geeksforgeeks.org/introduction-to-nosql/
- 4. https://www.javatpoint.com/nosql-databa

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Total: 45 Periods

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Course Outcomes:

Upon completion of this course, students will be able to:

- CO1 Create a valid and well-formed XML document for web-based data entities using XML schema and DTD.
- CO2 Develop an XML application with a database using SAX and XSL Technologies.
- CO3 Compare the characteristics, benefits, service orientation principles of SOA with the components of Distributed system for a given applicationframework.
- CO4 Construct web service architecture using WSDL, SOAP and UDDI for businessapplications.
- CO5 Discuss the web service specification like WS-BPEL, WS-Coordination, WS-Policy, and WS-Security to build secure vs interaction SOA basedapplications.

Cos/POs	PO	PSO	PSO											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
C01	3	3	3	2	2	-	-	-	1	-	2	3	2	1
CO2	3	2	2	2	2	-	-	-	1	-	2	2	2	2
CO3	3	3	3	2	2	-	-	-	1	-	2	3	2	2
CO4	3	3	3	2	2	-	-	-	1	-	2	3	2	2
CO5	3	2	2	2	2	2	-	-	1	-	2	2	3	2

Mapping of COs with POs and PSOs

22ADE36

Pre-requisites: Nil

Preamble

This course enables the learner to understand the basics of software testing. Which addresses how to do the testing and planning. It teaches to build test cases and execute them. To focus on wide aspects of testing and understanding multiple facets of testing and also to get an insight about test automation and the tools used for test automation.

UNIT 1 FOUNDATIONS OF SOFTWARE TESTING

Introduction of software testing, Black-Box Testing and White-Box Testing, Software Testing Life Cycle, V-model of Software Testing, Program Correctness and Verification, Reliability versus Safety, Failures, Errors and Faults (Defects), Software Testing Principles, Program Inspections, Stages of Testing: Unit Testing, Integration Testing, System Testing.

UNIT 2 TEST PLANNING

The Goal of Test Planning, High Level Expectations, Intergroup Responsibilities, Test Phases, Test Strategy, Resource Requirements, Tester Assignments, Test Schedule, Test Cases, Bug Reporting, Metrics and Statistics.

UNIT 3 TEST DESIGN AND EXECUTION

Test Objective Identification, Test Design Factors, Requirement identification, Testable Requirements, Modeling a Test Design Process, Modeling Test Results, Boundary Value Testing, Equivalence Class Testing, Path Testing, Data Flow Testing, Test Design Preparedness Metrics, Test Case Design Effectiveness, Model-Driven Test Design, Test Procedures, Test Case Organization and Tracking, Bug Reporting, Bug Life Cycle.

UNIT 4 ADVANCED TESTING CONCEPTS

Performance Testing: Load Testing, Stress Testing, Volume Testing, Fail-Over Testing, Recovery Testing, Configuration Testing, Compatibility Testing, Usability Testing, Testing the Documentation, Security testing, testing in the Agile Environment, Testing Web and Mobile Applications.

UNIT 5 TEST AUTOMATION AND TOOLS

Automated Software Testing, Automate Testing of Web Applications, Selenium: Introducing Web Driver and Web Elements, Locating Web Elements, Actions on Web Elements, Different Web Drivers, Understanding Web Driver Events, Testing: Understanding Testing.xml, Adding Classes, Packages, Methods to Test, Test Reports.

TEXT BOOKS:

- 1. Yogesh Singh, "Software Testing", Cambridge University Press, 2012
- 2. UnmeshGundecha, Satya Avasarala, "Selenium WebDriver 3 Practical Guide" Second Edition 2018

REFERENCES:

- Glenford J. Myers, Corey Sandler, Tom Badgett, The Art of Software Testing, 3rd Edition, 2012, John Wiley & Sons, Inc.
- 2. Ron Patton, Software testing, 2nd Edition, 2006, Sams Publishing
- 3. Paul C. Jorgensen, Software Testing: A Craftsman's Approach, Fourth Edition, 2014, Taylor & Francis Group.
- 4. Carl Cocchiaro, Selenium Framework Design in Data-Driven Testing, 2018, Packt Publishing.

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Total: 45 Periods

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e-RESOURCES:

- 1. https://onlinecourses.nptel.ac.in/noc22_cs61/preview
- 2. https://onlinecourses.nptel.ac.in/noc23_cs38/preview

Course Outcomes:

Upon completion of this course, students will be able to:

- CO1 Realize the basic concepts of software testing and the need for software testing
- CO2 Interpret Test planning and formulate different activities involved in test planning
- CO3 Create effective test cases that can uncover critical defects in the application
- CO4 Evaluate advanced types of testing Concepts
- CO5 Develop automation in software testing using Selenium

Cos/POs	PO	PSO	PSO											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	2	1	-	-	-	-	-	2	3	1	2
CO2	3	3	3	2	1	-	-	-	-	-	2	3	1	2
CO3	3	3	3	2	1	-	-	-	-	-	2	3	1	2
CO4	3	3	3	2	1	-	-	-	-	-	2	3	1	2
CO5	3	3	3	2	1	-	-	-	-	-	2	3	1	2

Mapping of COs with POs and PSOs

Pre-requisites: Python Programming Preamble

Python Web Development is designed to enrich the knowledge of different Web based Python Frameworks and covered Python fundamentals including OOPS concepts. The course has been designed for both the Frontend and Back-end development processes. SQL is also covered to connect our application with the Database.

UNIT 1 INTRODUCTION TO PYTHON

Python interpreter – Revisiting Python List & Dictionary – Classes and Objects – Decorators – Regular Expression.

UNIT 2 WEB TECHNOLOGIES

Understanding web servers and web clients - HTML Tags - CSS Classes - Using JavaScript&JQuery - Front-end framework: Bootstrap and Materialize CSS - Responsive Grid Design.

UNIT 3 DJANGO FRAMEWORK

Introduction To Django - Django App Architecture - Django Models - Django Admin - Django Urls - Django Views - Django Orm&Querysets - Django Forms - Django Users & Auth - Django Templates & Static Files - Django Tests & Exceptions - Django Security & Web Application Tools.

UNIT 4 DATABASES

CRUD Operations in Sqlite3 - CRUD Operations in MySQL/MariaDB - CRUD Operations in PostgreSQL - CRUD Operations in MongoDB - CRUD Operations in Neo4j.

UNIT 5 DJANGO REST API FRAMEWORK

Introduction to Rest API - Working with JSON files - Serialization - Routers - Class based views - API Permissions API request methods - Understating response objects and headers Using CURL - Using Postman - Creating API endpoints in Django web application.

Total:45 Periods

TEXT BOOKS:

- 1. Fabrizio Romano, Gaston C. Hillar, Arun Ravindran, "Learn Web Development with Python", Packt Publishing 1st edition 2018
- 2. AidasBendoraitis, Jake Kronika, "Django 3 Web Development", Packt Publishing 4th edition 2020)

REFERENCES:

- 1 Gaston C. Hillar, "Django RESTful Web Services", Packt Publishing 1st edition 2018
- 2 Eric Matthes, "Python Crash course", Third Edition, No Starch Press, 2023.

e-RESOURCES:

- 1. https://www.educative.io/blog/web-development-in-python
- 2. https://realpython.com/learning-paths/become-python-web-developer/

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Develop a Python program using modules and packages to solve Python code in real-time, facilitating rapid prototyping, experimentation, and learning.
- CO2 Develop a Web page using HTML, CSS, JavaScript Concepts.
- CO3 Build a Django application using Web application tools.
- CO4 Develop CRUD Operations in Database for managing data in database system.
- CO5 Design and develop Django Web application with hands-on.

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Mapping of COs with POs and PSOs

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	2	-	-	-	-	-	2	1	3	3
CO2	3	3	3	2	2	-	-	-	-	-	2	1	3	3
CO3	3	3	3	2	2	-	-	-	-	-	2	1	3	3
CO4	3	3	3	2	2	-	-	-	-	-	2	1	3	3
CO5	3	3	3	2	2	-	-	-	-	-	2	1	3	3
Pre-requisites: NIL

22ADE38

Preamble: The main objective of this course is to introduce DevOps terminology, definition & concepts and to understand the concepts of Continuous Integration/ Continuous Testing/ Continuous Deployment, also llustrate the benefits and drive the adoption of cloud-based Devops tools to solve real world problems.

UNIT 1 INTRODUCTION TO DEVOPS

Devops Essentials - Introduction To AWS, GCP, Azure - Version control systems: Git and Github.

UNIT 2 COMPILE AND BUILD USING MAVEN & GRADLE

Introduction, Installation of Maven, POM files, Maven Build lifecycle, build phases (compile build, test, package) Maven Profiles, Maven repositories (local, central, global), Maven plugins, Maven create and build Artificats, Dependency management, Installation of Gradle, understand build using Gradle.

UNIT 3 CONTINUOUS INTEGRATION USING JENKINS

Install & Configure Jenkins, Jenkins Architecture Overview, creating a Jenkins Job, configuring a Jenkins job, Introduction to Plugins, Adding Plugins to Jenkins, commonly used plugins (Git Plugin, Parameter Plugin, HTML Publisher, Copy Artifact and Extended choice parameters). Configuring Jenkins to work with java, Git and Maven, creating a Jenkins Build and Jenkins workspace.

UNIT 4 CONFIGURATION MANAGEMENT USING ANSIBLE

Ansible Introduction, Installation, Ansible master/slave configuration, YAML basics, Ansible modules, Ansible Inventory files, Ansible playbooks, Ansible Roles, adhoc commands in ansible.

UNIT 5 BUILDING DEVOPS PIPELINES USING AZURE

Create Github Account, Create Repository, Create Azure Organization, create a new pipeline, build a sample code, Modify azure-pipelines.yaml file.

Total: 45 Periods

TEXT BOOKS:

- 1. Roberto Vormittag, "A Practical Guide to Git and GitHub for Windows Users: From Beginner to Expert in Easy Step-By-Step Exercises", Second Edition, Kindle Edition, 2016.
- 2. Jason Cannon, "Linux for Beginners: An Introduction to the Linux Operating System and Command Line", Kindle Edition, 2014.

REFERENCES:

- 1. Hands-On Azure Devops: Cicd Implementation for Mobile, Hybrid, And Web Applications Using Azure Devops and Microsoft Azure: CICD Implementation for ... DevOps and Microsoft Azure (English Edition) Paperback 1 January 2020.
- 2. Jeff Geerling, "Ansible for DevOps: Server and configuration management for humans", First Edition, 2015.
- 3. David Johnson, "Ansible for DevOps: Everything You Need to Know to Use Ansible for DevOps", Second Edition, 2016.
- 4. https://www.jenkins.io/user-handbook.pdf

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e-RESOURCES:

- 1. https://www.jenkins.io/user-handbook.pdf
- 2. https://maven.apache.org/guides/getting-started/

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Explain different actions performed through Version control tools like Git.
- CO2 Perform Continuous Integration and Continuous Testing and Continuous Deployment using Jenkins by building and automating test cases using Maven & Gradle.
- CO3 Perform Automated Continuous Deployment to production environments
- CO4 Implement master/slave configuration and adhoc commands using Ansible.
- CO5 Explain the Cloud-based DevOps tools using Azure DevOps.

	PO	PSO	PSO											
COS/POS	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	2	-	-	-	-	-	1	-	2	3	3
CO2	3	3	3	2	-	-	-	-	-	1	-	2	3	3
CO3	3	3	3	2	-	-	-	-	-	1	-	2	3	3
CO4	3	3	3	2	-	-	-	-	-	1	-	2	3	3
CO5	3	3	3	2	-	-	-	-	-	1	-	2	3	3

Mapping of COs with POs and PSOs

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Pre-requisites: Computer Networks

Preamble:

Learn the basics and types of Virtualizations and easy understand the Hypervisors and its types it helps to Explore the Virtualization Solutions which can be Experiment the virtualization platforms.

UNIT 1 INTRODUCTION TO VIRTUALIZATION

Virtualization and cloud computing - Need of virtualization – cost, administration, fast deployment, reduce infrastructure cost – limitations- Types of hardware virtualization: Full virtualization - partial virtualization - Paravirtualization-Types of Hypervisors

UNIT 2 SERVER AND DESKTOP VIRTUALIZATION

Virtual machine basics- Types of virtual machines- Understanding Server Virtualization- types of server virtualization- Business Cases for Server Virtualization – Uses of Virtual Server Consolidation – Selecting Server Virtualization Platform-Desktop Virtualization-Types of Desktop Virtualization

UNIT 3 NETWORK VIRTUALIZATION

Introduction to Network Virtualization-Advantages- Functions-Tools for Network Virtualization- VLAN-WAN Architecture-WAN Virtualization

UNIT 4 STORAGE VIRTUALIZATION

Memory Virtualization-Types of Storage Virtualization-Block, File-Address space Remapping-Risks of Storage Virtualization-SAN-NAS-RAID

UNIT 5 VIRTUALIZATION TOOLS

VMWare-Amazon AWS-Microsoft HyperV- Oracle VM Virtual Box - IBM PowerVM- Google Virtualization- Case study

TEXT BOOKS:

- 1. Cloud computing a practical approach Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi 2010
- 2. Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011.
- 3. David Marshall, Wade A. Reynolds, Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center, Auerbach

REFERENCES:

- 1. ChrisWolf, ErickM. Halter, "Virtualization: From the Desktop to the Enterprise", APress, 2005
- 2. James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.

e-RESOURCES:

1. https://www.mygreatlearning.com/blog/virtualization-in-cloud-computing/

Course Outcomes: Upon completion of this course, students will be able to

- CO1 Discuss the virtualization concepts and Hypervisor to provide greater IT mobility
- CO2 Apply the Virtualization for real-world applications to mask server resources from server users.
- CO3 Install &configure the different VM platforms to achieve major advances in speed, agility, and security
- CO4 Experiment with the VM with various software helps to achieve location independence by abstracting the physical location of the data.
- CO5 Create virtualization for real-world applications to increase the performance.

Total: 45 Periods

Mapping of COs with POs and PSOs

COsPOs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	-	-	-	-	-	-	-	1	-	3
CO2	3	3	2	2	-	-	-	-	-	-	-	1	-	3
CO3	3	3	3	2	1	-	-	-	-	-	-	1	1	3
CO4	3	3	3	2	1	-	-	-	-	-	2	1	1	3
CO5	3	3	3	2	1	-	-	-	-	-	2	1	1	3

STREAM PROCESSING

L T P C 3 0 0 3

Pre-requisites: Nil **Preamble**

Introduce Data Processing terminology, definition & amp; concepts. Define different types of Data Processing. Explain the concepts of Real-time Data processing Select appropriate structures for designing and running real-time data services in a business environment Illustrate the benefits and drive the adoption of real-time data services to solve real world problems

UNIT 1 FOUNDATIONS OF DATA SYSTEMS

Introduction to Data Processing, Stages of Data processing, Data Analytics, Batch Processing, Stream processing, Data Migration, Transactional Data processing, Data Mining, Data Management Strategy, Storage, Processing, Integration, Analytics, Benefits of Data as a Service, Challenges. Case Study : Design and Implement Simple application using MongoDB.

UNIT 2 REAL-TIME DATA PROCESSING

Introduction to Big data, Big data infrastructure, Real-time Analytics, Near real-time solution, Lambda architecture, Kappa Architecture, Stream Processing, Understanding Data Streams, Message Broker, Stream Processor, Batch & amp; Real-time ETL tools, Streaming Data Storage.

UNIT 3 DATA MODELS AND QUERY LANGUAGES

Relational Model, Document Model, Key-Value Pairs, NoSQL, Object-Relational Mismatch, Many to-One and Many-to-Many Relationships, Network data models, Schema Flexibility, Structured Query Language, Data Locality for Queries, Declarative Queries, Graph Data models, Cypher Query Language, Graph Queries in SQL, The Semantic Web, CODASYL, SPARQL – Case Study : Query the designed system using MongoDB.

UNIT 4 EVENT PROCESSING WITH APACHE KAFKA

Apache Kafka, Kafka as Event Streaming platform, Events, Producers, Consumers, Topics, Partitions, Brokers, Kafka APIs, Admin API, Producer API, Consumer API, Kafka Streams API, Kafka Connect API- Case Study : Create a Event Stream with Apache Kafka.

UNIT 5 REAL-TIME PROCESSING USING SPARK STREAMING

Structured Streaming, Basic Concepts, Handling Event-time and Late Data, Fault-tolerant Semantics, Exactly-once Semantics, Creating Streaming Datasets, Schema Inference, Partitioning of Streaming datasets, Operations on Streaming Data, Selection, Aggregation, Projection, Watermarking, Window operations, Types of Time windows, Join Operations, Deduplication - Case Study : Create a Real-time Stream processing application using Spark Streaming

TEXT BOOKS:

- 1. Streaming Systems: The What, Where, When and How of Large-Scale Data Processing by Tyler Akidau, Slava Chemyak, Reuven Lax, O'Reilly publication
- 2. Designing Data-Intensive Applications by Martin Kleppmann, O'Reilly Media
- **3.** Practical Real-time Data Processing and Analytics : Distributed Computing and Event Processing using Apache Spark, Flink, Storm and Kafka, Packt Publishing

REFERENCES:

- 1. https://spark.apache.org/docs/latest/streaming-programming-guide.html
- 2 Kafka.apache.org

e-RESOURCES:

1. https://nptel.ac.in/courses/106105174

Total:45 PERIODS

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Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Explain the applicability and utility of streaming algorithms.
- CO2 Describe and apply current research trends in data-stream processing.
- CO3 Analyze the suitability of stream mining algorithms for data stream systems.
- CO4 Program and build stream processing systems, services and applications.
- CO5 Solve problems in real-world applications that process data streams.

PO PSO Cos/POs **CO1** _ _ _ -**CO2** --**CO3** -_ _ **CO4** _ -_ CO5 _ _ _

Mapping of COs with POs and PSOs

1 - Slight (Low), 2 - Moderate (Medium), 3 - Substantial (High).

PSO

Pre-requisites: Database Management Systems

Preamble The students can able to Characterize the functionalities of logical and physical components of storage, Describe various storage networking technologies, Identify different storage virtualization technologies, Discuss the different backup and recovery strategies, Understand common storage management activities and solutions

UNIT 1 STORAGE SYSTEMS

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Introduction to Information Storage: Digital data and its types, Information storage, Key characteristics of data center and Evolution of computing platforms. Information Lifecycle Management. Third Platform Technologies: Cloud computing and its essential characteristics, Cloud services and cloud deployment models, big data analytics, social networking and mobile computing, Characteristics of third platform infrastructure and Imperatives for third platform transformation. Data Center Environment: Building blocks of a data center, Compute systems and compute virtualization and Software-defined data center.

UNIT 2 INTELLIGENT STORAGE SYSTEMS AND RAID

Components of an intelligent storage system, Components, addressing, and performance of hard disk drives and solid-state drives, RAID, Types of intelligent storage systems, Scale-up and scale- out storage Architecture.

UNIT 3 STORAGE NETWORKING TECHNOLOGIES AND VIRTUALIZATION

Block-Based Storage System, File-Based Storage System, Object-Based and Unified Storage. Fibre Channel SAN: Software-defined networking, FC SAN components and architecture, FC SAN topologies, link aggregation, and zoning, Virtualization in FC SAN environment. Internet Protocol SAN: iSCSI protocol, network components, and connectivity, Link aggregation, switch aggregation, and VLAN, FCIP protocol, connectivity, and configuration. Fibre Channel over Ethernet SAN: Components of FCoE SAN,FCoE SAN connectivity, Converged Enhanced Ethernet, FCoE architecture.

UNIT 4 BACKUP, ARCHIVE AND REPLICATION

Introduction to Business Continuity, Backup architecture, Backup targets and methods, Data deduplication, Cloud-based and mobile device backup, Data archive, uses of replication and its characteristics, Compute based, storage-based, and network-based replication, Data migration, Disaster Recovery as a Service (DRaaS).

UNIT 5 SECURING STORAGE INFRASTRUCTURE

Information security goals, Storage security domains, Threats to a storage infrastructure, Security controls to protect a storage infrastructure, Governance, risk, and compliance, Storage infrastructure management functions, Storage infrastructure management processes.

Total: 45 Periods

TEXT BOOKS:

- 1. EMC Corporation, Information Storage and Management, Wiley, India.
- 2. Jon Tate, Pall Beck, Hector Hugo Ibarra, Shanmuganathan Kumaravel and Libor Miklas, Introduction to Storage Area Networks, Ninth Edition, IBM Redbooks, December 2017.
- 3 Ulf Troppens, Rainer Erkens, Wolfgang Mueller-Friedt, Rainer Wolafka, NilsHaustein, StorageNetworksExplained, SecondEdition, Wiley, 2009.

REFERENCES:

- 1. Salman Khan, Hossein Rahmani, Syed Afaq Ali Shah, Mohammed Bennamoun, ``A Guide to Convolutional Neural Networks for Computer Vision", Synthesis Lectures on Computer VisionMorgan & Claypool publishers, 2018.
- 2 Yoav Goldberg, ``Neural Network Methods for Natural Language Processing",SynthesisLectureson HumanLanguageTechnologies,Morgan &Claypoolpublishers,2017.

VCET, B.Tech-AI&DS, R2022, Curriculum and Syllabus.

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Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Summarize the fundamentals of information storage management in Cloud Computing
- CO2 Illustrate the usage of advanced intelligent storage systems and RAID
- CO3 Interpret various storage networking architectures SAN, including storage subsystems and virtualization.
- CO4 Examine the different roles in providing disaster recovery and remote replication technologies
- CO5 Discuss the security needs and security measures to be employed in information storage management.

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	3	3	-	-	-	2	-	-	-	2	2
CO2	3	3	3	3	3	-	-	-	2	-	-	-	2	3
CO3	3	3	3	3	3	-	-	-	2	-	-	-	2	3
CO4	3	3	3	3	3	-	-	-	2	-	-	-	3	2
CO5	3	3	3	3	3	-	-	-	2	-	-	-	3	2

Mapping of COs with POs and PSOs

Pre-requisites: Computer Networks

Preamble

This course allows for the efficient use of resources and enables large-scale processing of data or computation. Distributed computing systems can be used for a wide range of applications, including scientific research, data analysis, and cloud computing services. By distributing tasks across multiple nodes, distributed computing can increase performance, reliability, and scalability compared to traditional centralized computing systems.

UNIT 1 INTRODUCTION

Examples of Distributed Systems-Trends in Distributed Systems - Focus on resource sharing -Challenges. Case study: World Wide Web- System Models-Physical Model-Architectural Model-Fundamental model.

UNIT 2 COMMUNICATION IN DISTRIBUTED SYSTEM

Inter process Communication - the API for internet protocols - External data representation and marshalling- Remote Invocation - Request-reply protocols - Remote procedure call - Remote method invocation. Case study: Java RMI – Group communication - Publish-subscribe systems - Message queues - Shared memory approaches.

UNIT 3 DISTRIBUTED FILE SYSTEM AND NAME SERVICES

Distributed File Systems - Introduction - File service architecture - Andrew File system. Naming -Introduction - Name services and domain name system - Directory Services - Peer to peer Systems -Napster - Peer to peer middleware - Routing overlays. Case study: Google File system.

UNIT 4 DISTRIBUTED TRANSACTIONS AND CONCURRENCY CONTROL

Introduction - Clocks, events and process states - Synchronizing physical clocks - Logical time and logical clocks - Coordination and Agreement - Introduction - Distributed mutual exclusion algorithms -Election algorithms - Distributed Transactions - Flat and nested distributed transactions-Atomic Commit protocols - Concurrency control in Distributed systems - Distributed Deadlocks-Transaction Recovery.

UNIT 5 PROCESS & RESOURCE MANAGEMENT

Process Management: Process Migration: Features, Mechanism - Threads: Models, Issues, Implementation.

Resource Management: Introduction- Features of Scheduling Algorithms – Task Assignment Approach - Load Balancing Approach - Load Sharing Approach.

TEXT BOOKS:

- George Coulouris, Jean Dollimore and Tim Kindberg, "Distributed Systems Concepts and 1. Design", Fifth Edition, Pearson Education, 2012.
- 2. Andreas Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", O'Reilly, 2014.

REFERENCES:

- Pradeep, "Distributed K Sinha Operating Systems: Concepts and Design", Prentice Hall of 1. India.2012.
- Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. 2. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.

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Total: 45 Periods

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e-RESOURCES:

- 1. https://nptel.ac.in/courses/106106107/, "Inter process Communication", Prof. Ananthanarayana VS, Department of Information Technology, NITK, Surathkal.
- 2. https://onlinecourses.nptel.ac.in/, "Time and global states", Dr. Rajiv Misra, Department of ComputerScienceand Engineering, IIT, Patna.

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Realize the resource sharing principles, trends and challenges in a distributed system using World Wide Web as a case study.
- CO2 Interpret the process communication using remote method invocation for a given distributed environment.
- CO3 Annotate the file systems for a distributed environment using distributed file service implementations.
- CO4 Apply suitable concurrency control method to ensure multiple transactions to maintain ACID property and serializability in the schedules.
- CO5 Explain the process and resource management policies for a given distributed environment using scheduling algorithms.

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	-	-	-	-	-	-	1	-	1	-	2
CO2	3	3	2	-	-	-	-	-	-	1	-	1	-	2
CO3	3	3	2	1	-	-	-	-	-	1	-	1	-	2
CO4	3	3	2	1	-	-	-	-	-	1	-	1	-	2
CO5	3	3	2	1	-	-	-	-	-	1	-	1	-	2

Mapping of COs with POs and PSOs

Pre - Requisites: Nil

Preamble:

The main aim of this course is to make understand the need for SDN and its data plane operations, to understand the functions of control plane, to comprehend the migration of networking functions to SDN environment, to explore various techniques of network function virtualization and to comprehend the concepts behind network virtualization.

UNIT 1 SDN: INTRODUCTION

Evolving Network Requirements – The SDN Approach – SDN architecture - SDN Data Plane, Control plane and Application Plane- Case Study: Virtualbox/Mininet Environment for SDN.

UNIT 2 SDN DATA PLANE AND CONTROL PLANE

Data Plane functions and protocols - OpenFLow Protocol - Flow Table - Control Plane Functions -Southbound Interface, Northbound Interface – SDN Controllers - Ryu, OpenDaylight, ONOS -Distributed Controllers – Case Study: mininet topology with SDN controller and use Wireshark to capture and visualize the OpenFlow messages such as OpenFlow FLOW MOD, PACKET IN, PACKETOUT etc.

UNIT 3 SDN APPLICATIONS

SDN Application Plane Architecture – Network Services Abstraction Layer – Traffic Engineering – Measurement and Monitoring – Security – Data Center Networking-Case Study: Northbound API to program flow table rules on the switch for various use cases like L2 learning switch, Traffic Engineering, Firewall etc.

UNIT 4 NETWORK FUNCTION VIRTUALIZATION

Network Virtualization - Virtual LANs – OpenFlow VLAN Support - NFV Concepts – Benefits and Requirements – Reference Architecture-Case Study: end-to-end network service with two VNFs using vim-emu.

UNIT 5 NFV FUNCTIONALITY

NFV Infrastructure – Virtualized Network Functions – NFV Management and Orchestration – NFV Use cases – SDN and NFV –Case Study: Installing OSM and onboard and orchestrate network service.

TOTAL: 45PERIODS

TEXT BOOKS:

- 1. William Stallings, "Foundations of Modern Networking: SDN, NFV, QoE, IoT and Cloud", Pearson Education, 1st Edition, 2015.
- 2. Thomas D. Nadeau, Ken Gray, —SDN: Software Defined Networks, O'Reilly Media, 2013, First Edition.

REFERENCES:

- 1. Ken Gray, Thomas D. Nadeau, "Network Function Virtualization", Morgan Kauffman, 2016.
- 2. Fei Hu, "Network Innovation through OpenFlow and SDN: Principles and Design", 1st Edition, CRC Press, 2014.
- 3. Oswald Coker, Siamak Azodolmolky, "Software-Defined Networking with OpenFlow", 2 nd Edition, O'Reilly Media, 2017

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e-RESOURCES:

- 1. Website: Open Networking Foundation :http://opennetworking.org.
- 2. Website: Project Floodlight: http://www.projectfloodlight.org/floodlight/
- 3. https://www.kathara.org
- 4. Website: Mininet An Instant Virtual Network on your laptop: http://mininet.org/

Course Outcomes: Upon completion of the course, students will be able to:

- 1. Describe the SDN architecture for Virtualbox/Mininet Environment using SDN Data plane, control plane and application plane.
- 2. Identify the functions of the data plane and control plane for SDN controller and use Wireshark to capture and visualize the OpenFlow messages.
- 3. Design and develop SDN applications with security measures for L2 learning switch, Traffic Engineering and Firewall.
- 4. Discuss the concepts of network virtualization for two VNFs using vim-emu.
- 5. Explain NFV infrastructure, management and orchestration for OSM compared with SDN.

Cos/ POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO1	PSO2
CO1	1	2	3	1	3	-	-	-	2	1	-	1	2	2
CO2	2	2	2	2	3	-	-	-	2	1	-	1	2	2
CO3	2	2	2	3	3	-	-	-	2	1	-	1	2	2
CO4	1	2	3	2	3	-	-	-	2	1		1	2	2
CO5	3	2	1	2	2	-	-	-	2	1		1	2	2

Mapping of COs with POs and PSOs

EDGE COMPUTING

Preamble

The main objective of edge computing is to acquire knowledge on Cloud Computing and enabling technologies to explore the need for Edge Computation and to impart the knowledge to log the sensor data and to perform further data analytics.

UNIT 1 EDGE COMPUTING PARADIGMS

Introduction to Edge Computing Scenarios and Use cases Eg. Healthcare - Edge Computing hardware and architectures - Edge Platforms, Edge vs Fog Computing, Communication Models - Edge, Fog and M2M Fog and Edge Computing Completing the cloud – Hierarchy of Fog and Edge computing – Business models – Opportunities and challenges.

UNIT 2 CHALLENGES IN FEDERATING EDGE RESOURCES

Introduction - Methodology - Integrated C2F2T Literature by modeling technique - Integrated C2F2T Literature by Use-case Scenarios - Integrated C2F2T Literature by metrics - Resources - Deployment of edge nodes, Public Usability of edge nodes, Modeling -mobility modeling, Network resource modeling.

UNIT 3 MANAGEMENT OF NETWORK

Introduction - Background - Network slicing - Network slicing in Software - Defined Clouds -Network slicing management in Edge - Internet of Vehicles: Architecture, Protocol and Security - Seven layered model architecture for the Internet of Vehicles - IoV: Network models, challenges and future aspects.

UNIT 4 MIDDLEWARE FOR EDGE COMPUTING: DESIGN ISSUES

Need for Edge Computing Middleware - Design Goals - State-of-the-Art Middleware Infrastructures -System Model - Middleware for Edge Cloud Architecture - Data Management for Fog Computing -Predictive analysis to support Fog Application Deployment.

UNIT 5 APPLICATIONS AND ISSUES

Exploiting Fog Computing in Health Monitoring - Surveillance Video Stream Processing at the Edge for Real - Time Human Objects Tracking - Fog Computing Model for Evolving Smart Transportation Applications – Testing Perspectives of Fog – Based loT Applications – Legal Aspects of Operating loT Applications in The Fog.

TEXT BOOKS:

- 1. Buyya, Rajkumar, and Satish Narayana Srirama, eds, Fog and edge computing: principles and paradigms, first edition, John Wiley & Sons, 2019. John mutumba
- 2. Bilay, Peter Gutsche, Mandy Krimmel and Volker Stiehl, SAP Cloud Platform Integration: The Comprehensive guide, second edition, Rheinwerg publishing, 2019.

REFERENCES:

- Bahga, Arshdeep, and vijayMadisetti. Cloud computing: A hands-on approach, first edition, 1. CreateSpace Independent Publishing Platform, 2013.
- Ovidiu Vermesen, Peter Friess, Internet of Things From Research and innovation to Market 2.

Total: 45 Periods

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Deployment, first edition, River Publishers, 2014.

e-RESOURCES:

- 1. https://www.google.com/url?q=https://nptel.ac.in/courses/106104449&sa=D&source=editors&ust =1707735463019874&usg=AOvVaw35LyVWd8fRVMhPC0hbRFAq
- 2. https://www.youtube.com/watch?v=F53RYtl2H34

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Illustrate the principles and architecture of fog computing.
- CO2 Interpret the communication and management of edge computing.
- CO3 Analyze the storage and computation of fogs.
- CO4 Examine the performance of the applications developed using fog architecture.
- CO5 Identify the security and privacy issues of edge computing.

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3	3	2	-	-	-	-	-	2	1	2	3	2
CO2	2	3	3	2	-	-	-	-	-	2	1	2	3	2
CO3	3	3	2	2	-	-	-	-	-	2	1	2	2	3
CO4	3	3	2	2	-	-	-	-	-	2	1	2	2	3
CO5	3	3	2	2	-	-	-	-	-	2	1	2	2	2

Mapping of COs with POs and PSOs

Pre-requisites: Cloud Computing **Preamble**

This course enables the student to introduce Cloud Computing terminology, definition, concepts, the security design and architectural considerations for Cloud and to follow best practices for Cloud security using various design patterns.

UNIT 1 FUNDAMENTALS OF CLOUD SECURITY CONCEPTS

Overview of cloud security- Security Services - Confidentiality, Integrity, Authentication, Nonrepudiation, Access Control - Basic of cryptography - Conventional and public-key cryptography, hash functions, authentication, and digital signatures. Case Study: Simulate a cloud scenario using Cloud Sim and run a scheduling algorithm present in Cloud Sim

UNIT 2 SECURITY DESIGN AND ARCHITECTURE FOR CLOUD

Security design principles for Cloud Computing - Comprehensive data protection - End-to-end access control - Common attack vectors and threats - Network and Storage - Secure Isolation Strategies - Virtualization strategies - Inter-tenant network segmentation strategies - Data Protection strategies: Data retention, deletion and archiving procedures for tenant data, Encryption, Data Redaction, Tokenization, Obfuscation, PKI and Key. Case Study: Implement symmetric key based encryption algorithm to protect the messages on communication.

UNIT 3 ACCESS CONTROL AND IDENTITY MANAGEMENT

Access control requirements for Cloud infrastructure - User Identification - Authentication and Authorization - Roles-based Access Control - Multi-factor authentication - Single Sign-on, Identity Federation - Identity providers and service consumers - Storage and network access control options - OS Hardening and minimization - Verified and measured boot - Intruder Detection and prevention. Case Study: Simulate a secure file sharing using a Cloud Sim.

UNIT 4 CLOUD SECURITY DESIGN PATTERNS

Introduction to Design Patterns, Cloud bursting, Geo-tagging, Secure Cloud Interfaces, Cloud Resource Access Control, Secure On-Premise Internet Access, Secure External Cloud.

UNIT 5 MONITORING, AUDITING AND MANAGEMENT

Proactive activity monitoring - Incident Response, Monitoring for unauthorized access, malicious traffic, abuse of system privileges - Events and alerts - Auditing – Record generation, Reporting and Management, Tamper-proofing audit logs, Quality of Services, Secure Management, User management, Identity management, Security Information and Event Management. Case Study: Simulate log forensics using Cloud Sim.

TEXT BOOKS:

- 1. Raj Kumar Buyya, James Broberg, andrzej Goscinski, "CloudComputing:", Wiley2013.
- 2. Dave shackleford, —Virtualization Security, SYBEX a wiley Brand 2013.
- 3. Mather, Kumaraswamy and Latif, -Cloud Security and Privacy, OREILLY 2011

REFERENCES:

- 1. Mark C.Chu-Carroll"CodeintheCloud", CRCPress, 2011
- 2. Mastering Cloud Computing Foundations and Applications Programming Rajkumar Buyya, Christian Vechhiola, S.Thamarai Selvi

VCET, B.Tech-AI&DS, R2022, Curriculum and Syllabus.

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Total: 45 Periods



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e-RESOURCES:

- 1. https://www.geeksforgeeks.org/cloud-computing-simulation-using-cloudsim/
- 2. https://www.youtube.com/watch?v=44IBhZwa4ZM

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Identify the essential security services to be applied in cloud environments.
- CO2 Explain the security challenges faced in cloud architecture for different strategies.
- CO3 Illustrate the policy grants permitted and procedure available to identify and verify the access mechanisms in cloud.
- CO4 Explain the Secure design patterns that eliminate the accidental insertion of vulnerabilities into code and to mitigate the consequences of these vulnerabilities in the cloud.
- CO5 Interpret the compliance program's detection mechanisms like auditing and monitoring in finding risks that have been escalated or in detecting new risks.

	PO	PSO	PSO											
COS/POS	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	3	-	-	-	-	-	2	-	1	3	2
CO2	3	3	2	3	-	-	-	-	-	2	-	1	3	2
CO3	3	3	2	3	-	-	-	-	-	2	-	1	3	2
CO4	3	3	2	3	-	-	-	-	-	2	-	1	3	2
CO5	3	3	2	2	-	-	-	-	-	2	-	1	3	2

Mapping of COs with POs and PSOs

L AUGMENTED REALITY AND VIRTUAL REALITY 22ADE51 3

Pre-requisites: NIL Preamble:

This course is designed to give historical and modern overviews and perspectives on augmented reality and virtual reality. It describes the fundamentals of sensation, perception, technical and engineering

aspects of augmented reality and virtual reality systems.

UNIT 1 IINTRODUCTION TO AUGMENTED REALITY(AR)

History of AR - Augmented reality characteristics - Difference between Augmented Reality and Virtual Reality - AR technological components - Technologies used in AR - Feature Extraction - Hardware components - AR devices - Importance of AR - Real world uses of AR - AR types - Software tools available for AR.

UNIT 2 TECHNOLOGIES NEEDED FOR AUGMENTED REALITY

Hardware technology - virtual scenes - 3D objects - AR components - Display - HMD - Eyeglasses -Contact Lenses - significance of AR - AR powered devices - AR application development drawbacks -Compatibility - Performance - AR libraries - Motion tracking - Environmental understanding -Anchors. Case Study: Study the design of an AR application with C# and Unity

UNIT 3 INTRODUCTION TO VIRTUAL REALITY(VR)

Defining Virtual Reality, History of VR, Human Physiology and Perception, Key Elements of Virtual Reality Experience, Virtual Reality System, Interface to the Virtual World-Input & output- Visual, Aural & Haptic Displays, Applications of Virtual Reality.

UNIT 4 VR MODELING

Modeling – Geometric Modeling – Virtual Object Shape – Object Visual Appearance – Kinematics Modeling – Transformation Matrices – Object Position – Transformation Invariants – Object Hierarchies - Viewing the 3D World - Physical Modeling - Collision Detection - Surface Deformation - Force Computation – Force Smoothing and Mapping – Behavior Modeling – Model Management. Case Study: GHOST (General Haptics Open Software Toolkit) software development toolkit.

UNIT 5 AUGMENTED REALITY & VIRTUAL REALITY FOR MICRO LEARNING 9

Micro learning techniques – Utilizing VR for learning – VR for Practical online assessment – VR info graphics - Virtual case considerations - Utilizing AR for learning - Accessible learning - sensible data elevated learner engagement - VR technology - Components of VR - VR Hardware - VR applications -Civil Engineering - Real Estate - Biology and Medicine - Virtual Mall - VR in Education - Virtual Laboratory – Factory Planning – Automobile Industry. Case Study: Study of Microsoft Hololens.

TEXT BOOKS:

- Kaliraj, P., Devi, T. "Innovating with Augmented Reality: Applications in Education and 1. Industry" (P. Kaliraj, Ed.) (1st ed.). CRC Press (2021). Taylor & Francis Group
- Steven M. LaValle, "Virtual Reality", Cambridge University Press, 2023. 2.
- John Vince, "Introduction to Virtual Reality", Springer-Verlag, 2004 3.

REFERENCES:

- Charles Palmer, John Williamson, "Virtual Reality Blueprints: Create compelling VR experiences 1. for mobile", Packt Publisher, 2018
- Schmalstieg / Hollerer,- "Augmented Reality: Principles & Practice" Pearson Education India; 2. First edition (12 October 2016), ISBN-10: 9332578494

e-RESOURCES:

- 1. https://www.vttresearch.com/sites/default/files/pdf/science/2012/S3.pdf
- 2. http://lavalle.pl/vr/book.html
- 3. https://www.coursera.org/learn/introduction-virtual-reality
- https://infyspringboard.onwingspan.com/web/en/app/toc/lex auth 0133115621849497605635 sh 4. ared/overview

Total: 45 Periods

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Course Outcomes: Upon completion of this course, students will be able to

- CO1 Explain the types and choose appropriate tool for designing augmented reality-based applications
- CO2 Analyze the hardware requirement of AR and explain the use of computer vision concepts for designing AR.
- CO3 Select an appropriate VR tool for a virtual reality-based application.
- CO4 Categorize and explain different models in VR modeling and choose appropriate modeling technique for a given problem.
- CO5 Design and explain a solution for a given scenario using AR-VR components and micro learning tools.

COsPOs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	2	1	-	-	-	-	-	1	3	2
CO2	3	3	2	2	2	1	-	-	-	-	-	1	3	2
CO3	3	3	2	2	2	1	-	-	-	-	-	1	3	2
CO4	3	3	2	2	2	1	-	-	-	-	-	1	3	2
CO5	3	3	2	2	2	1	-	-	-	-	-	1	3	2

Mapping of COs with POs and PSOs

Pre-requisites: Nil **Preamble:**

This course gives fundamental knowledge on the concepts and techniques of robot manipulator, its kinematics. It also familiarizes the students on various Programming and Machine Vision application in robots. It also builds confidence among students to evaluate, choose and incorporate robots in engineering systems.

UNIT 1 FUNDAMENTALS OF ROBOT

Robot – Definition – Robot Anatomy – Co-ordinate systems, Work Envelope, types and classification – specifications – Pitch, yaw, Roll, Joint Notations, Speed of Motion, Pay Load – Robot Parts and their functions – Need for Robots – Different Applications

UNIT 2 ROBOT KINEMATICS

Forward kinematics, inverse kinematics and the difference: forward kinematics and inverse Kinematics of Manipulators with two, three degrees of freedom (in 2 dimensional), four degrees of freedom (in 3 dimensional) – derivations and problems. Homogeneous transformation matrices, translation and rotation matrices.

UNIT 3 ROBOT DRIVE SYSTEMS AND END EFFECTORS

Pneumatic Drives – Hydraulic Drives – Mechanical Drives – Electrical Drives – D.C. Servo Motors, Stepper Motor, A.C. Servo Motors – Salient Features, Applications and Comparison of All These Drives. End Effectors – Grippers – Mechanical Grippers, Pneumatic and Hydraulic Grippers, Magnetic grippers, vacuum grippers, internal grippers and external grippers, selection and design considerations of a gripper.

UNIT 4 SENSORS IN ROBOTICS

Force sensors, touch and tactile sensors, proximity sensors, non-contact sensors, safety considerations in robotic cell, proximity sensors, fail safe hazard sensor systems, and compliance mechanism. Machine vision system - camera, frame grabber, sensing and digitizing image data – signal conversion, image storage, lighting techniques, image processing and analysis – data reduction, segmentation, feature extraction, object recognition, other algorithms, applications – Inspection, identification, visual serving and navigation.

UNIT 5 PROGRAMMING AND APPLICATIONS OF ROBOT

Teach pendant programming, lead through programming, robot programming languages – VAL programming – Motion Commands, Sensors commands, End-Effector Commands, and simple programs - Role of robots in inspection, assembly, material handling, underwater, space and medical fields.

TEXT BOOKS:

- 1. Mikell.P.Groover, "Industrial Robotics Technology, Programming and applications" McGraw Hill 2_{ND} edition 2017.
- 2. Ganesh.S.Hedge,"A textbook of Industrial Robotics", Lakshmi Publications, 2006

REFERENCES:

- 1. Fu K.S. Gonalz R.C. and ice C.S.G."Robotics Control, Sensing, Vision and Intelligence", McGraw Hill book co. 2007.
- 2. YoramKoren, "Robotics for Engineers", McGraw Hill Book, Co., 2002.

e-RESOURCES:

- 1. <u>https://nptel.ac.in/courses/107106090</u>, "Introduction to robotics" by Dr. Krishna Vasudevan, Dr. T Asokan, Dr. Balaraman Ravindran, IIT Madras.
- 2. <u>https://onlinecourses.nptel.ac.in/noc19_me74/preview</u>, "Robotics" by Prof.Dilip Kumar Pratihar, IIT Kharagpur.

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Course Outcomes: Upon completion of this course, students will be able to

- CO1 Interpret various features of robots and the technology involved in robotics.
- CO2 Apply basic engineering knowledge and laws for designing robots.
- CO3 Choose the drive and gripper of a robot suitable for an environment.
- CO4 Explain the image processing and image analysis techniques for machine vision system.
- CO5 Develop a simple program for the working of a robot.

Mapping of COs with POs and PSOs

COsPOs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1	1	-	-	-	-	-	-	-	1	2	2
CO2	3	2	1	1	-	-	-	-	-	-	-	1	2	2
CO3	3	2	1	1	-	-	-	-	-	-	-	1	2	2
CO4	3	2	1	1	-	-	-	-	-	-	-	1	2	2
CO5	3	2	1	1	-	-	-	-	-	-	-	1	2	2

CYBER SECURITY

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Pre-requisites: Nil

Preamble:

With the growing reliance on digital technologies and the ever-increasing threats to our online systems and data, understanding and mitigating cyber risks have become paramount. This course will explore the essential principles, concepts, and practices that form the foundation of cybersecurity.

UNIT 1 INTRODUCTION

Cyber Security – History of Internet – Impact of Internet – CIA Triad; Reason for Cyber Crime – Need for Cyber Security – History of Cyber Crime; Cybercriminals – Classification of Cybercrimes – A Global Perspective on Cyber Crimes; Cyber Laws – The Indian IT Act – Cybercrime and Punishment.

UNIT 2 ATTACKS AND COUNTERMEASURES

OSWAP; Malicious Attack Threats and Vulnerabilities: Scope of Cyber-Attacks – Security Breach – Types of Malicious Attacks – Malicious Software – Common Attack Vectors – Social engineering Attack – Wireless Network Attack – Web Application Attack – Attack Tools – Countermeasures.

UNIT 3 RECONNAISSANCE

Harvester – Whois – Netcraft – Host – Extracting Information from DNS – Extracting Information from E-mail Servers – Social Engineering Reconnaissance; Scanning – Port Scanning – Network Scanning and Vulnerability Scanning – Scanning Methodology – Ping Sweer Techniques – Nmap Command Switches – SYN – Stealth – XMAS – NULL – IDLE – FIN Scans – Banner Grabbing and OS Finger printing Techniques.

UNIT 4 INTRUSION DETECTION

Host -Based Intrusion Detection – Network -Based Intrusion Detection – Distributed or Hybrid Intrusion Detection – Intrusion Detection Exchange Format – Honeypots – Example System Snort.

UNIT 5 INTRUSION PREVENTION

Firewalls and Intrusion Prevention Systems: Need for Firewalls – Firewall Characteristics and Access Policy – Types of Firewalls – Firewall Basing – Firewall Location and Configurations – Intrusion Prevention Systems – Example Unified Threat Management Products.

Total: 45 Periods

TEXT BOOKS:

- 1. Anand Shinde, "Introduction to Cyber Security Guide to the World of Cyber Security", Notion Press, 2021 (Unit 1)
- 2. Nina Godbole, SunitBelapure, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley Publishers, 2011 (Unit 1)
- 3. https://owasp.org/www-project-top-ten/

REFERENCES:

- 1. David Kim, Michael G. Solomon, "Fundamentals of Information Systems Security", Jones & Bartlett Learning Publishers, 2013 (Unit 2)
- 2. Patrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made easy", Elsevier, 2011 (Unit 3)
- 3. Kimberly Graves, "CEH Official Certified Ethical Hacker Review Guide", Wiley Publishers, 2007 (Unit 3)

William Stallings, Lawrie Brown, "Computer Security Principles and Practice", Third Edition, Pearson Education, 2015 (Units 4 and 5)

4.

e-RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc23_cs127/preview, "Cyber Security and Privacy", Prof. Saji K Mathew, IIT Madras.

https://onlinecourses.swayam2.ac.in/nou19_cs08/preview, "Introduction to Cyber Security", Dr.

2. Jeetendra Pande, Uttarakhand Open University, Haldwani.

Course Outcomes: Upon completion of this course, students will be able to

- CO1 Analyze the cybercrime, laws, and security for digital protection.
- CO2 Evaluate cyber-attacks and employ tools for mitigation.
- CO3 Interpret potential security risks during the reconnaissance phase.
- CO4 Identify and respond to security breaches to enhance overall cyber security.
- CO5 Design and implement preventive measures against cyber attacks.

COsPOs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	-	-	-	-	1	-	-	-	2	3	-
CO2	3	3	3	-	-	-	-	1	-	-	-	2	3	-
CO3	3	3	3	-	-	-	-	1	-	-	-	2	3	-
CO4	3	2	3	-	-	-	-	1	-	-	-	2	3	-
CO5	3	2	3	-	-	-	-	1	-	-	-	2	3	-

Mapping of COs with POs and PSOs

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Pre-requisites: Nil **Preamble**

This course aims to provide a strong foundation in blockchain fundamentals, consensus methods, and practical skills with Hyperledger Fabric and Ethereum.

UNIT 1 INTRODUCTION TOBLOCKCHAIN

Blockchain - Public Ledgers, Blockchain as Public Ledgers - Block in a Blockchain, Transactions - The Chain and the Longest Chain - Permissioned Model of Blockchain, Cryptographic - Hash Function, Properties of a hash function - Hash pointer and Merkle tree.

UNIT 2 BITCOINANDCRYPTOCURRENCY

A basic crypto currency, Creation of coins, Payments and double spending, FORTH – the precursor for Bitcoin scripting, Bitcoin Scripts, Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay.

UNIT 3 BITCOIN CONSENSUS

Bitcoin Consensus, Proof of Work (PoW)- HashcashPoW, Bitcoin PoW, Attacks on PoW, monopoly problem- Proof of Stake- Proof of Burn - Proof of Elapsed Time - Bitcoin Miner, Mining Difficulty, Mining Pool-Permissioned model and use cases.

UNIT 4 HYPERLEDGER FABRIC& ETHEREUM

Architecture of Hyperledger fabricv1.1 -chaincode -Ethereum: Ethereum network, EVM, Transaction fee, Mist Browser, Ether, Gas, Solidity.

UNIT 5 BLOCKCHAINAPPLICATIONS

Smart contracts, Truffle Design and issue-DApps-NFT.Blockchain Applications in Supply Chain Management, Logistics, Smart Cities, Finance and Banking, Insurance, etc- Case Study.

Total: 45 Periods

TEXT BOOKS:

- 1. Bashir and Imran, Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks, 2017.
- 2. Andreas Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", O'Reilly, 2014.

REFERENCES:

- 1. Daniel Drescher, "Blockchain Basics", First Edition, Apress, 2017.
- 2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016
- 3. Melanie Swan, "Blockchain: Blueprint for a New Economy", O'Reilly, 2015
- 4. Ritesh Modi, "Solidity Programming Essentials: A Beginner's Guide to Build Smart Contracts for Ethereum and Blockchain", Packt Publishing.
- 5. Hand book of Research on Blockchain Technology, published by ElsevierInc.ISBN:9780128198162, 2020.

e-RESOURCES:

- 1. NPTEL & MOOC courses titled blockchain technology
- 2. blockgeeks.comguide/what-is-block-chain-technology-https://nptel.ac.in/courses/106105184/

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Identify the cryptographic techniques used in blockchain, including hash functions and Merkle trees
- CO2 Analyze the workings of the Bitcoin network, including its scripting language and peer-to-peer network.
- CO3 Analyze the role of miners and mining pools in the Bitcoin network
- CO4 Apply hyperledger Fabric and Ethereum platform to implement the Block chain Application.
- CO5 Analyze the use of Blockchain applications in SCM,Logistics,Finanace and Banking.

	PO	PSO	PSO											
COS/POS	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	2	2	-	-	-	2	-	-	2	3	2
CO2	3	3	3	3	3	-	-	-	2	-	-	2	2	2
CO3	3	3	3	3	3	-	-	-	3	-	-	2	2	3
CO4	3	2	3	2	2	-	-	-	3	-	-	2	2	2
CO5	3	2	3	2	2	-	-	-	3	-	-	2	2	2

Mapping of COs with POs and PSOs

Pre-requisites: Nil

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Preamble: The course is aimed at giving exposure to and enhancing the knowledge and skills of fresh graduate engineers and engineers involved in the operation use of 3D Scanners and 3D printing / additive manufacturing with the aid of CAD packages. It gives exposure and on hand experience in the field of CAD packages, 3D Scanner and 3D Printing.

UNIT 1 INTRODUCTION

Introduction; Design considerations – Material, Size, Resolution, Process; Modelling and viewing - 3D; Scanning; Model preparation – Digital; Slicing; Software; File formats.

UNIT 2 PRINCIPLE

Processes – Extrusion, Wire, Granular, Lamination, Photo polymerisation; Materials - Paper, Plastics, Metals, Ceramics, Glass, Wood, Fiber, Sand, Biological Tissues, Hydrogels, Graphene; Material Selection - Processes, applications, limitations.

UNIT 3 INKJET TECHNOLOGY

Printer - Working Principle, Positioning System, print head, print bed, Frames, Motion control; Print head Considerations – Continuous Inkjet, Thermal Inkjet, Piezoelectric Drop-On-Demand; Material Formulation for jetting; Liquid based fabrication – Continuous jet, Mulitjet; Powder based fabrication – Colour Jet.

UNIT 4 LASER TECHNOLOGY

Light Sources – Types, Characteristics; Optics – Deflection, Modulation; Material feeding and flow – Liquid, powder; Printing machines – Types, Working Principle, Build Platform, Print bed Movement, Support structures.

Case Study: Study 3D printer(s) including print heads, build envelope, materials used and related support removal system(s).

UNIT 5 INDUSTRIAL APPLICATIONS

Product Models, manufacturing – Printed electronics, Biopolymers, Packaging, Healthcare, Food, Medical, Biotechnology, Displays; Future trends.

Total: 45 Periods

TEXT BOOKS:

- 1. Christopher Barnatt, 3D Printing: The Next Industrial Revolution, CreateSpace Independent Publishing Platform, 2013
- 2. Ian M. Hutchings, Graham D. Martin, Inkjet Technology for Digital Fabrication, John Wiley & Sons, 2013
- 3. Chua, C.K., Leong K.F. and Lim C.S., Rapid prototyping: Principles and applications, second edition, World Scientific Publishers, 2010

REFERENCES:

- 1. Ibrahim Zeid, Mastering CAD CAM Tata McGraw-Hill Publishing Co., 2007
- 2. Joan Horvath, Mastering 3D Printing, APress, 2014

e-RESOURCES:

- 1. https://archive.nptel.ac.in/courses/112/103/112103306/, "Fundamentals of Additive Manufacturing Technologies", Prof. Sajan Kapil, IIT Guwahati.
- 2. https://www.coursera.org/learn/introduction-to-3d-modeling, "Introduction to 3D Modeling", Prof. Glenn Wilcox, University of Michigan.

VCET, B.Tech-AI&DS, R2022, Curriculum and Syllabus.

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Course Outcomes: Upon completion of this course, students will be able to

- CO1 Realize the basic concepts of 3D printing technology.
- CO2 Apply the skills to work with 3D printing technologies.
- CO3 Categorize the concepts and working principles of 3D printing using inkjet technique.
- CO4 Explain the working principles of 3D printing using laser technique.
- CO5 Illustrate various methods for designing and modeling of industrial applications.

COsPOs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	3	-	2	1	-	-	-	-	-	1	3	2
CO2	2	2	3	-	2	1	-	-	-	-	-	1	3	2
CO3	2	2	3	2	2	1	-	-	-	-	-	1	3	2
CO4	2	2	3	2	2	1	-	-	-	-	-	1	3	2
CO5	2	2	3	2	2	1	-	-	-	-	-	1	3	2

Mapping of COs with POs and PSOs

GAME DEVELOPMENT

22ADE56

Pre-requisites: Nil

Preamble:

This course provides basic skills for conceptualizing, designing, implementing and testing the game. It majorly emphasizes on theoretical and practical approach to game design by utilizing standardized tools. The students will have a wider scope to develop their creative side and there is an emphasis on using their imagination to build and enrich the gaming experience

UNIT 1 3D GRAPHICS FOR GAME DESIGN

Genres of Games, Basics of 2D and 3D Graphics for Game Avatar, Game Components – 2D and 3D Transformations – Projections – Color Models – Illumination and Shader Models – Animation – Controller Based Animation.

UNIT 2 GAME DESIGN PRINCIPLES

Character Development, Storyboard Development for Gaming – Script Design – Script Narration, Game Balancing, Core Mechanics, Principles of Level Design – Proposals – Writing for Preproduction, Production and Post – Production.

UNIT 3 GAME ENGINE DESIGN

Rendering Concept – Software Rendering – Hardware Rendering – Spatial Sorting Algorithms – Algorithms for Game Engine– Collision Detection – Game Logic – Game AI – Path finding.

UNIT 4 OVERVIEW OF GAMING PLATFORMS AND FRAMEWORKS

Pygame Game development – Unity – Unity Scripts – Mobile Gaming, Game Studio, Unity Single player and multi-Player games.

UNIT 5 GAME DEVELOPMENT USING PYGAME

Developing 2D and 3D interactive games using Pygame – Avatar Creation – 2D and 3D Graphics Programming – Incorporating music and sound – Asset Creations – Game Physics algorithms Development – Device Handling in Pygame – Overview of Isometric and Tile Based arcade Games – Puzzle Game.

Total: 45 Periods

TEXT BOOKS:

- 1. Sanjay Madhav, "Game Programming Algorithms and Techniques: A Platform Agnostic Approach", Addison Wesley, 2013
- 2. Will McGugan, "Beginning Game Development with Python and Pygame: From Novice to Professional", Apress, 2007
- 3. Paul Craven, "Python Arcade games", Apress Publishers, 2016

REFERENCES:

- 1. David H. Eberly, "3D Game Engine Design: A Practical Approach to Real-Time Computer Graphics",
- ^{1.} Second Edition, CRC Press,2006
- 2. Jung Hyun Han, "3D Graphics for Game Programming", Chapman and Hall/CRC, 2011

e-RESOURCES:

- 1. https://onlinecourses.nptel.ac.in/noc19_ge32/preview, Game Theory, by K.S. MallikarjunaRao, IIT Bombay.
- 2. https://www.coursera.org/specializations/game-design-and-development, Game Design and Development with Unity 2020 Specialization, Prof. Brian Winn, Michigan State University.

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Course Outcomes: Upon completion of this course, students will be able to

- CO1 Explain the basic concepts of 2D and 3D Graphics for a game.
- CO2 Summarize the script for preproduction, production and post production of a game.
- CO3 Choose gaming engines suitable for an environment.
- CO4 Apply a suitable platform and framework to design a game.
- CO5 Develop a simple game using Pygame.

Mapping of COs with POs and PSOs

COsPOs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	3	2	2	-	-	1	1	-	-	-	2	2
CO2	2	2	3	2	2	-	-	1	1	-	-	-	2	2
CO3	2	2	3	2	2	-	-	1	1	-	-	-	2	2
CO4	2	2	3	2	2	-	-	1	1	-	-	-	2	2
CO5	2	2	3	2	2	-	-	1	1	-	-	-	2	2

Pre-requisites: Nil **Preamble**

The main aim of this course is to know the background of classical computing and quantum computing, to learn the fundamental concepts behind quantum computation and quantum mechanics and its relation to Computer Science.

QUANTUM COMPUTING

UNIT 1 QUANTUM COMPUTING BASIC CONCEPTS

Complex Numbers-Linear Algebra-Matrices and Operators-Global Perspectives Postulates of Quantum Mechanics –Quantum Bits-Representations of Qubits–Superpositions.

UNIT 2 QUANTUM GATES AND CIRCUITS

Universal logic gates-Basics in glequbitgates- Multiple qubit gates-Circuit development-Quantum error correction.

UNIT 3 QUANTUM ALGORITHMS

Quantum parallelism-Deutsch's algorithm-The Deutsch-Jozsa algorithm-Quantum Fourier transform and its applications-Quantum Search Algorithms: Grover's Algorithm.

UNIT 4 OUANTUM INFORMATION THEORY

Data compression-Shannon's noiseless channel coding theorem-Schumacher's quantum noiseless channel coding theorem-Classical information over noisy quantum channels.

UNIT 5 QUANTUM CRYPTOGRAPHY

Classical cryptography basic concepts-Private key cryptography-Shor's Factoring Algorithm-Quantum Key Distribution-BB84 -Ekart91.

TEXT BOOKS:

- ParagKLala,McGrawHillEducation,"QuantumComputing,ABeginnersIntroduction",Firstedition(1 1. November2020).
- 2. MichaelA.Nielsen,IssacL.Chuang,"QuantumComputationandQuantumInformation",Tenth Edition, Cambridge UniversityPress, 2010.
- Chris Bernhardt, The MIT Press; Reprint edition (8 September 2020), "Quantum Computing 3. forEveryone".

REFERENCES:

- ScottAaronson, "QuantumComputingSinceDemocritus", CambridgeUniversityPress, 2013. 1.
- N.DavidMermin, "QuantumComputerScience:AnIntroduction", CambridgeUniversityPress, 2007. 2.

e-RESOURCES:

- https://www.itsoc.org/sites/default/files/2021-05/ITW-2021-Quantum_Computing.pdf 1.
- 2. https://youtu.be/Rs2TzarBX5I?si=-isQmsg7XIHK5wZc

Course Outcomes: Upon completion of this course, students will be able to:

- Summarize the basics of quantum computing and the fundamental units of quantum information. CO1
- CO2 Explore the concept of universal quantum gates from computation models.
- Explain the algorithms for implementing quantum mechanics. CO3
- Implement the Model circuits using quantum computation environment and frameworks. CO4
- Explain the basics concepts of quantum cryptography using various algorithms. CO5

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Total: 45 Periods

Mapping of COs with POs and PSOs

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	3	-	-	-	-	-	-	2	1	2	3
CO2	3	3	3	3	-	-	-	-	-	-	2	1	2	3
CO3	3	3	3	3	-	-	-	-	-	-	2	1	2	3
CO4	3	3	3	3	-	-	-	-	-	-	2	1	2	3
CO5	3	3	3	3	-	-	-	-	-	-	2	1	2	3

AGILE METHODOLOGIES FOR SOFTWARE DEVELOPMENT

Preamble:

This course introduces agile methodologies such as Scrum, Extreme Programming (XP), Lean, and Kanban.

UNIT 1 AGILE PRINCIPLESS

Understanding the Agile Values - Silver Bullet Methodology - Agile to the Rescue - A fractured perspective - Agile Manifesto and Purpose behind each practice-Agile Elephant-Where to start with a new Methodology-12 principles of Agile Software -The Customer is always Right-Delivering the project-Communicating and Working Together-Project Execution-Constantly improving the project and the team-Agile Project.

UNIT 2 SCRUM AND SELF-ORGANIZING TEAMS

Basic pattern for a Scrum Project-Rules of Scrum-Command-and-Control Team-Self-Organizing Teams-Scrum Values-Daily Scrum-Sprints, Planning and Retrospectives-User stories-Conditions of Satisfaction-Story Points and Velocity-Burn down Charts-Planning and Running a Sprint-GASP-Scrum Values Revisited.

UNIT 3 XP EMBRACING CHANGE AND SIMPLICITY

Practices Do Work Without the Values-Company Culture Compatible with Scrum Values-Primary Practices of XP-The XP values help the team change their mindset-An effective mindset starts with the XP values–Understanding the XP principles–Feedback Loops – Code and Design – Make Code and Design Decisions at the Last Responsible Moments.

UNIT 4 INCREMENTAL DESIGN AND LEAN

Incremental Design and the Holistic XP-Lean Thinking-Commitment, Options Thinking and Set Based Development-Create Heroes and Magical Thinking-Eliminate Waste-Value Stream Map-Deliver as Fast as Possible-WIP Area Chart-Pull Systems.

UNIT 5 KANBAN AND AGILE COACH

The Principles of Kanban-Improving Your Process with Kanban-Measure and Manage Flow-Little's Law-Emergent Behavior with Kanban-The Agile Coach-Shuhari-The Principles of Coaching.

TEXT BOOKS:

1. AndrewStellmanandJenniferGreene, "LearningAgile:UnderstandingScrum, XP, LeanandKanban", 18 ^tEdition,O'Reilly MediaInc, 2015.

REFERENCES:

- 1. EricBrechner, "AgileProjectManagementwithKanban", 1stEdition, MicrosoftPress, 2015.
- RobertC.Martin, "AgileSoftwareDevelopment:Principles,Patterns,andPractices", PearsonPrenticeH 2. all,2011.

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Total: 45 Periods

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e-RESOURCES:

- 1. https://www.youtube.com/watch?v=KNBHQ0pyaG8
- 2. https://www.geeksforgeeks.org/agile-methodology-tutorial/

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Explain the purpose of agile's core principles and apply for project development.
- CO2 Utilize the scrum's emphasis on project management and self-organization.
- CO3 Experiment various user practices using XP practices.
- CO4 Model applications using incremental design and lean to empower the team.
- CO5 Make use of Kanban's practices help deliver great software by managing flow.

Cos/POs	PO	PSO	PSO											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
C01	3	2	3	3	2	-	-	-	-	-	-	2	3	2
CO2	3	2	3	2	2	-	-	-	-	-	-	2	3	2
CO3	3	2	3	2	2	-	-	-	-	-	-	2	3	2
CO4	3	2	2	2	2	-	-	-	-	-	-	2	2	2
CO5	3	2	2	2	2	-	-	-	-	-	-	2	3	2

Mapping of COs with POs and PSOs

ETHICAL HACKING

Pre-requisites: Computer Networks, Data and Information Security **Preamble**

This course enables the learner to learn ethical hacking and security challenges in computer networking. Which addresses the data security issues and types of attacks includes malwares, viruses, sniffer and denial of service. It teaches wireless hacking and hacking in operating system environments. Learners also learn how to protect the network system using firewalls and filters and also about the legal, professional and ethical issues.

UNIT 1 INTRODUCTION

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Ethical Hacking Overview - Role of Security and Penetration Testers - Penetration-Testing Methodologies- Laws of the Land - Overview of TCP/IP- The Application Layer - The Transport Layer -The Internet Layer - IP Addressing - Network and Computer Attacks - Malware - Protecting Against Malware Attacks - Intruder Attacks - Addressing Physical Security

UNIT 2 FOOT PRINTING, RECONNAISSANCE AND SCANNING NETWORKS

Footprinting Concepts - Footprinting through Search Engines, Web Services, Social Networking Sites, Website, Email - Competitive Intelligence - Footprinting through Social Engineering –Footprinting Tools - Network Scanning Concepts - Port-Scanning Tools - Scanning Techniques - Scanning Beyond IDS and Firewall

UNIT 3 ENUMERATION AND VULNERABILITY ANALYSIS

Enumeration Concepts - NetBIOS Enumeration – SNMP, LDAP, NTP, SMTP and DNS Enumeration - Vulnerability Assessment Concepts - Desktop and Server OS Vulnerabilities - Windows OS Vulnerabilities - Tools for Identifying Vulnerabilities in Windows- Linux OS Vulnerabilities-Vulnerabilities of Embedded Oss

UNIT 4 SYSTEM HACKING

Hacking Web Servers - Web Application Components- Vulnerabilities - Tools for Web Attackers and Security Testers Hacking Wireless Networks - Components of a Wireless Network – WardrivingWireless Hacking - Tools of the Trade

UNIT 5 NETWORK PROTECTION SYSTEMS

Access Control Lists. - Cisco Adaptive Security Appliance Firewall - Configuration and Risk Analysis Tools for Firewalls and Routers - Intrusion Detection and Prevention Systems - Network-Based and Host-Based IDSs and IPSs - Web Filtering - Security Incident Response Teams – Honeypots.

TEXT BOOKS:

1. Michael T. Simpson, Kent Backman, and James E. Corley, Hands-On Ethical Hacking and Network Defense, Course Technology, Delmar Cengage Learning, 2010.

2. Basics of Hacking and Penetration Testing - Patrick Engebretson, SYNGRESS, Elsevier, 2013. **REFERENCES:**

1. Black Hat Python: Python Programming for Hackers and Pentesters, Justin Seitz, 2014.

e-RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_cs13/preview

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Total: 45 Periods

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Classify computer-based vulnerabilities and distinguish the type of security threat for given situation
- CO2 Apply appropriate foot printing and port scanning tools for a given scenario
- CO3 Use enumeration and vulnerability analysis techniques for a given scenario in different operating systems
- CO4 Describe various hacking options available in web applications in wired and wireless networks
- CO5 Illustrate Risk Analysis Tools, Honeypots for network protection

Cos/POs	РО 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	2	-	-	1	-	1	2	-	1	2	
CO2	3	2	1	1	3	-	1	-	2	1	1	1	2	
CO3	3	2	2	1	3	-	1	-	1	2	1	1	2	
CO4	3	1	1	2	3	-	1	-	1	2	1	1	2	
CO5	3	3	1	1	3	-	1	-	2	1	1	1	2	

Mapping of COs with POs and PSOs

Pre-requisites: Nil

Preamble:

The course cyber forensics aims to reveal electronic discovery technique used to determine the technical and criminal evidence also involves electronic data storage extraction for legal purposes.

CYBER FORENSICS

UNIT 1 COMPUTER CRIME

Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Introduction to Identity Theft & Identity Fraud. Types of CF techniques – Incident and incident response methodology – Forensic duplication and investigation. Preparation for IR: Creating response tool kit and IR team. – Forensics Technology and Systems – Understanding Computer Investigation – Data Acquisition.

UNIT 2 EVIDENCE COLLECTION AND FORENSICS TOOLS

Processing Crime and Incident Scenes – Working with Windows and DOS Systems. Current Computer Forensics Tools: Software/ Hardware Tools.

UNIT 3 ANALYSIS AND VALIDATION

Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics.

UNIT 4 ETHICAL HACKING

Introduction to Ethical Hacking – Foot printing and Reconnaissance – Scanning Networks – Enumeration – System Hacking – Malware Threats – Sniffing.

UNIT 5 ETHICAL HACKING IN WEB

Social Engineering – Denial of Service – Session Hijacking – Hacking Web servers – Hacking Web Applications – SQL Injection – Hacking Wireless Networks – Hacking Mobile Platforms

Total: 45 Periods

TEXT BOOKS:

1. Bill Nelson, Amelia Phillips, Frank Enfinger, Christopher Steuart, —Computer Forensics and Investigations, Cengage Learning, India Edition, 2016.

REFERENCES:

- 1. MarjieT.Britz, —Computer Forensics and Cyber Crime: An Introduction, 3rdEdition, Prentice Hall, 2013.
- 2. AnkitFadia Ethical Hacking Second Edition, Macmillan India Ltd, 2006.
- 3. Kenneth C.Brancik —Insider Computer Fraud Auerbach Publications Taylor & amp; Francis Group-2008.

e-RESOURCES:

- 1. https://www.netacad.com/courses/security/introduction-cybersecurity.
- 2. http://www.cse.scu.edu/~tschwarz/COEN252_09/ln.html.

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Course Outcomes: Upon completion of this course, students will be able to

- CO1 Indentify traditional problems associated with Computer Crime, Identity Theft & Identity Fraud using incident response methodology, Forensic duplication and investigation
- Analyze the hardware and software computer forensics tools using acquisition, validation, CO2 extraction and reconstruction-based functionalities for preserving the computer-generated records from cyber-attacks.

Assess the characteristics of network forensics using knoppix tool and packet sniffers for

- CO3 analyzing data stealing malware during the cyber attack and compare the features of E-mail, mobile device forensics using e-mail server and sim card reader investigation for mitigating the effects of phishing and identity theft.
- CO4 Discover the available computer on the network using scanning and enumerating technology and escalating the privileges for cracking the system.
- CO5 Elaborate the vulnerabilities that affect the web server, wireless network and mobile platforms.

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	1	1	1	-	-	-	1	-	2
CO2	3	3	2	2	2	1	1	1	-	-	-	1	-	2
CO3	3	3	2	2	1	1	1	1	-	-	-	1	-	2
CO4	3	3	2	2	1	1	1	1	-	-	1	1	-	2
CO5	3	3	2	2	2	1	1	1	-	-	1	1	-	2

Mapping of COs with POs and PSOs
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Pre-requisites: Computer Networks

Preamble

This course aims to develop semantic web related simple applications and to study about the Security issues in Social Networking.

UNIT 1 INTRODUCTION

Basics of Symmetric Key Cryptography, Basics of Asymmetric Key Cryptography, Hardness of Functions. Notions of Semantic Security (SS) and Message Indistinguishability (MI): Proof of Equivalence of SS and MI, Hard Core Predicate, Trap-door permutation, Goldwasser-Micali Encryption. Goldreich-Levin Theorem: Relation between Hardcore Predicates and Trap-door permutations.

UNIT 2 FORMAL NOTIONS OF ATTACKS

Attacks under Message Indistinguishability: Chosen Plaintext Attack (IND-CPA), Chosen Ciphertext Attacks (IND-CCA1 and IND-CCA2), Attacks under Message Non-malleability: NM-CPA and NM-CCA2, Inter-relations among the attack model

UNIT 3 RANDOM ORACLES

Provable Security and asymmetric cryptography, hash functions. One-way functions: Weak and Strong one-way functions. Pseudo-random Generators (PRG): Blum-Micali-Yao Construction, Construction of more powerful PRG, Relation between One-way functions and PRG, Pseudo - random Functions (PRF)

UNIT 4 BUILDING A PSEUDORANDOM PERMUTATION

Understanding and predicting human behavior for social communities - User data Management - Inference and Distribution - Enabling new human experiences - Reality mining – Context – Awareness - Privacy in online social networks - Trust in online environment - Neo4j -Relationships - Properties.

UNIT 5 MESSAGE AUTHENTICATION CODES

Left or Right Security (LOR). Formal Definition of Weak and Strong MACs, Using a PRF as a MAC, Variable length MAC. Public Key Signature Schemes: Formal Definitions, Signing and Verification, Formal Proofs of Security of Full Domain Hashing. Assumptions for Public Key Signature Schemes: One-way functions Imply Secure One-time Signatures. Shamir's Secret Sharing Scheme. Formally Analyzing Cryptographic Protocols. Zero Knowledge Proofs and Protocols.

Total: 45 Periods

TEXT BOOKS:

- 1. Hans Delfs and Helmut Knebl, Introduction to Cryptography: Principles and Applications, Springer Verlag.
- 2. Wenbo Mao, Modern Cryptography, Theory and Practice, Pearson Education (Low Priced Edition)

REFERENCES:

- 1. ShaffiGoldwasser and MihirBellare, Lecture Notes on Cryptography, Available at http://citeseerx.ist.psu.edu/.
- 2. OdedGoldreich, Foundations of Cryptography, CRC Press (Low Priced Edition Available), Part 1 and Part 23
- 3. William Stallings, "Cryptography and Network Security: Principles and Practice", PHI 3rd Edition, 2006.

Course Outcomes:

Upon completion of this course, students will be able to:

- CO1 Interpret the basic principles of cryptography and general cryptanalysis.
- CO2 Determine the concepts of symmetric encryption and authentication.
- CO3 Identify the use of public key encryption, digital signatures, and key establishment.
- CO4 Articulate the cryptographic algorithms to compose, build and analyze simple cryptographic solutions.
- CO5 Express the use of Message Authentication Codes

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	3	1	-	-	-	2	1	1	2	1	-
CO2	1	3	2	1	2	-	-	-	3	2	2	2	1	-
CO3	1	1	2	3	2	-	-	-	1	1	1	3	1	-
CO4	3	1	2	1	3	-	-	-	3	2	1	2	1	-
CO5	2	3	3	3	3	-	-	-	3	1	1	1	1	-

Mapping of COs with POs and PSOs

SOCIAL NETWORKS

Pre-requisites: Computer Networks

Preamble

This course aims to develop semantic web related simple applications and to study about the Security issues in Social Networking.

UNIT 1 FUNDAMENTALS OF SOCIAL NETWORKING

Introduction to Semantic Web - Limitations of current Web - Development of Semantic Web - Emergence of the Social Web - Social Network analysis - Development of Social Network. Analysis - Key concepts and measures in network analysis - Historical overview of privacy and security - Major paradigms - for understanding privacy and security.

UNIT 2 SECURITY ISSUES IN SOCIAL NETWORKS

The evolution of privacy and security concerns with networked technologies - Contextual influences on privacy attitudes and behaviors - Anonymity in a networked world.

UNIT 3 EXTRACTION AND MINING IN SOCIAL NETWORKING DATA

Extracting evolution of Web Community from a Series of Web Archive - Detecting communities in social networks - Definition of community - Evaluating communities - Methods for community detection and mining - Applications of community mining algorithms - Tools for detecting communities - social network infrastructures and communities - big data and Privacy.

UNIT 4 PREDICTING HUMAN BEHAVIOR AND PRIVACY ISSUES

Understanding and predicting human behavior for social communities - User data Management - Inference and Distribution - Enabling new human experiences - Reality mining – Context – Awareness - Privacy in online social networks - Trust in online environment - Neo4j -Relationships - Properties.

UNIT 5 ACCESS CONTROL, PRIVACY AND IDENTITY MANAGEMENT

Understand the access control requirements for Social Network - Enforcing Access Control Strategies -Authentication and Authorization - Roles-based Access Control – Host - storage and network access control options – Firewalls – Authentication and Authorization in Social Network - Identity & Access Management - Single Sign-on - Identity Federation - Identity providers and service consumers - The role of Identity provisioning.

TEXT BOOKS:

- 1. Peter Mika, "Social Networks and the Semantic Web, First Edition, Springer 2007
- 2. BorkoFurht, "Handbook of Social Network Technologies and Application, First Edition, Springer, 2010.
- 3. Learning Neo4j 3.x Second Edition by Jérôme Baton, Rik Van Bruggen, Packt publishing
- 4. David Easley, Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning about a Highly Connected Worldl, First Edition, Cambridge University Press, 2010.

REFERENCES:

- 1. Black Hat Python: Python Programming for Hackers and Pentesters, Justin Seitz, 2014.
- 2. Jackson, Matthew O., "Social and Economic Networks", Princeton University Press, 2008.
- 3. GuandongXu, Yanchun Zhang and Lin Li, "Web Mining and Social Networking Techniques and applications", First Edition, Springer, 2011.
- 4. Dion Goh and Schubert Foo, "Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively", IGI Global Snippet, 2008

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Total: 45 Periods

e-RESOURCES:

1. https://www.google.com/url?q=https://nptel.ac.in/courses/106106169&sa=D&source=editors&ust =1707561444338353&usg=AOvVaw11syOZCsKkebxXS4YuZrjz

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Develop simple applications using semantic web
- CO2 Address the Privacy and Security issues in Social Networking
- CO3 Explain the data extraction and mining of social networks
- CO4 Discuss the prediction of human behavior in social communities
- CO5 Describe the applications of social networks

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	-	-	-	-	-	1	-	1	3	3
CO2	3	3	2	2	-	-	-	-	-	1	-	1	3	3
CO3	3	3	2	2	-	-	-	-	-	1	-	1	3	3
CO4	3	3	2	2	-	-	-	-	-	1	-	1	3	3
CO5	3	3	2	2	-	-	-	-	-	1	-	1	3	3

Mapping of COs with POs and PSOs

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Pre-requisites :Nil Preamble

This course provides the learners to know the fundamentals of database and SQL language to create and manipulate the database

UNIT 1 INTRODUCTION TO DATABASE MANAGEMENT

Introduction – Database System – Example – Characteristics – Importance of Databases – File System Vs Database System – DBMS Users – Data abstraction – Levels of abstraction – Data Independence – Database System Architecture – Database administrator

UNIT 2 DATA MODELS

Introduction – Benefits of Data Modelling – Types Modelling – Phases of Data Modelling – ER model – Generalization, Specialization and Aggregation – Database Design Process – Strength and Weakness of ER Model – Case study of Building an ER Model. Relational Model – Data Structure – Mapping the ER Model to Relational Model – Data Manipulation – Data Integrity – Advantages of Relational Model

UNIT 3 SQL

SQL – Data Definition: CREATE, ALTER and DROP commands– Keys and Constraints – Data Manipulation: SQL Data Retrieval– Views: Creating views from single and multiple relations – DML operations on views – Embedded and Dynamic SQL

UNIT 4 FUNCTIONAL DEPENDENCY AND NORMALIZATION

Undesirable Properties and Schema refinement – Decomposition using functional dependencies: 1NF, 2NF, 3NF, BCNF – Desirable properties of Decomposition – Multi valued Dependencies.

UNIT 5 TRANSACTION MANAGEMENT

Transaction concepts- Transaction Recovery-Properties of Transaction-Serializability-Concurrency Control – Locking Mechanisms-Two Phase Commit Protocol-Dead lock. Case study: Database connectivity using SQL.

Total : 45 Periods

TEXT BOOKS:

1. G K Gupta, "Database Management Systems", 1st Edition, Tata Mc Graw Hill, 2018

REFERENCES:

- 1. Silberschatz. Abraham, Korth, Henry F. and Sudarshan S., "Database System Concepts", 7th Edition, McGraw Hill, New York, 2021..
- 2 Back End : ORACLE / SQL SERVER / MYSQL.

e-RESOURCES:

1. http://www.nptelvideos.in/2012/11/database-management-system.html, Database Management Systems, Dr.S.Srinath, IIT Madras

Course Outcomes:

Upon completion of this course, students will be able to:

- CO1 Analyze the architecture and applications of database system and choose an appropriate Databases
- CO2 Design a relational database using ER model
- CO3 Manipulate the relational database with SQL statements
- CO4 Design relational database using normalization methods
- CO5 Discuss serialization and concurrency control mechanisms to avoid deadlock problem in transaction processing.

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	-	-	-	-	-	2	3	2	1	-	-
CO2	3	3	2	-	-	-	-	-	2	2	2	1	-	-
CO3	3	3	3	-	-	-	-	-	2	2	2	1	-	-
CO4	3	3	3	-	-	-	-	-	2	3	2	1	-	-
CO5	3	3	3	-	-	-	-	-	2	3	2	1	-	-

Mapping of COs with POs and PSOs

Preamble

22ADO02

The technology revolution has brought about the need to process, store, analyze, and comprehend large volumes of diverse data in meaningful ways. Data science is a compilation of techniques that extract value from data. This course introduces data science and the essentials of applied statistics required in the context of data science and its applications.

UNIT 1 INTRODUCTION TO DATA SCIENCE

Data Science: Benefits and uses – facets of data - Data Science Process: Overview – Defining research goals – Retrieving data – Data preparation - Exploratory Data analysis – Building the model– presenting findings and building applications.

UNIT 2 DESCRIPTIVE STATISTICS

Types of Data - Types of Variables -Describing Data with Tables and Graphs –Describing Data with Averages - Describing Variability -Normal Distributions and Standard (z) Scores.

UNIT 3 PREDICTIVE ANALYTICS

Correlation –Scatter plots –correlation coefficient for quantitative data –computational formula for correlation coefficient – Regression –regression line –least squares regression line – Standard error of estimate – interpretation of r2 –multiple regression equations –regression towards the mean.

UNIT 4 PYTHON LIBRARIES FOR DATA WRANGLING

Basics of Numpy arrays –aggregations –computations on arrays –comparisons, masks, boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – Hierarchical indexing –combining datasets – aggregation and grouping.

UNIT 5 DATA VISUALIZATION

Importing Matplotlib – Line plots – Scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors –subplots – text and annotation – customization – three dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn

TEXT BOOKS:

- 1. Davy Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016 for Unit I.
- 2. Robert S. Witte and John S. Witte, "Statistics", 11th Edition, Wiley Publications, 2017 for Units II, III.
- 3. Jake VanderPlas, "Python Data Science Handbook Essential Tool for Working with Data", O'Reilly, 2016 for Units IV,V

REFERENCES:

1. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green TeaPress, 2014.

e-RESOURCES:

- 1. https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs28/, "Data Science for Engineers", Prof. RagunathanRengasamy, Prof. Shankar Narasimhan, IIT- Madras.
- https://nptel.ac.in/courses/106/106/106106212/, "Python for Data Science", Prof. RagunathanRengasamy, IIT-Madras.

VCET, B.Tech-AI&DS, R2022, Curriculum and Syllabus.

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TOTAL : 45 PERIODS

Course Outcomes: Upon completion of the course, students will be able to:

- CO1 Interpret data science basics, exploratory data analysis and its tools.
- CO2 Perform the different types of descriptive analytics for the data science process.
- CO3 Apply the correlation and regression analytics on standard data sets for the data science
- CO4 Use the Python Libraries for Data Wrangling in data science.
- CO5 Apply visualization techniques to interpret and explore data.

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	2	1	-	-	1	-	1	1	-	-
CO2	3	3	2	2	2	1	-	-	1	-	2	1	-	-
CO3	3	3	2	2	2	1	-	-	1	-	2	1	-	-
CO4	3	3	2	2	3	1	-	-	2	-	3	1	-	-
CO5	3	3	2	2	3	1	-	-	2	-	3	1	-	-

Mapping of COs with POs and PSOs

Course Outcomes: Upon completion of the course, students will be able to:

22ADO03

Preamble

1. Identify the cyber criminals using Indian and global legal perspectives. Interpret the cyber offences using the tools for active, passive attack in social engineering. 2.

professionals to spot vulnerabilities, fend off attacks, and immediately respond to emergencies.

- 3. Analyze the security challenges in electronic gadgets using traditional, modern techniques and identify the threat.
- Select the appropriate tools and methods used to identify the vulnerability faced by an organization. 4.
- 5. Analyze the security standards in an organization to identify the cost and type of threats.

CYBERCRIME AND INFORMATION SECURITY **UNIT 1**

Cybercrime and information security - Cybercriminals - Classifications of Cybercrimes - Cybercrime: The Legal Perspectives - Indian Perspective - Cybercrime and the Indian ITA 2000 - Global perspective. 9

UNIT 2 **CYBER OFFENSES**

Categories of Cybercrime - Attacks - Social Engineering - Cyberstalking - Cybercafe and cybercrimes- Botnet - Attack Vector.

UNIT 3 **CYBERCRIME: MOBILE AND WIRELESS DEVICES**

Credit card Frauds in mobile and wireless computing era - Security challenges - Authentication Service Security - Attacks on Mobile/cell phones.

TOOLS AND METHOD USED IN CYBERCRIME UNIT 4

Proxy Servers and Anonymizers – Phishing – Password Cracking – Keyloggers and Spywares – virus and worms - Trojan Horses and Backdoors - DoS and DDoS Attacks.

CYBERSECURITY ON ORGANIZATIONAL IMPLICATIONS UNIT 5

Cost of Cybercrimes and IPR issues - Web Threats for Organizations - Security and Privacy implications from cloud computing – Protecting people's privacy in the organization – Organizational guidelines for internet usage, safe computing guidelines and computer usage policy.

TEXT BOOK:

1. Nina Godbole, SunitBelapure, "Cyber Security" Wiley India, 1st edition copyright 2011 reprint 2013.

REFERENCES:

- Jennifer L. Bayuk, J. Healey, P. Rohmeyer, Marcus Sachs, Jeffrey Schmidt, Joseph Weiss "Cyber 1. Security Policy Guidebook", John Wiley & Sons, 2012.
- Marjie T. Britz, "Computer Forensics and Cyber Crime: An Introduction", Pearson publication, 2. 2nd edition.
- Dan Shoemaker, "Cyber security The Essential Body Of Knowledge", First Edition, Cengage 3. Learning, 2011.

e-RESOURCES:

- http://larose.staff.ub.ac.id/files/2011/12/Cyber-Criminology-Exploring-Internet-Crimes-and-Criminal-1. Behavior.pdf.
- 2. https://heimdalsecurity.com/pdf/cyber_security_for_beginners_ebook.pdf.

Cyber security is the body of technologies, processes, and practices designed to protect networks, computers, and data from attack, damage, and unauthorized access. Cyber security teaches

TOTAL : 45 PERIODS

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Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Identify the cyber criminals using Indian and global legal perspectives.
- CO2 Interpret the cyber offences using the tools for active, passive attack in social engineering.
- CO3 Analyze the security challenges in electronic gadgets using traditional, modern techniques and identify the threat.
- CO4 Select the appropriate tools and methods used to identify the vulnerability faced by an organization.
- CO5 Analyze the security standards in an organization to identify the cost and type of threats.

COs/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	-	-	-	2	3	-	-	-	-	1	-	-
CO2	3	2	-	-	-	2	3	-	-	-	-	1	-	-
CO3	3	2	-	-	-	2	3	-	-	-	-	1	-	-
CO4	3	2	-	-	-	2	3	-	-	-	-	1	-	-
CO5	3	2	-	-	-	2	3	-	-	-	-	1	-	-

Mapping of COs with POs and PSOs

DATA VISUALIZATION

Pre-requisites :NIL Preamble

This course provides practical exposure to Python Programming frameworks required for visualizing data.

UNIT 1 INTRODUCTION TO NUMPY

Understanding Data Types in Python – NumPy Arrays Basics: Array Attributes – Array Indexing – Array Slicing – Array Reshaping – Concatenation and Splitting – NumPy Arrays Computation: Universal Functions – Loops Slowness – UFuncs Introduction – UFuncs Exploring – Features – Aggregations

UNIT 2 COMPUTATION ON ARRAYS

Computation on Arrays: Broadcasting – Introduction – Rules – Comparisons, Masks, and Boolean Logic – UFuncs Comparison Operators – Boolean Arrays – Masks Boolean Arrays – Fancy Indexing – Sorting Arrays – Fast Sorting in NumPy – Partial Sorts – Example – Structured Data: NumPy's Structured Arrays.

UNIT 3 DATA MANIPULATION WITH PANDAS

Pandas Objects Introduction – Data Indexing and Selection – Data Operation: Index Preservation – Index Alignment – Operations between DataFrame and Series – Handling missing data – Hierarchical Indexing: Creating, Indexing, Slicing, Rearranging and Data Aggregations

UNIT 4 ADVANCED OPERATIONS WITH PANDAS

Combining Datasets: Concat and Append – Combining Datasets: Merge and Join – Aggregation and Grouping – Pivot Tables – Vectorized String Operations: Pandas String Operations Introduction – Pandas String Methods.

UNIT 5 VISUALIZATION WITH MATPLOTLIB

General Matplotlib – Line Plots – Scatter Plots – Visualizing errors – Density and Contour Plots – Histograms, Binnings and Density – Customizing Plot Legends – Customizing Colorbars – Multiple Subplots.

Total : 45 PERIODS

Text Book :

1. VanderPlas, J. "Python data science handbook: Essential tools for working with data", 1st Edition, O'Reilly Media, Inc, USA, 2016

REFERENCES:

- 1. Dr. Ossama Embarak, "Data Analysis and Visualization using Python ",1st Edition ,APress, 2018 Canada.
- 2 Wes McKinney, "Python for Data Analysis", 2nd Edition, O'Reilly, USA, 2018.
- 3 Operating System : Linux / Windows 4. Software : Python / Keras / Tensorflow / OpenCV 5. Laboratory Manual

e-RESOURCES:

- 1. https://bedford-computing.co.uk/learning/wp-content/uploads/2015/10/Python-for-Data-Analysis.pdf
- 2. https://wesmckinney.com/book/

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Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Apply Python data types and NumPy for manipulating data.
- CO2 Identify structured data manipulation techniques in NumPy.
- CO3 Explain proficiency in working with Pandas Series and Data Frame objects.
- CO4 Implement data manipulation tasks and complex datasets using Pandas.
- CO5 Create various types of plots using Matplotlib for data visualization.

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	-	-	-	-	2	3	2	2	-	-
CO2	3	3	3	2	-	-	-	-	2	2	2	3	-	-
CO3	3	3	3	2	-	-	-	-	2	2	2	2	-	-
CO4	3	3	3	2	-	-	-	-	2	3	2	3	-	-
CO5	3	3	3	2	-	-	-	-	2	3	2	2	-	-

Mapping of COs with POs and PSOs

22ADO05

Pre-requisites: NIL

Preamble: To impart knowledge on various analytical methods for achieving Business Intelligence.

UNIT 1 FOUNDATIONS OF BUSINESS ANALYTICS

Business Analytics - Evaluation of Business analytics - scope of business analytics - Data for Business Analytics: Data set and Database - Big data-Metrics and Data classification - Data reliability and validity - Models in business analytics - problem solving with analytics

UNIT 2 BUSINESS ANALYTICS ON SPREADSHEET AND VISUALIZATION 9

Basic excel skills - Excel function - using excel lookup function for specific application - using excel lookup functions for database queries - spreadsheet Add-ins for business analytics - Data Visualization: Tools and Software - Creating Charts in Microsoft Excel - Excel Data Visualization Tools

UNIT 3 DESCRIPTIVE STATISTICS

Populations and samples - Measures of location - Measures of dispersion - Measures of shape - Excel descriptive statistic tool Descriptive statistic for grouped data - Descriptive statistic for Categorical data-Measures of association-outliers-statistical thinking in business decisions

UNIT 4 STATISTICAL INFERENCE AND REGRESSION MODELS

Statistical Inference: Hypothesis Testing - Hypothesis-Testing Procedure- One-Sample Hypothesis Tests. Trendlines: Modeling Relationships - Trends in Data – Regression Analysis: Simple Linear Regression : Finding the Best-Fitting Regression Line – Multiple linear regression

UNIT 5 FORECASTING TECHNIOUES

Qualitative and judgmental Forecasting-statistical forecasting model - forecasting models for stationary timeseries-forecasting models for time series with linear trend - forecasting time series with seasonality selecting appropriate time series-based forecasting models-regression forecasting with causal variables

Total: 45 Periods

TEXT BOOKS:

James R. Evans. "Business Analytics", 2nd Edition, Pearson, 2017. 1.

REFERENCES:

U Dinesh Kumar. "Business Analytics: The Science of Data - Driven Decision Making", 1st 1. Edition, Wiley, 2017.

e-RESOURCES:

- https://mrcet.com/downloads/digital_notes/AE/III/Business%20Analytics.pdf 1.
- https://onlinecourses.nptel.ac.in/noc24_cs65/preview 2.

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Summarize the business data modelling and its analytics.
- Explain the business analytics and data Visualization using spreadsheet. CO2
- CO3 Analyze data, make evidence-based decisions, and contribute effectively in business contexts.
- CO4 Interpret the inference on results and use regression models for prediction.
- CO5 Implement the Forecasting Techniques on time series data with causal variables.

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Mapping of COs with POs and PSOs

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	2	2	-	-	-	-	-	2	1	-	-
CO2	3	3	3	2	2	-	-	-	-	-	2	1	-	-
CO3	3	3	3	2	2	-	-	-	-	-	2	1	-	-
CO4	3	3	3	2	2	-	-	-	-	-	2	1	-	-
CO5	3	3	3	2	2	-	-	-	-	-	2	1	-	-

22ADM61

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Pre-requisites: NIL

Preamble:

Data science is a multidisciplinary field that utilizes scientific methods, processes, algorithms, and systems to extract insights and knowledge from structured and unstructured data. It combines domain expertise, programming skills, statistical knowledge, and machine learning techniques to uncover patterns, trends, and relationships within data sets. Data science plays a crucial role in informing decision-making, driving innovation, and solving complex problems across various industries and domains.

UNIT 1 INTRODUCTION

Data Science: Benefits and uses - facets of data - Data Science Process: Overview - Defining research goals – Retrieving data – data preparation – Exploratory Data analysis – build the model -presenting findings and building applications - Data Mining - Data Warehousing - Basic statistical descriptions of Data

UNIT 2 DESCRIBING DATA

Types of Data - Types of Variables -Describing Data with Tables and Graphs -Describing Data with Averages - Describing Variability - Normal Distributions and Standard (z) Scores.

UNIT 3 DESCRIBING RELATIONSHIPS

Correlation -Scatter plots -correlation coefficient for quantitative data -computational formula for correlation coefficient - Regression - regression line - least squares regression line - Standard error of estimate – interpretation of r2 –multiple regression equations –regression towards the mean.

UNIT 4 MACHINE LEARNING

The modeling process – Types of machine learning – Supervised learning – Unsupervised learning -Semi-supervised learning- Classification, regression – Clustering – Outliers and Outlier Analysis

UNIT 5 HANDLING LARGE DATA

Problems – techniques for handling large volumes of data – programming tips for dealing with large data sets- Case studies: Predicting malicious URLs, building a recommender system - Tools and techniques needed – Research question – Data preparation – Model building – Presentation and automation.

TEXT BOOKS:

- 1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016.
- 2. Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016.
- 3. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017.

REFERENCES:

1. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014.

e-RESOURCES:

- 1. https://nptel.ac.in/courses/106106179
- 2. https://www.coursera.org/learn/foundations-of-data-science

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Total : 45 Periods

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Discuss about data science process for making business decisions.
- CO2 Explain different types of data and the concept of Normal Distributions and Standard (z) Scores for data analysis.
- CO3 Interpret the usage of statistical inference and regression models for a given application.
- CO4 Describe different types of machine learning approaches for analyzing business problems.
- CO5 Apply tools and techniques to handle large volumes of data in practical scenarios.

PO PSO PSO Cos/POs 1 2 3 4 5 6 7 8 9 10 11 12 2 1 3 3 2 **CO1** 2 2 1 _ -1 _ 1 1 _ _ **CO2** 3 3 2 2 2 1 1 2 1 _ _ _ _ _ **CO3** 3 3 2 2 2 1 1 2 1 _ _ _ _ _ **CO4** 3 3 2 2 3 1 2 3 1 --_ --3 3 2 2 3 1 2 3 **CO5** 1 _ _

Mapping of COs with POs and PSOs

Pre-requisites: NIL

Preamble: Artificial intelligence (AI) refers to the simulation of human intelligence processes by machines, especially computer systems. These processes include learning, reasoning, problem-solving, perception, and decision-making.

UNIT I INTELLIGENT AGENTS

Introduction to AI – Agents and Environments – concept of rationality – nature of environments – structure of agents. Problem solving agents – search algorithms – uninformed search strategies.

UNIT II PROBLEM SOLVING

Heuristic search strategies – heuristic functions. Local search and optimization problems – local search in continuous space – search with non-deterministic actions – search in partially observable environments – online search agents and unknown environments.

UNIT III GAME PLAYING AND CSP

Game theory – optimal decisions in games – alpha-beta search – monte-carlo tree search – stochastic games – partially observable games. Constraint satisfaction problems – constraint propagation – backtracking search for CSP – local search for CSP – structure of CSP.

UNIT IV LOGICAL REASONING

Knowledge-based agents – propositional logic – propositional theorem proving – propositional model checking – agents based on propositional logic. First-order logic – syntax and semantics – knowledge representation and engineering – inferences in first-order logic – forward chaining – backward chaining – resolution.

UNIT V PROBABILISTIC REASONING

Acting under uncertainty – Bayesian inference – naïve Bayes models. Probabilistic reasoning – Bayesian networks – exact inference in BN – approximate inference in BN – causal networks.

TEXT BOOKS:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", Fourth Edition, Pearson Education, 2021.

REFERENCES:

- 1. Dan W. Patterson, "Introduction to AI and ES", Pearson Education, 2007
- 2. Kevin Night, Elaine Rich, and Nair B., "Artificial Intelligence", McGraw Hill, 2008
- 3. Patrick H. Winston, "Artificial Intelligence", Third Edition, Pearson Education, 2006
- 4. Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill Education, 2013

e-RESOURCES:

1. https://nptel.ac.in/courses/106106126

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Explain intelligent agent frameworks and search strategies used in decision making.
- CO2 Apply problem solving techniques and obtain search spaces for partially defined and unknown environments.
- CO3 Apply game playing theory and constraint satisfaction problem solving techniques for a given application
- CO4 Perform logical reasoning and derive inferences using FOL forward chaining and backward chaining
- CO5 Perform probabilistic reasoning under uncertainty using Bayesian inference networks

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Total: 45 Periods

Mapping of COs with POs and PSOs

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	3	-	-	-	-	2	1	1	2	-	-
CO2	3	2	2	1	1	-	-	-	2	1	1	2	-	-
CO3	3	2	2	1	1	-	-	-	2	1	1	2	-	-
CO4	3	2	2	2	1	-	-	-	2	1	1	2	-	-
CO5	3	2	2	1	1	-	-	-	2	1	1	2	-	-

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Pre-requisites: NIL

Preamble: Data Warehousing and Data Mining stand at the forefront of this technological revolution, offering powerful tools and techniques to unlock the hidden potential within complex datasets. By seamlessly integrating data from disparate sources into a centralized repository, Data Warehousing provides a solid foundation for analysis and decision-making. Meanwhile, Data Mining algorithms delve deep into these repositories, uncovering patterns, trends, and relationships that can drive innovation, optimize processes, and enhance strategic planning. Together, Data Warehousing and Data Mining empower organizations to harness the full potential of their data assets, transforming raw information into actionable knowledge that fuels growth, innovation, and competitive advantage in the digital age.

UNIT I DATA WAREHOUSING, BUSINESS ANALYSIS AND ON-LINE 9 ANALYTICAL PROCESSING (OLAP)

Basic Concepts - Data Warehousing Components – Building a Data Warehouse – Database Architectures for Parallel Processing – Parallel DBMS Vendors - Multidimensional Data Model – Data Warehouse Schemas for Decision Support, Concept Hierarchies -Characteristics of OLAP Systems – Typical OLAP Operations, OLAP and OLTP.

UNIT II DATA MINING – INTRODUCTION

Introduction to Data Mining Systems – Knowledge Discovery Process – Data Mining Techniques – Issues – applications- Data Objects and attribute types, Statistical description of data, Data Preprocessing – Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures.

UNIT III DATA MINING - FREQUENT PATTERN ANALYSIS

Mining Frequent Patterns, Associations and Correlations – Mining Methods- Pattern Evaluation Method – Pattern Mining in Multilevel, Multi Dimensional Space – Constraint Based Frequent Pattern Mining, Classification using Frequent Patterns

UNIT IV CLASSIFICATION AND CLUSTERING

Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Support Vector Machines — Lazy Learners – Model Evaluation and Selection-Techniques to improve Classification Accuracy. Clustering Techniques – Cluster Analysis-Partitioning Methods – Hierarchical Methods – Density Based Methods - Grid Based Methods – Evaluation of clustering – Clustering high dimensional data- Clustering with constraints, Outlier analysis-outlier detection methods.

UNIT V WEKA TOOL

Datasets – Introduction, Iris plants database, Breast cancer database, Auto imports database - Introduction to WEKA, The Explorer – Getting started, Exploring the explorer, Learning algorithms, Clustering algorithms, Association–rule learners.

Total : 45 Periods

TEXT BOOKS:

1. Jiawei Han and Micheline Kamber, —Data Mining Concepts and Techniques^{II}, Third Edition, Elsevier, 2012.

REFERENCES:

- 1. Alex Berson and Stephen J.Smith, —Data Warehousing, Data Mining & OLAPI, Tata McGraw Hill Edition, 35th Reprint 2016.
- 2. K.P. Soman, Shyam Diwakar and V. Ajay, —Insight into Data Mining Theory and Practicell, Eastern Economy Edition, Prentice Hall of India, 2006.
- 3. Ian H.Witten and Eibe Frank, —Data Mining: Practical Machine Learning Tools and Techniques^{II}, Elsevier, Second Edition.

e-RESOURCES:

- 1. https://nptel.ac.in/courses/106105174
- 2. https://www.opensourceforu.com/2017/01/an-introduction-to-weka/

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Design a Data warehouse system and perform business analysis with OLAP tools.
- CO2 Apply suitable pre-processing and visualization techniques for data analysis
- CO3 Apply frequent pattern and association rule mining techniques for data analysis
- CO4 Apply appropriate classification and clustering techniques for data analysis
- CO5 Apply various classification and clustering techniques using tools

Cos/POs	PO 1	PO 2	PO 3	РО 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	2	-	1	-	-	-	-	2	1	-	-
CO2	3	2	2	2	1	1	-	-	-	-	2	1	-	-
CO3	3	2	2	2	1	1	-	-	-	-	2	1	-	-
CO4	3	2	2	2	1	1	-	-	-	-	2	1	-	-
CO5	3	2	2	2	1	1	-	-	-	-	2	1	-	-

Mapping of COs with POs and PSOs

22ADM64

Pre-requisites: NIL

Preamble: In the era of artificial intelligence and big data, machine learning has emerged as a transformative technology with the potential to revolutionize industries, drive innovation, and shape the future of society. By enabling computers to learn from data, identify patterns, and make decisions without explicit programming, machine learning is paving the way for intelligent systems that can analyze complex datasets, predict outcomes, and automate tasks at scale.

INTRODUCTION UNIT I

Learning Problems - Perspectives and Issues - Concept Learning - Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.

UNIT II NEURAL NETWORKS AND GENETIC ALGORITHMS

Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.

UNIT III **BAYESIAN AND COMPUTATIONAL LEARNING**

Bayes Theorem - Concept Learning - Maximum Likelihood - Minimum Description Length Principle -Bayes Optimal Classifier - Gibbs Algorithm - Naïve Bayes Classifier - Bayesian Belief Network - EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

UNIT IV INSTANT BASED LEARNING

K- Nearest Neighbour Learning - Locally weighted Regression - Radial Basis Functions - Case Based Learning.

UNIT V **ADVANCED LEARNING**

Learning Sets of Rules - Sequential Covering Algorithm - Learning Rule Set - First Order Rules - Sets of First Order Rules - Induction on Inverted Deduction - Inverting Resolution - Analytical Learning - Perfect Domain Theories - Explanation Base Learning - FOCL Algorithm - Reinforcement Learning - Task - Q-Learning - Temporal Difference Learning

TEXT BOOKS:

Tom M. Mitchell, —Machine Learning, McGraw-Hill Education (India) Private Limited, 2013. 1.

REFERENCES:

- 1 Ethem Alpaydin, —Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.
- 2 Stephen Marsland, —Machine Learning: An Algorithmic Perspective, CRC Press, 2009.

e-RESOURCES:

https://nptel.ac.in/courses/106106126 1.

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Total: 45 Periods

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Differentiate between supervised, unsupervised, semi-supervised machine learning approaches
- CO2 Discuss the decision tree algorithm and overcome the problem of over fitting.
- CO3 Discuss and apply the back propagation algorithm and genetic algorithms to various problems.
- CO4 Apply the concept of Instant based learning to solve business problems.
- CO5 Analyze and apply advanced machine learning approaches for performing data analytics.

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	2	2	-	-	-	2	1	-	-	-	-
CO2	3	3	2	3	2	-	-	-	2	1	-	-	-	-
CO3	3	3	2	2	2	-	-	-	1	1	-	-	-	-
CO4	3	3	2	2	2	-	-	-	1	1	-	-	-	-
CO5	3	2	3	2	2	-	-	-	2	1	-	-	-	-

Mapping of COs with POs and PSOs

EXPERT SYSTEMS

Pre-requisites: NIL

Preamble:

In the realm of artificial intelligence, expert systems have emerged as a powerful tool for capturing and leveraging human expertise to solve complex problems, make informed decisions, and enhance productivity.

INTRODUCTION TO EXPERT SYSTEMS UNIT I

Overview, problem domain and knowledge domain, the advantages of an expert system, general stages in the development of an expert system, general characteristics of an expert system, history and uses of expert systems today, rule-based expert systems, procedural and nonprocedural paradigms, characteristics of artificial neural systems.

UNIT II REPRESENTATION OF KNOWLEDGE

The study of logic, difference between formal logic and informal logic. Knowledge representation, semantic nets, translate semantic nets into PROLOG, limitations of semantic nets, schemas, frames and their limitations, propositional and first order predicate logic, quantifiers, limitations of propositional and predicate logic.

UNIT III METHODS OF INFERENCE

Trees, lattices, and graphs, state and problem spaces, AND-OR trees and goals, methods of inference, rules of inference, resolution rule of inference, resolution systems, and deduction, shallow and causal reasoning, additional methods of Inference, Meta knowledge, the Markov decision process.

UNIT IV REASONING UNDER UNCERTAINTY

Overview, types of errors attributed to uncertainty, features of classical probability, experimental and subjective probabilities, compound and conditional probabilities, hypothetical reasoning and backward induction, temporal reasoning, Markov chains, odds of belief, sufficiency and necessity, role of uncertainty in inference chains, implications of combining evidence.

UNIT V **DESIGN OF EXPERT SYSTEMS**

Overview, stages in the development of an expert system, types of errors in development stages, knowledge engineer role in expert systems, life cycle of an expert system.

TEXT BOOKS:

- J. Giarratano and G. Riley, "Expert Systems -- Principles and Programming". 4th Edition, PWS 1. Publishing Company, 2004.
- 2. Peter Jackson, Introduction to Expert Systems, Addison Wesley Longman, 1999. ISBN 0-20187686-8.

REFERENCES:

- Durkin, J., Expert systems Design and Development, Macmillan, 1994 1.
- Elias M. Awad, Building Expert Systems, West Publishing Company 1996 2.
- Gonzalez and D. Dankel, "The Engineering of Knowledge-Based Systems", Prentice Hall, 1994. 3.
- Nikolopoulos, "Expert Systems", Marcel Dekker Inc. 1997. ISBN 0 8247 9927 5. 4.

e-RESOURCES:

https://nptel.ac.in/courses/106106126 1.

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Total: 45 Periods

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Explain the design of systems using human knowledge and/ or behavior as a basis.
- CO2 Explore traditional as well as new technologies for knowledge acquisition and representation
- CO3 Describe different methods of inference involved in expert systems
- CO4 Discuss the problem of uncertainty while incorporating artificial intelligence, expert, and decision systems into society.
- CO5 Design an expert system for a given scenario.

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	3	-	-	-	-	2	1	1	2	-	-
CO2	3	2	2	1	1	-	-	-	2	1	1	2	-	-
CO3	3	2	2	1	1	-	-	-	2	1	1	2	-	-
CO4	3	2	2	2	1	-	-	-	2	1	1	2	-	-
CO5	3	2	2	1	1	-	-	-	2	1	1	2	-	-

Mapping of COs with POs and PSOs

16.03.2024

COGNITIVE SCIENCE

Pre-requisites: NIL

22ADM66

Preamble: This course *explores fundamental issues in human knowledge representation, inductive learning and reasoning.*

UNIT 1 PHILOSOPHY, PSYCHOLOGY AND NEUROSCIENCE

Philosophy: Mental-physical Relation – From Materialism to Mental Science – Logic and the Sciences of the Mind – Psychology: Place of Psychology within Cognitive Science – Science of Information Processing –Cognitive Neuroscience – Perception – Decision – Learning and Memory – Language Understanding and Processing.

UNIT 2 COMPUTATIONAL INTELLIGENCE

Machines and Cognition – Artificial Intelligence – Architectures of Cognition – Knowledge Based Systems – Logical Representation and Reasoning – Logical Decision Making –Learning – Language – Vision- Case Study on reasoning algorithms

UNIT 3 PROBABILISTIC PROGRAMMING LANGUAGE

WebPPL Language – Syntax – Using Javascript Libraries – Manipulating probability types and distributions – Finding Inference – Exploring random computation – Co-routines: Functions that receive continuations –Enumeration- Case Study on Mathematical functions using WebPPL.

UNIT 4 INFERENCE MODELS OF COGNITION

Generative Models – Conditioning – Causal and statistical dependence – Conditional dependence – Data Analysis – Algorithms for Inference-Case Study on Conditional inference learning model and Generative Model

UNIT 5 LEARNING MODELS OF COGNITION

Learning as Conditional Inference – Learning with a Language of Thought – Hierarchical Models– Learning (Deep) Continuous Functions – Mixture Models- Case Study on hierarchical model and Mixture model.

TEXT BOOKS:

- 1. Vijay V Raghavan, Venkat N.Gudivada, VenuGovindaraju, C.R. Rao, Cognitive Computing: Theory and Applications: (Handbook of Statistics 35), Elsevier publications, 2016
- 2. Jose Luis Bermúdez, Cognitive Science -An Introduction to the Science of the Mind, Cambridge University Press 2020

REFERENCES:

- Judith Hurwitz, Marcia Kaufman, Adrian Bowles, Cognitive Computing and Big Data Analytics, Wiley Publications, 2015
- 2. Robert A. Wilson, Frank C. Keil, "The MIT Encyclopedia of the Cognitive Sciences", The MIT Press, 1999.

e-RESOURCES:

- 1. https://onlinecourses.nptel.ac.in/noc20_hs29/preview, "Introduction to Cognitive Psychology", By Prof. Naveen Kashyap, IIT Guwahati.
- 2. https://onlinecourses.nptel.ac.in/noc22_ee122/preview, "Cognition and its computation", Prof. Sharba Bandyopadhyay and Prof. Rajlakshmi Guha, IIT- Kharagpur.

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Total: 45 Periods

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Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Explain the underlying theory behind cognition from materialism to mental Science.
- CO2 Apply suitable Logical Representation and Reasoning to the cognition elements computationally
- CO3 Use probabilistic programming language to implement mathematical functions through WebPPL
- CO4 Develop applications using cognitive inference model and generative models for interactions
- CO5 Develop applications using cognitive learning model to learn new things faster.

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	2	2	-	-	-	2	1	-	-	-	-
CO2	3	3	2	3	2	-	-	-	2	1	-	-	-	-
CO3	3	3	2	2	2	-	-	-	1	1	-	-	-	-
CO4	3	3	2	2	2	-	-	-	1	1	-	-	-	-
CO5	3	2	3	2	2	-	-	-	2	1	-	-	-	-

Mapping of COs with POs and PSOs

22ADM67

GAMIFICATION

Pre-requisites: NIL

Preamble: Gamification is a strategy that integrates entertaining and immersive gaming elements into nongame contexts to enhance engagement and motivate certain behaviors.

UNIT I INTRODUCTION

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

UNIT II GAMES WITH PERFECT INFORMATION

Games with Perfect Information — Strategic games — prisoner's dilemma, matching pennies - Nash equilibria —mixed strategy equilibrium — zero-sum games

UNIT III GAMES WITH IMPERFECT INFORMATION

Games with Imperfect Information — Bayesian Games — Motivational Examples — General Definitions — Information aspects — Illustrations — Extensive Games with Imperfect — Information — Strategies — Nash Equilibrium — Repeated Games — The Prisoner's Dilemma — Bargaining

UNIT IV NON-COOPERATIVE GAME THEORY

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

UNIT V GAMIFICATION

Gamification Basics— The Business Value of Gamification -Design And Motivation— Player-Centric Gamification Design- Design Choices - Operant Conditioning - Self-Determination Theory - Behavioral Economics — Applications— Gamification for Marketing— Gamification at Work- Gamification and Learning— Gamification for Behavior Change.

Total: 45 Periods

TEXT BOOKS:

- 1. M. J. Osborne, An Introduction to Game Theory. Oxford University Press, 2012.
- 2. M. Machler, E. Solan, S. Zamir, Game Theory, Cambridge University Press, 2013
- 3. N. Nisan, T. Roughgarden, E. Tardos, and V. V. Vazirani, Algorithmic Game Theory. Cambridge University Press, 2007.
- 4. Kevin Werbach and Daniel Hunter, for the Win: How Game Thinking Can Revolutionize Your Business (Wharton Digital Press, 2012)

REFERENCES:

- 1. A.Dixit and S. Skeath, Games of Strategy, Second Edition. W W Norton & Co Inc, 2004.
- 2. YoavShoham, Kevin Leyton-Brown, Multiagent Systems: Algorithmic, Game-Theoretic, and Logical Foundations, Cambridge University Press 2008.
- 3. Zhu Han, DusitNiyato, WalidSaad, TamerBasar and Are Hjorungnes, "Game Theory in Wireless and Communication Networks", Cambridge University Press, 2012
- 4. Y.Narahari, "Game Theory and Mechanism Design", IISC Press, World Scientific

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e-RESOURCES:

1. https://nptel.ac.in/courses/110104063

Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Discuss the notion of a strategic game and equilibria and identify the characteristics of main applications of these concepts.
- CO2 Discuss the use of Nash Equilibrium for decision making problem.
- CO3 Identify key strategic aspects and based on these be able to connect them to appropriate game theoretic concepts given a real world situation.
- CO4 Identify some applications that need aspects of Bayesian Games to perform decision making.
- CO5 Discuss the purpose of Gamification concepts and apply in real world applications.

Mapping of COs with POs and PSOs

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	2	2	-	-	-	2	1	-	-	-	-
CO2	3	3	2	3	2	-	-	-	2	1	-	-	-	-
CO3	3	3	2	2	2	-	-	-	1	1	-	-	-	-
CO4	3	3	2	2	2	-	-	-	1	1	-	-	-	-
CO5	3	2	3	2	2	-	-	-	2	1	-	-	-	-

22ADV01

Prerequisite:

Knowledge of basic statistics (t-test, chi-square-test, regression) and know the difference between descriptive and inferential statistics.

Preamble:

The goal of R programming is to emphasize on the understanding of how R works, with the aim of a beginner, rather than expert, use. R is a system for statistical analyses and graphics. R is both software and a language considered as a dialect of the S language created by the AT&T Bell Laboratories. R is freely distributed under the terms of the GNU General Public License; its development and distribution are carried out by several statisticians known as the R Development Core Team.

Course Outcomes: Upon completion of the course, students will be able to:

- 1. Interpret the basics of R programming and able to develop R script using GUI.
- 2. Apply the depth of exploratory data analysis and able to represent the data in charts and graphs.

Module 1 – Overview of R language

- Defining the R project
- Generating R codes, Scripts
- Text editors for R
- Graphical User Interfaces (GUIs) for R, Packages.

Module 2 – R Objects and Exploratory Data Analysis

- R Objects and data structures: Variable classes, Vectors and matrices, Data frames and lists.
- Manipulating objects in R: Mathematical operations, Decision making, loops, functions and Strings.
- Exploratory Data Analysis: Reading, creating and storing R -CSV file, Excel File.

VCET, B.Tech-AI&DS, R2022, Curriculum and Syllabus.

• Graphical Representation: R-PIE chart – Bar chart – line graphs.

TOTAL : 30 PERIODS

REFERENCES:

- 1. Jared P. Lander, "R for everyone", Pearson Education, 2nd Edition, 2015
- 2. Norman Matloff, "The Art of R Programming", No Starch Press, 2011.

e-Resources:

- 1. https://www.udemy.com/course/r-basics/
- 2. https://www.coursera.org/learn/r-programming/

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POWER BI

Prerequisite:

Knowledge on Computer Programming, Microsoft Excel, Tables, Data modeling and have little knowledge of DAX (Data Analysis expressions) language.

Preamble:

Microsoft Power BI is a business intelligence and analytics platform consisting of applications and services designed to provide coherent visual and interactive insights into data. This course covers the installation and configuration of the primary tools and services that BI professionals utilize to design and develop Power BI content, including Power BI Desktop, the On-Premises Data Gateway and the Power BI Publisher for Excel.

Course Outcomes: Upon completion of the course, students will be able to:

1. Design a Power BI dashboard for a given business model and publish the reports in dashboard.

Module 1 – Fundamentals of Power BI

- Power BI architecture and Data Access.
- Power BI Desktop installation.
- Integrating Power BI and Data Source.
- Creating Visuals for Excel Tables.

Module 2 – Implementation, Publishing and sharing of Power BI desktop 20 Visualization

- Hands-on with Creating Visualizations in Power BI
- DAX concept
- Embedding business definitions to DAX Measures
- Creating Power BI Dashboard
- Setting up scheduled refreshes and security
- Publishing Power BI report

TOTAL : 30 PERIODS

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REFERENCES:

- 1. Brett Powell "Microsoft Power BI Cookbook: Creating Business Intelligence Solutions of Analytical Data Models, Reports, and Dashboard", Packt Publishing, 2017.
- 2. Philip Seamark "Beginning DAX with Power BI: The SQL Pro's Guide to Better Business Intelligence", Apress Publishing, 2018

e-Resources:

- 1. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_0130944302595522562323_shared/overview
- 2. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_0130944169681960962022_shared/overview
- 3. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_0130944354379038722546_shared/overvi ew

VCET, B.Tech-AI&DS, R2022, Curriculum and Syllabus.

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Prerequisite:

22ADV03

Knowledge of Object Oriented Programming Concepts, Java Script.

Preamble:

Type Script is an open-source pure object-oriented programming language developed and maintained by Microsoft under the Apache 2 license. TypeScript extends JavaScript by adding data types, classes, and other object-oriented features with type-checking. It is a typed superset of JavaScript that compiles to plain Java Script. This course aims to impart knowledge about the implementation of TypeScript among the student community.

Course Outcomes: Upon completion of the course, students will be able to:

- 1. Know about typescript and benefits of typescript over other scripting languages.
- 2. Create generics with typescript.

Module 1 – Introduction to TypeScript

Getting to Know TypeScript - Typescript's Type System – Components - Setup the Environment - Basic Data Types -Type Inference -Type Casting -Difference between let and var -Const Declaration-Arrow Functions.

Module 2 – Implementation of TypeScript

Classes-Type casting- Type Assertion -Static Properties-Interface Implementation by class-Array Destructuring -Object Destructuring -Mixed Destructuring-Generic Classes-Modules.

TOTAL : 30 PERIODS

REFERENCES:

- 1. Dan Vanderkam, "Effective TypeScript" O'Reilly Media; 1st edition, 2019.
- 2. Remo H. Jansen, "Learning TypeScript" Packt Publishing; 1st edition 2015.

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KOTLIN PROGRAMMING

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Preamble:

This course helps students to learn concept of Kotlin, also this course teaches how to develop applications for the Android operating system using Kotlin

UNIT 1 KOTLIN INTRODUCTION

Introduction, Overview, Environment Setup, Basic Syntax, Architecture, Variable, Datatypes, Operator, Conditional statements, Loops, Enum.

UNIT 2 ARRAYS, STRINGS AND FUCNTIONS

Array- Generic Array, Arrays of Primitives, Create an Array, Createan array using closure, Create an uninitialized array.String- String Equality, String Literals, Elements of string.Kotlin Application-Kotlin on server side, Kotin on Android.Functions- Definition, Recursive Function, Default and Named Argument, Higer order function, Inline function, Vararg parameter in function, Basic Lambdas.Ranges- Integral types Ranges, downTo() function, step() function, until function.

UNIT 3 CLASSES AND OBJECTS

Defining Class Hierarchies-Class, Visibility Modifiers, Inner and nested classes, Inheritance. Declaring a Class with nontrivial constructor or properties: Primary Constructor and initializer blocks, Secondary constructor, initializing the superclass in different ways, implementing properties declared in interfaces. Compiler-generated methods: Universal object methods, Data Classes, Class Delegation -Declaring an instance- Object Declaration: Singleton Objects, Annotations

UNIT 4 EXCEPTION HANDLING AND NULL SAFETY

Exception Handling: Introduction, try catch, Multiple catch Block, Nested try-catch block, finally Block, throw keyword Null Safety: Nullable Types and Non-Nullable Types, Smart cast, Unsafe and Safe Cast Operator, Elvis Operator

UNIT 5 KOTLIN FOR ANDROID

Kotlin on Android, Setting up kotlin for android, Using Kotlin in Android Studio, Auto-Generated Gradle Configuration, Converting Java Code to Kotlin,

TEXT BOOKS:

1. "Kotlin in Action" Dmitry Jemerov, Svetlana Isakova - Manning Publications-2017

REFERENCES:

1. "Kotlin for Android App Development" by Peter Sommerhoff.

e-RESOURCES:

1. https://onlinecourses.swayam2.ac.in/aic20_sp02/preview

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TOTAL: 30 PERIODS