## 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.E. - COMPUTER SCIENCE AND ENGINEERING**

**Choice Based Credit System (CBCS)** 

### VELALAR COLLEGE OF ENGINEERING AND TECHNOLOGY, ERODE-12. (AUTONOMOUS) DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

### VISION

To produce competent professionals for a globalized technological society by preparing them to become part of the industry and research organizations in the field of science and technology and orient them towards serving the society.

### MISSION

M1. Strengthening the core competence in Computer Science and Engineering through analytical learning and Industry – Institute interaction.

M2. Providing exposure to latest tools and technologies in the core area to design solutions and conduct investigations.

M3. Promoting innovative research based projects / activities in the emerging areas of technology convergence.

M4. Inculcating professional behavior, strong ethical values, leadership abilities, entrepreneurship skills and commitment to lifelong learning.

### **PROGRAM EDUCATIONAL OBJECTIVES**

Our graduates after few years of graduation will:

PEO1. **Preparation**: Develop professional skills for a successful professional career as an engineer, scientist, technocrat, administrator or an entrepreneur.

PEO2. **Core Competence**: Design and implement practical systems consisting of software and/or hardware components through the key principles and practices of computation, mathematics and basic principles of engineering.

PEO3. **Multidisciplinary:** Design and apply new ideas and technologies as the field evolves, to solve real world problems in related interdisciplinary areas.

PEO4. **Professional Environment:** Demonstrate professional attitude and ethics, effective communication, team work and managerial skills for societal, environmental and global context.

PEO5. Learning Environment: Engage in continuing education and training and acquire professional competence through lifelong learning.

#### **PROGRAM OUTCOMES**

Graduates will be able to

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: **Problem Analysis:** Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

PO3: **Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: **Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions for complex problems.

PO5: **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: **The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

### **PROGRAM SPECIFIC OUTCOMES**

PSO1. Apply a variety of programming skills to solve business problems

PSO2. Apply design principles in the construction of computing systems and expert systems of varying complexity.

	VELALAR COLLEGE OF ENGINEERING AND TECHNOLOGY (Autonomous)
Department	Computer Science and Engineering
Programme	B.E Computer Science and Engineering
Regulations	2022

SUMMARY OF CREDITS												
				Cre	edits p	er Sem	ester				C 124-	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	7.5	16
2	BS	11	8	4	4					27	16.9	23
3	ES	8	8	4						20	12.5	29
4	PC			12	20	12	11	4		59	36.9	59
5	PE					6	6	6		18	11.3	12
6	OE					3	3	3		9	5.6	9
7	EC						3		12	15	9.4	15
8	MC					✓						-
9	VC					✓						-
10 OC, SC, AC						✓						-
Total	Credits / Sem	23	20	20	24	21	23	17	12	<u>160</u>	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.

VGET	VELALAR COLLEGE OF ENGINEERING AND TECHNOLOGY	CURRICULUM
	(Autonomous)	UG
		D 2022
Department	Computer Science and Engineering	Incorporating Relative
Programme	B.E Computer Science and Engineering	Grading System

		SEMESTER 1											
S. No.	Course Code	Course Title	egory	Pe	eriods Week	/	edits	Max. Marks					
			Cat	L	Т	P	Cr	CA	SE	Tot.			
1	22MCT01	Induction Programme	MC	2 WEEKS			2 WEEKS		S	0	-	-	-
		Theory		1	1		1		<u> </u>				
2	22ENT11	Communicative English (For Students admitted in the AY 2022-23 only)	HS	3	0	0	3	40	60	100			
2a	22ENT11	Communicative English (For Students admitted from the AY 2023-24 onwards)	HS	3	0	0	3	40	60	100			
3	22MAT12	Matrices and Differential Calculus	BS	3	1	0	4	40	60	100			
4	22PHT11	Engineering Physics	BS	3	0	0	3	40	60	100			
5	22CYT11	Engineering Chemistry	BS	3	0	0	3	40	60	100			
6	22CST11	Python Programming	ES	3	0	0	3	40	60	100			
7	22MET11	Engineering Graphics (For Students admitted AY:2022-23 & 2023-24 only)	ES	2	0	4	4	40	60	100			
8	22EET11	Basics of Electrical and Electronics Engineering (For Students admitted from AY: 2024-2025 onwards)	ES	3	0	0	3	40	60	100			
9	22HST11	தமிழர்மரபு / Heritage of Tamil (For Students admitted from AY: 2023-2024 onwards)	HS	1	0	0	1	40	60	100			
		Practical											
10	22PHL11	Physics and Chemistry Laboratory I	BS	0	0	2	1	60	40	100			
11	22CSL11	Python Programming Laboratory (For the students admitted in AY 2022–2023 and 2023–2024 only)	ES	0	0	2	1	60	40	100			
11a	22CSL11	Python Programming Laboratory (For Students admitted from AY:2024-2025 onwards)	ES	0	0	2	1	60	40	100			
12	22EEL22	Engineering Practices Laboratory (For Students admitted from AY: 2024-2025 onwards)	ES	0	0	2	1	60	40	100			
		Mandatory											
13	22MCT02	Universal Human Values	MC	0	0	2	0	100	0	100			
		Total Credits					23						

		SEMESTER 2								
S. No.	Course Code	Course Title	ategory	Pe	eriods Week	/	Credits	Max	<b>x. Ma</b> i	rks
			0	L T P		T P		CA	SE	Tot.
	-	Theory	1	1	1	r				1
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 (For Students admitted AY:2022-23 & 2023-24 only)	ES	3	0	0	3	40	60	100
5	22MET11	Engineering Graphics (For Students admitted from AY: 2024-2025 onwards)	ES	2	0	4	4	40	60	100
	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 ததொழில் நட்பமும் / Tamils and Technology (For Students admitted from AY: 2023-2024 onwards)	HS	1	0	0	1	40	60	100
		Practical					-	-		-
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
	22EEL22	Engineering Practices Laboratory (For Students admitted AY:2022-23 & 2023-24 only)	ES	0	0	2	1	60	40	100
		Mandatory				_			_	
10	22MCT03	Environmental Science and Engineering	MC	2	0	0	0	100	0	100
	Total Credits 20									

	SEMESTER 3										
S.	Course	Course Title	atego ry	Periods / Week		<b>Cred</b> its	Ma	Max. Mar			
140.	Code		Ű	L	Т	Р		CA	SE	Tot.	
		Theory									
1	22MAT34	Discrete Mathematics	BS	3	1	0	4	40	60	100	
2	22CST31	ST31Java ProgrammingPC300						40	60	100	
3	22CST32	Data Structures using PythonPC300							60	100	
4	22CSC31	Foundations of Data Science	PC	3	0	2	4	50	50	100	
5	22CSC32	Digital Principles and Computer Organization	ES	3	0	2	4	50	50	100	
6	22HST21	தமிழரும் ததொழில் நட்பமும் / Tamils and Technology	HS	1	0	0	1	40	60	100	
		Practical									
7	22CSL31	Java Programming Laboratory	PC	0	0	2	1	60	40	100	
8	22CSL32	Data Structures using Python Laboratory	PC	0	0	2	1	60	40	100	
		Mandatory									
9	22MCL04	English for Professionals	MC	0	0	2	0	100	0	100	
	Total Credits 20										

	SEMESTER 4										
S.	Course Code	Course Title		Pe	eriod Wee	ls / k	redits	Max. Marks			
INO.			Ca	L	Т	Р	CI	CA	SE	Tot.	
	Theory										
1	22MAT42	Optimization Techniques and Queueing Theory	BS	3	1	0	4	40	60	100	
2	22CSC41	Operating Systems	PC	3	0	2	4	50	50	100	
3	22CST41	Database Management Systems	PC	3	0	0	3	40	60	100	
4	22CST42	Design and Analysis of Algorithms	PC	3	1	0	4	40	60	100	
5	22CSC42	Object Oriented Software Engineering	PC	3	0	2	4	50	50	100	
6	22CST43	Web Programming	PC	3	0	0	3	40	60	100	
	•	Practical		•		•					
8	22CSL41	Database Management Systems Laboratory	PC	0	0	2	1	60	40	100	
9     22CSL42     Web Programming Laboratory     PC     0     0     2     1     60							60	40	100		
	Total Credits 24										

	SEMESTER 5										
S.	Course Code	Course Title	gory	Pe	eriod Weel	s / K	dits	Ma	Max. Marks		
No.	Course Code	Course The	Cate	L	Т	Р	Cre	CA	SE	Tot.	
	1										
1	22CST51	Computer Networks	PC	3	0	0	3	40	60	100	
2	22CST52	Theory of Computations	PC	3	1	0	4	40	60	100	
3	22CST53	Artificial Intelligence and Machine Learning	PC	3	0	0	3	40	60	100	
4		Professional Elective - 1	PE	3	0	0	3	40	60	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	22CSL51	Computer Networks Laboratory	PC	0	0	2	1	60	40	100	
8	22CSL52	Artificial Intelligence and Machine Learning Laboratory	PC	0	0	2	1	60	40	100	
		Mandatory									
9	22MCT05	Aptitude and Logical Reasoning	MC	2	0	0	0	100	0	100	
1022MCL06Communication Skills LaboratoryMC002						0	100	0	100		
	Total Credits 21										

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		SEMESTER 6										
S.	Course	Course Title	egory	Periods / Week		edits	Ma	Max. Marks				
No.	Code		Cat	L	Т	Р	Cro	CA	SE	Tot.		
	Theory											
1	22CST61	Compiler Design	PC	3	0	0	3	40	60	100		
2	22CST62	Big Data Analytics	PC	3	0	2	4	50	50	100		
3	22CST63	53     Mobile Application Development				0	3	40	60	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										
8	22CSL61	Mobile Application Development Laboratory	PC	0	0	2	1	60	40	100		
9	22CSL62	Mini Project	EC	0	0	6	3	40	60	100		
Total Credits 23												

	SEMESTER 7										
s.	Course	Course Title	egory	Pe	eriods / Week		edits	Max. Marks		rks	
No.	o. Code		Cat	L	Т	Р	Cre	CA	SE	Tot.	
Theory											
1	22CST71	Economics and Management for Engineers	HS	3	0	0	3	40	60	100	
2	22CST72	Cryptography and Cyber Security	PC	3	0	0	3	40	60	100	
3		Professional Elective - 5	PE	3	0	0	3	40	60	100	
4		Professional Elective - 6	PE	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	22CSL71	Security 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	
Total Credits 17											

		SEMESTER 8								
S. No.	Course	Course Title	tegory	Periods / Week		edits	Max. Marks			
INO.	No. Coue		Ca	L	Т	Р	C	CA	SE	Tot.
		Practical								
1	22CSL81	Internship	EC	-	-	-	2	100	0	100
2	22CSL82	Project Work	EC	0	0	20	10	40	60	100
Total Credits 12										
Total Programme Credits 160										

## **PROFESSIONAL ELECTIVE COURSES: VERTICALS**

Vertical I Data Science	Vertical II Full Stack Development	Vertical III Cloud Computing and Data Processing Technologies	Vertical IV Emerging Technologies	Vertical V Artificial Intelligence and Machine Learning	Vertical VI Networking and Cyber Security
Exploratory Data Analysis	Cloud Computing	Cloud Computing	Augmented Reality / Virtual Reality	Knowledge Engineering	Ad-hoc and Wireless Sensors Networks
Text and Speech Analytics	NoSQL Database	Distributed Computing	Human Computer Interface	Text and Speech Analytics	Mobile Communication
Social Network Analysis	Service Oriented Architecture	Edge and Fog Computing	Brain Computer Interface	Social Network Analysis	Ethical Hacking
Information Retrieval	UI/UX Design	Security and Privacy in cloud	Robotics	Prompt Engineering	Security and Privacy in Cloud
Data Warehousing and Data Mining	Devops	Devops and Site Reliability Engineering	Fintech and Block chain Technologies	Computer Vision	Software Defined Networks
Business Intelligence	Software Testing and Automation	Cloud Services Management	Game Development	Natural Language Processing	Cyber Forensics
Image and Video Analytics	Programming with JavaScript	Information Storage Management	3D Printing and Design	Cognitive Science and Analytics	Embedded Systems and IoT
Recommender Systems	Python Web Development	Virtualization	Generative AI	Deep Learning	Information Security

### **Registration of Professional Elective Courses from Verticals:**

Professional Elective Courses will be registered in Semesters V to 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	P	erioo Wee	ls / k	edits	Μ	ax. Ma	arks
INO	Code		Cat	L	Т	Р	C	CA	SE	Tot.
		Vertical I : Verticals for Data So	cience	1	1	1	1			
1	22CSE11	Exploratory Data Analysis	PE	3	0	0	3	40	60	100
2	22CSE12	Text and Speech Analysis	PE	3	0	0	3	40	60	100
3	22CSE13	Social Network Analysis	PE	3	0	0	3	40	60	100
4	22CSE14	Information Retrieval	PE	3	0	0	3	40	60	100
5	22CSE15	Data Warehousing and Data Mining	PE	3	0	0	3	40	60	100
6	22CSE16	Business Intelligence	PE	3	0	0	3	40	60	100
7	22CSE17	Image and Video Analytics	PE	3	0	0	3	40	60	100
8	22CSE18	Recommender Systems	PE	3	0	0	3	40	60	100
	I	Vertical II : Verticals for Full Stack D	evelopr	nent	;	1	1			
1	22CSE21	Cloud Computing	PE	3	0	0	3	40	60	100
2	22CSE22	NoSQL Database	PE	3	0	0	3	40	60	100
3	22CSE23	Service Oriented Architecture	PE	3	0	0	3	40	60	100
4	22CSE24	UI/UX Design	PE	3	0	0	3	40	60	100
5	22CSE25	Devops	PE	3	0	0	3	40	60	100
6	22CSE26	Software Testing and Automation	PE	3	0	0	3	40	60	100
7	22CSE27	Programming with JavaScript	PE	3	0	0	3	40	60	100
8	22CSE28	Python Web Development	PE	3	0	0	3	40	60	100
		Vertical III : Verticals for Cloud Computing and Dat	a Proce	essin	g Te	echno	logies			
1	22CSE21	Cloud Computing	PE	3	0	0	3	40	60	100
2	22CSE31	Distributed Computing	PE	3	0	0	3	40	60	100
3	22CSE32	Edge and Fog Computing	PE	3	0	0	3	40	60	100
4	22CSE33	Security and Privacy in cloud	PE	3	0	0	3	40	60	100
5	22CSE34	Devops and Site Reliability Engineering	PE	3	0	0	3	40	60	100
6	22CSE35	Cloud Services Management	PE	3	0	0	3	40	60	100
7	22CSE36	Information Storage Management	PE	3	0	0	3	40	60	100
8	22CSE37	Virtualization	PE	3	0	0	3	40	60	100
	1	Vertical IV : Verticals for Emerging T	echnol	ogies	5				1	
1	22CSE41	Augmented Reality and Virtual Reality	PE	3	0	0	3	40	60	100
2	22CSE42	Human Computer Interaction	PE	3	0	0	3	40	60	100
3	22CSE43	Brain Computer Interface	PE	3	0	0	3	40	60	100
4	22CSE44	Robotics	PE	3	0	0	3	40	60	100
5	22CSE45	Fintech and Block chain Technologies	PE	3	0	0	3	40	60	100
6	22CSE46	Game Development	PE	3	0	0	3	40	60	100
7	22CSE47	3D Printing and Design	PE	3	0	0	3	40	60	100
8	22CSE48	Generative AI	PE	3	0	0	3	40	60	100

	Vertical V : Verticals for Artificial Intelligence and Machine Learning									
1	22CSE51	Knowledge Engineering	PE	3	0	0	3	40	60	100
2	22CSE12	Text and Speech Analysis	PE	3	0	0	3	40	60	100
3	22CSE13	Social Network Analysis	PE	3	0	0	3	40	60	100
4	22CSE52	Prompt Engineering	PE	3	0	0	3	40	60	100
5	22CSE53	Computer Vision	PE	3	0	0	3	40	60	100
6	22CSE54	Natural Language Processing	PE	3	0	0	3	40	60	100
7	22CSE55	Cognitive Science and Analytics	PE	3	0	0	3	40	60	100
8	22CSE56	Deep Learning	PE	3	0	0	3	40	60	100
		Vertical VI : Verticals for Networking and	Cyber	Sec	urity	7				
1	22CSE61	Ad-hoc and Wireless Sensors Networks	PE	3	0	0	3	40	60	100
2	22CSE62	Mobile Communication	PE	3	0	0	3	40	60	100
3	22CSE63	Ethical Hacking	PE	3	0	0	3	40	60	100
4	22CSE33	Security and Privacy in cloud	PE	3	0	0	3	40	60	100
5	22CSE64	Software Defined Networks	PE	3	0	0	3	40	60	100
6	22CSE65	Cyber Forensics	PE	3	0	0	3	40	60	100
7	22CSE66	Embedded Systems and IoT	PE	3	0	0	3	40	60	100
8	22CSE67	Information Security	PE	3	0	0	3	40	60	100

		OPEN ELECTIVES								
S.	Course Code	Course Title	tegory	P	eriod Wee	ls / k	edits	Μ	ax. Ma	arks
INO			Ca	L	Т	Р	C	CA	SE	Tot.
	OF	FERED BY DEPARTMENT OF COMPUTER SCI	ENCE A	AND	EN	GIN	EERI	NG	n	n
1	22CSO01	Foundation of AR and 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
	1	OFFERED BY DEPARTMENT OF BIO MEDI	CAL E	NGI	NEF	ERIN	G			
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 basics and Applications	OE	3	0	0	3	40	60	100
8	22BMO08	Nanotechnology and Applications	OE	3	0	0	3	40	60	100
		ENGI	NEE	RIN	G					
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
	OFFERED	BY DEPARTMENT OF ELECTRONICS AND CO	MMU	NICA	ATI(	ON E	NGIN	NEERI	ING	
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
	OFFER	ED BY DEPARTMENT OF ELECTRICAL AND E	LECTI	RON	ICS	ENC	GINE	ERINO	3	
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
		CAL E	NGI	NEF	ERIN	G		[		
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
		OFFERED BY DEPARTMENT OF MEDICA	L ELE	CTI	RON	ICS				
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
		OFFERED BY DEPARTMENT OF INFORMAT	TION T	ECI	INO	LOC	GΥ			
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								
	OFFER	ED BY DEPARTMENT OF ARTIFICIAL INTELL	IGENC	CE A	ND	DAT	ASC	IENCI	E	
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 SCIENCE	AND H	IUM	ANI	TIE	S			
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

### 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, Moreover, for minor degree the student can register for courses from any one of the following verticals also

Vertical I Fintech and Block Chain	Vertical II Entrepreneurship	Vertical III Public Administration	Vertical IV Business Data Analytics	Vertical V Environmental and Sustainability	Vertical VI Artificial 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	-

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

		MINOR DEGREE COURSES: VER	TIC	ALS					
S.	Course	Course Title	H	lour Wee	s / k	edits	Μ	lax. M	larks
No.	Code		L	Т	Р	Cre	CA	SE	Tot.
		VERTICAL I- FINTECH AND BLOCK	CHA	IN					
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
		VERTICAL II - ENTREPRENEURS	HIP						
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	3	0	0	3	40	60	100	
		VERTICAL III – PUBLIC ADMINISTR	ATI	ON					
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
		VERTICAL IV - BUSINESS DATA ANA	LYT	ICS		[	[	n	
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
		VERTICAL V - ENVIRONMENTAL AND SUS	TAI	ABI	LITY	Y		1	
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 Bio Materials	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 INTELLIGENCE										
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								
S. Course No Code	Course	Course Title	gory	Periods / Week			dits	Max. Marks		
	course rule	Cate	L	Т	Р	Cre	CA	SE	Tot.	
1	22CSV01	R Programming	VAC	0	0	2	1	100	0	100
2	22CSV02	Go Lang	VAC	0	0	2	1	100	0	100
3	22CSV03	Type Script	VAC	0	0	2	1	100	0	100
4	22CSV04	Raspberry Pi	VAC	0	0	2	1	100	0	100
5	22CSV05	Practical Machine Learning with Tensorflow	VAC	0	0	2	1	100	0	100
6	22CSV06	Power BI	VAC	0	0	2	1	100	0	100

	MANDATORY COURSES										
S.	Course	Course Title	tegory	Periods / Week			edits	Max. Marks			
INO	Coue		Cai	L	Т	Р	Cr	CA	SE	Tot.	
1	22MCT01	Induction Programme	MC	-	-	-	-	-	-	100	
2	22MCT02	Universal Human Values - I	MC	1	0	2	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

CA - Continuous Assessment

T - Tutorial Period

SE - Semester Examination

P - Practical Period

Tot - Total Marks

Category	Credits	Minimum contact periods per week	1  Derived = 50
Theory	3	4	Minutes duration
	4	5	Windles duration
Practical	1	3	

#### 22CSL11

#### PYTHON PROGRAMMING LABORATORY

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

(Students admitted during 2024- 25 onwards)

L T P C 0 0 3 1

#### **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)
- 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:

- 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
C01	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	-	-

(Students admitted during 2023-2024 onwards)	
Preamble :	
Communicative English is a life skill necessary for all students of Engineering and Technology. T course Essential English for Professionals aims at enabling the learners to communicate effectively a appropriately in professional contexts by exposing them to LSRW tasks.	'he Ind
UNIT 1 LISTENING	5
Listening to Casual Conversation- Note-Taking on TED Talks – Summarizing UNIT 2 READING	7
Reading for gist - Biographies of Famous Personalities - Reading and Note Making on News Articles	
UNIT 3 WRITING Letter Writing - Seeking Permission- Seeking Apology - Letters Requesting Certificates – Analytical Writing and Issue based writing	5
UNIT 4 SPEAKING	9
Presentation Techniques - Presentation with visual aids – Extempore and Impromptu talk	
UNIT 5 VERBAL ABILITY	4
Parajumbles - Sentence Completion - Identifying Common Errors	
DEFEDENCES: TOTAL: 30 PERIC	ODS

**ENGLISH FOR PROFESSIONALS** 

(III / IV Semester)

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

### e. RESOURCES :

22MCL04

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

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 to professional 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	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	-	-

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

LTPC

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### **COMPUTER NETWORKS**

### 22CST51

### **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).

### **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", Fifth Edition, Tata McGraw Hill, Reprint 2017.

### **REFERENCES:**

1. William Stallings, "Data Communication and Networks", Pearson Education, Tenth edition, 2014.

2. James.F. Kurouse& W. Rouse, "Computer Networking: A Topdown Approach

Featuring", Seventh dition, Pearson Education, 2016.

3. William Stallings, "Data Communication and Networks", Pearson Education, Tenth edition, 2014. 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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**TOTAL : 45 PERIODS** 

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

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

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

### Mapping of COs with POs and PSOs

### THEORY OF COMPUTATIONS

### LTPC 3104

### **Preamble:**

22CST52

The course aims to familiarize the various Computing models like Finite State Machine, Pushdown Automata and Turing Machine and impart the knowledge in types of grammars.

#### **UNIT 1** AUTOMATA

Formal proof – Additional forms of proof – Inductive proofs –Finite Automata (FA) –Deterministic Finite Automata (DFA) - Non-deterministic Finite Automata (NFA) - Finite Automata with Epsilon transitions.

#### **REGULAR EXPRESSIONS AND LANGUAGES** UNIT 2

Regular Expression – FA and Regular Expressions – Moore machine and Mealy machine-Closure properties of regular languages - Equivalence and minimization of Automata - Pumping Lemma forRegular sets .

#### UNIT 3 **GRAMMARS**

Grammar Introduction-Types of Grammar - Context Free Grammars and Languages-Parse Trees -Ambiguity in grammars and languages - Relationship between derivation and derivation trees - Normal forms for CFG : Elimination of Useless symbols - Unit productions - Null productions - Chomsky normal form- Greibach Normal form.

#### PUSHDOWN AUTOMATA AND TURING MACHINES UNIT 4

Pushdown automata - Languages of a Pushdown Automata - Equivalence of Pushdown automata and CFG- Deterministic Pushdown Automata -Pumping Lemma for CFL-Closure properties of CFL -Turing Machines – Programming Techniques for TM.

#### UNIT 5 DECIDABILITY AND UNDECIDABILITY

A Language that is not recursively enumerable(RE)- An undecidable program that is RE-UndecidableProblems about Turing Machines- Post's Correspondence Problem-The classes Pand NP. Case Study:Pattern matching for mobilephone, gmail.

### **TOTAL(L:45+T:15) : 60 PERIODS**

### **TEXT BOOK:**

- Hopcroft J.E., Motwani.R and Ullman. J.D., "Introduction to Automata Theory, Languages and 1. Computations", Second Edition, Pearson Education, 2012.
- Harry R Lewis and Christos H Papadimitriou, "Elements of the Theory of Computation", 2. Second Edition, Prentice Hall of India, Pearson Education, New Delhi, 2015.

### **REFERENCES:**

- MichealSipser, "Introduction of the Theory and Computation", Third Edition, Cengage 1. Learning India Private Limited, 1997.
- Mishra K.L.P and Chandrasekaran N, "Theory of Computer Science Automata, Languages and 2. Computation", Third Edition, Prentice Hall of India Learning India Private Limited, 2009.

VCET, B.E-CSE, R2022 - Curriculum and Syllabus

- Kamala Krithivasan and Rama. R, "Introduction to Formal Languages, Automata Theory and 3. Computation", Pearson Education, 2011.

### 9+3

## 10+3

## 10+3

# 7+3

9+3

### e-RESOURCES:

- 1. http://nptel.ac.in/courses/ 106104148, Theory of Computation, RaghunathTewari, IIT Kanpur.
- 2. Handouts: https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-
- 2. 045jautomata-computability-and-complexity-spring-2011/lecture-notes/

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

- 1. Translate the given FA into deterministic and non-deterministic finite automata using Minimization Techniques.
- 2. Examine the given language is regular or not using Pumping Lemma and Minimization technique.
- 3. Formulate Chomsky and Greibach Normal form for the given regular expression using simplification Techniques.
- 4. Construct pushdown automata for the given Context Free Grammar or Context Free Language using Pumping Lemma technique.
- 5. Apply programming techniques involved in turing machine to solve decidable and undecidable problems to achieve efficiency.

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	-	2
CO2	2	3	2	-	-	-	-	-	-	-	-	1	-	2
CO3	2	3	2	-	-	-	-	-	-	-	-	1	-	2
CO4	2	3	2	-	-	-	-	-	-	-	-	1	-	2
CO5	2	3	2	-	-	-	-	-	-	-	-	1	-	2

### Mapping of COs with POs and PSOs

### 22CST53 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING L T P

### Pre-requisites : Nil

### Preamble

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 1 PROBLEM SOLVING

Introduction to AI - AI Applications - Problem solving agents – search algorithms – uninformed search strategies – Heuristic search strategies – Local search and optimization problems – adversarial search – constraint satisfaction problems (CSP)

### UNIT 2 PROBABILISTIC REASONING

Acting under uncertainty – Bayesian inference – naïve bayes models. Probabilistic reasoning – Bayesian networks – exact inference in BN – approximate inference in BN – causal networks- case study: Emails that are either SPAM or HAM

### UNIT 3 SUPERVISED LEARNING

Introduction to machine learning – Linear Regression Models: Least squares, single & multiple variables, Bayesian linear regression, gradient descent, Linear Classification Models: Discriminant function – Probabilistic discriminative model - Logistic regression, Probabilistic generative model – Naive Bayes, Maximum margin classifier – Support vector machine, Decision Tree, Random forests.

### UNIT 4 NEURAL NETWORKS

Perceptron - Multilayer perceptron, activation functions, network training – gradient descent optimization – stochastic gradient descent, error backpropagation, from shallow networks to deep networks –Unit saturation (aka the vanishing gradient problem) – ReLU, hyperparameter tuning, batch normalization, regularization, dropout.

### UNIT 5 ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING

Combining multiple learners: Model combination schemes, Voting, Ensemble Learning - bagging, boosting, stacking, Unsupervised learning: K-means, Instance Based Learning: KNN, Gaussian mixture models and Expectation maximization- case study on decision-making in selected multinational enterprises.

### **TEXT BOOKS:**

- 1. Stuart Russell and Peter Norvig, "Artificial Intelligence A Modern Approach", Fourth Edition, Pearson Education, 2021.
- 2. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020. **REFERENCES:**
- 1. Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill Education, 2013
- 2. Ian Goodfellow, Yoshua Bengio, AaronCourville, Deep Learning", MIT Press, 2016

### e-RESOURCES:

- 1. An Introduction to Artificial Intelligence, IIT Delhi, By Prof. Mausam, https://onlinecourses. nptel.ac.in/noc22\_cs56
- 2. Introduction to Machine Learning, By Prof. Balaraman Ravindran IIT Madras,

### Total : 45 PERIODS

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

- CO1 Summarize the main concepts and use appropriate search algorithms for problem solving
- CO2 Develop the ability to understand and use apply reasoning under uncertainty
- CO3 Interpret the role of build supervised learning models
- CO4 Examine the core issues with several deep learning NN model
- CO5 Experiment with ensembling and unsupervised models

Cos/POs	PO 1	PO 2	PO 3	<b>PO</b> 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	-	-	-	-	1	3	3	3	1	2
CO2	1	1	1	3	1	-	-	-	1	2	1	3	2	2
CO3	2	1	2	1	1	-	-	-	2	1	1	3	1	1
CO4	3	1	3	1	-	-	-	-	2	1	2	1	2	2
CO5	3	1	1	2	2	-	-	-	3	1	2	3	2	2

### Mapping of COs with POs and PSOs

### **Preamble:**

The course aims to provide a development of socket programming, simulation of Stop & Wait, Go back-N, Selective Repeat protocols and Distance Vector Routing algorithm along with the simulation of point-to-point and local area network using Cisco packet tracer.

### LIST OF EXPERIMENTS

- 1. Study of Network simulator 2 (NS2).
- 2. Implementation of Various Topologies using NS2 Simulator.
- 3. Bit Stuffing and CRC computation.
- 4. Socket program to implement echoclientandechoserver using TCP
- 5. Socket program to contact a given DNS server to resolve a given host name using UDP
- 6. Program to simulate Stop & Wait protocol.
- 7. Implementation of Sliding Window Protocol.
- 8. Program to simulate Distance Vector Routing algorithm.
- Case Study using Cisco Packet Tracer. Establish and test communication within a Local Area Network (LAN) using IP addressing, ARP, and basic network commands.
- 10. Establish a LAN in Cisco Packet Tracer and perform traffic analysis for FTP using TrafficGenerator.

### **TOTAL:45 PERIODS**

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

- 1. Simulate the network topologies using NS2 for data communication.
- 2. Experiment Automatic Repeat Request protocols (Stop and Wait, Go back-N and Selective Repeat) using the appropriate elements and packages in Socket programming.
- 3. Develop a java program to find shortest path using Distance Vector for a given scenario.
- 4. Write a java socket program for simulating TCP communication and UDP communication.
- 5. Create a Point-to-Point Network and Local Area Network using CISCO Packet Tracer.

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	3	3	-	-	-	1	-	-	1	3	3
CO2	3	3	2	3	3	-	-	-	1	-	-	1	3	1
CO3	3	3	2	3	3	-	-	-	1	-	-	1	3	1
CO4	3	3	2	3	3	-	-	-	1	-	-	1	3	1
CO5	3	3	2	3	3	-	-	-	1	-	-	1	3	3

### Mapping of COs with POs and PSOs

#### 22CSL52 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LABORATORY L T P C 0 0 2 1

### Preamble:

The lab focuses on the recent advances in sub-areas of Artificial Intelligence and Machine Learning (AI and ML). The major thrust areas of current research include Computer Vision, Neural Architecture Search, Medical Image Computing, and Probabilistic Machine Learning. Besides research, the lab provides a strong foundation on Machine Learning to students and industry professionals by offering courses and labs in Machine Learning and related areas. Moreover, the lab provides a thorough understanding of the recent advances in Computer Vision, Deep Learning, and Statistical Computing.

### LIST OF EXPERIMENTS

- 1. Implementation of Uninformed search algorithms (BFS & DFS)
- 2. Implementation of Informed search algorithms (A\*, memory-bounded A\*)
- 3. Implement naïve Bayes models
- 4. Implement Bayesian Networks
- 5. Build Regression models
- 6. Build SVM models
- 7. Implement ensembling techniques
- 8. Implement clustering algorithms
- 9. Implement EM for Bayesian networks
- 10. Build simple and deep learning NN models

### Tools:

Python, Numpy, Scipy, Matplotlib, Pandas, statmodels, seaborn, plotly, bokeh Note: Example data sets like: UCI, Iris, Pima Indians Diabetes etc.

### **TOTAL: 45 PERIODS**

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

- CO1 Implement uninformed and informed search techniques
- CO2 Build a knowledge base in Prolog and process queries to perform inference
- CO3 Develop supervised learning models
- CO4 Develop regression models
- CO5 Compare and evaluate the performance of different models

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

### Mapping of COs with POs and PSOs

### APTITUDE AND LOGICAL REASONING

### 22MCT05

### **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	st	
UNIT 5	Logical Reasoning		6
	Direction Sense, Seating Arrangements, Coding and Decoding		
	Т	OTAL :	<b>30 PERIODS</b>

### **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

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

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	-	-

#### Mapping of COs with POs and PSOs

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**TOTAL: 30 PERIODS** 

### Preamble :

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 professional success and progress.

### UNIT 1 RECEPTIVE SKILLS

LISTENING & READING – Developing Listening & Reading Skills - Comprehension and Analysis – Listening & Reading for Main Idea - Specific Information - Cloze Test- Rearranging words and sentences UNIT 2 PRODUCTIVE SKILLS 8

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

UNIT 3ENGLISH FOR NATIONAL AND INTERNATIONAL EXAMINATIONS4Orientation to International English Language Testing System (IELTS) and other Competitive4Examinations – MCQs4

### 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, 2<sup>st</sup> Edition, New Delhi, 2018.
- 2. Koneru Aruna 'Professional Communication' MC Graw Hill Education, Chennai, 2008.
- 3. Upadhyay Meenakshi & Arun Sharma 'Comprehension Interpersonal & Communication Skills for General Studies Civil Services Preliminary Examination' MC Graw Hill Education, New Delhi, 2012.

### e. RESOURCES :

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

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

- **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	-	-

## 22CST61 Preamble:

The course aims to provide Understanding of the Phases of compiler, grouping of phases, familiarize the computing models of finite automata, parsing techniques, and impart the knowledge in design principles of a Compiler, optimization techniques, generation of machine codes.

#### UNIT 1 **INTRODUCTION TO COMPILERS**

Translators - Compilation and Interpretation - Language processors - The Phases of Compiler - Errors Encountered in Different Phases- Cousins of compiler - The Grouping of Phases-Compiler Construction Tools -Need and Role of Lexical Analyzer - Input Buffering. 9

#### UNIT 2 LEXICAL ANALYSIS

Specification and Recognition of Tokens -Lexical Errors - Finite automata- Regular Expression - Converting Regular Expression to DFA- Minimization of DFA - Language for Specifying Lexical Analyzers- Optimization of DFA based Pattern Matchers - LEX - Design of Lexical Analyzer for a sample Language.

#### SYNTAX ANALYSIS UNIT 3

Need and Role of the Parser - Context Free Grammars -Top Down Parsing -General Strategies-Recursive Descent Parser - Predictive Parser - Bottom up parsing-Shift Reduce Parser - LR Parser-SLR Parser - Canonical LR Parser - LALR Parser - Error Handling and Recovery in Syntax Analyzer- YACC-Design of a syntax Analyzer for a Sample Language.

#### UNIT 4 **INTERMEDIATE CODE GENERATION**

Syntax directed Definitions-Construction of Syntax Tree - Intermediate languages-Declarations- Assignment statements - Boolean expressions- Case statements - Back patching - Procedure calls.

CODE OPTIMIZATION AND CODE GENERATION UNIT 5 Runtime Storage management - Principal Sources of Optimization - DAG - Basic Blocks and Optimization-Loop Optimization-Flow Graphs - Next use Information - Issues in Design of a Code Generator - The target machine - A Simple Code Generator.

### **TOTAL : 45 PERIODS**

## **TEXT BOOK:**

- Alfred V Aho, Monica S. Lam, Ravi Sethi and Jeffrey D Ullman, "Compilers Principles, Techniques and 1. Tools", 2nd Edition, Pearson Education, 2007.
- Randy Allen, Ken Kennedy, "Optimizing Compilers for Modern Architectures: ADependence-based 2. Approach", 1st Edition, Morgan Kaufmann Publishers, 2002.

### **REFERENCES:**

- Steven S. Muchnick, "Advanced Compiler Design and Implementation," 1st Edition, Morgan Kaufmann 1. Publishers - Elsevier Science, India, Indian Reprint 2003.
- Keith D Cooper and Linda Torczon, "Engineering a Compiler", 2nd Edition, Morgan Kaufmann 2. Publishers Elsevier Science, 2011.
- Charles N. Fischer, Richard. J. LeBlanc, "Crafting a Compiler with C", 1st Edition, 3. PearsonEducation,2008.

## e-RESOURCES:

http://nptel.ac.in/courses/106108113/2, Principles of Compiler Design, Y.N. Srikant, IISc Bangalore. 1.

VCET, B.E-CSE, R2022 - Curriculum and Syllabus

http://nptel.ac.in/courses/106104072/ui/Course home-2.htm, Compiler Design ,Prof. Sanjeev Κ 2. Aggarwal, IIT Kanpur.

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

- 1. Explain the phases of compiler for a given input and write context free grammars, regular expressions for a given language using LEX tool.
- 2. Determine NFA, DFA for a given regular expression using subset construction algorithm, Thompson's algorithm and Minimization algorithm.
- 3. Construct parsing tables for a given CFG grammar using appropriate bottom up and top down parsing techniques and parse a given input string using YACC tool.
- 4. Write the syntax directed translation schemes for the Context Free Grammar to form an intermediate languages.
- 5. Apply suitable optimization technique and code generation algorithm for a given code snippet to generate efficient and optimized code.

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	-	3
CO2	3	2	2	2	1	-	-	-	-	1	-	1	1	3
CO3	3	2	2	2	1	-	-	-	-	1	-	1	1	3
CO4	3	2	2	2	1	-	-	-	-	1	-	1	-	3
CO5	3	2	2	2	1	-	-	-	-	1	-	1	1	3

### Mapping of COs with POs and PSOs
## **Pre-requisites: Foundations of Data Science**

#### **Preamble:**

22CST62

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 JasperReports to create database.

#### UNIT I **INTRODUCTION TO BIG DATA**

Types Of Digital Data-Characteristics 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.

#### UNIT III **INTRODUCTION TO HADOOP**

Introducing Hadoop: RDBMS versus Hadoop-Distributed Computing Challenges- History of Hadoop - Hadoop Overview -Hadoop Distributors- Hadoop Distributed File System-Single node and Multi node configuration-Processing Data with Hadoop-Managing Resources and Application with Hadoop YARN-Interacting with Hadoop Ecosystem.

#### **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. Case Study: Connecting to MongoDB NoSQL Database.

#### 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. Write a map reduce program to find unit wise salary.
- 5. CRUD(Create, Read, Update, and Delete)operations in MongoDB.
- 6. 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.
- 7. Top N and bottom N view on the worksheet in any kind of datasets using tableau visualization tools.

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

#### TOTAL : (L:45+P:15) 60 PERIODS

## **TEXT BOOKS:**

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

## **REFERENCES:**

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

#### e-RESOURCES:

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

VCET, B.E-CSE, R2022 - Curriculum and Syllabus

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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	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	2	2	-	-	-	-	-	-	-	3	2
CO2	3	2	2	2	2	-	-	-	-	-	-	-	3	2
CO3	3	2	2	2	2	-	-	-	-	-	-	-	3	2
CO4	3	2	2	2	2	-	-	-	-	-	-	-	3	2
CO5	3	2	2	2	2	-	-	-	-	-	-	-	3	2

#### MOBILE APPLICATION DEVELOPMENT

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#### **Preamble:**

Mobile Application Development is designed to impart the knowledge on application development framework and tools for creating android applications. It also equips the students to design, implement and deploy applications in mobile devices.

#### UNIT 1 **GETTING STARTED WITH ANDROID**

Android - Evolution of Android - Android architecture - Features- Core building blocks - Anatomy of android application - Android activity life cycle. Android Toast. Android Widgets: Button - TextView - EditText-RadioGroup -ToggleButton - CheckBox - Spinner - DatePicker - Progress Bar - DialogBox.

#### UNIT 2 INTENTS, LAYOUTS AND TELEPHONY

Intent - Types of Intent - Launching Activities using Intents. Layout: Relative Layout - Table Layout - Linear Layout - ListView - GridView - CardView. Android Telephony: Phone call -send Mail- Send SMS.

#### MENUS, NOTIFICATION AND MULTIMEDIA UNIT 3

Menus - Option Menu - Adding and Updating menu items - Handling menu items. Android Notification. Multimedia in Android: Android camera – Android Audio player – Android Video player.

#### DATABASE AND CONTENT PROVIDERS UNIT 4

Storage types in Android - Android SQLite Database - Firebase Login - Firebase authentication. Parsing in android - Android JSON parser - Connecting Android with MySQL using API - Android Google Map - Finding Current location. 9

#### UNIT 5 HYBRID APP DEVELOPMENT

Apache Cordova- Architecture of Apache Cordova - Building simple App using Apache Cordova- Publish the app on app store: Monetizing, promoting and distributing applications. React Native: Overview and its features.

#### TOTAL : **45 PERIODS**

#### **TEXT BOOKS:**

- Reto Meier, "Professional Android 4 Application Development", Wiley India Pvt. Ltd, New Delhi 2014. 1.
- John M. Wargo, "Apache Cordova API Cookbook", Pearson Education 2015. 2.

#### **REFERENCES:**

- ZiguardMedneiks, Laird Dornin G, Blake Meike and Masumi Nakamura, "Programming Android", 1. O'Reily,2013.
- Anubhav Pradhan and Anil V Deshpande, "Composing Mobile Apps", First Edition, Wiley India Pvt. Ltd, 2. 2014.
- 3. Charlie Collins, Michael Galpin and Matthias Kappler, "Android in Practice", Manning Publications, 2012.

#### e-RESOURCES:

- https://nptel.ac.in/courses/106/106/106106147/, "Mobile Computing Starting Android Programming", 1 Professor Pushpendra Singh, IIT- Madras.
- https://nptel.ac.in/courses/106/106/106106222/, "Introduction to Modern Application Development", Prof. 2. Madhavan Mukund, Prof. AbhijatVichare and Prof. Aamod Sane, IIT- Madras.

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

- 1. Develop mobile application for the given user requirement using android development framework and tools.
- 2. Create android applications using views, layouts, intents and SMS Manager API to send SMS and E-mails.
- 3. Create menu, notifications and multimedia features for the applications using android Notification Manager

and Multimedia APIs.

- 4. Create databases for the applications to store and retrieve data using SQLite and Firebase.
- 5. Create mobile applications using standard web technologies such as HTML5, CSS3 and JavaScript for androidand iOS 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	1	2	3	2	1	-	1	-	-	-	-	2	1	2
CO2	1	2	3	2	1	-	1	-	-	-	-	2	1	2
CO3	1	2	3	2	1	-	1	-	-	-	-	2	1	2
CO4	1	2	3	2	1	-	1	-	-	-	-	2	1	2
CO5	1	2	3	2	1	-	1	-	-	-	-	2	1	2

#### Mapping of COs with POs and PSOs

# 22CSL61MOBILE APPLICATION DEVELOPMENT LABORATORYL T P C0 0 2 1

#### Preamble:

Mobile Application Development equips the students to design, implement and deploy various applications in mobile devices. Students can design and develop useful applications for android platforms with interactive user interfaces using application frameworks and in built APIs.

#### LIST OF EXPERIMENTS

- 1. Setting up Android Platform, Android Virtual Device and create application to display Welcome Message.
- 2. Build a Score Keeper App that gives a user the ability to keep track of the score of two different teams playing a game of choice. Include different Buttons which can be clicked for different events in the game to add points.
- 3. Create a Musical Structure App to store and present the user with the library of songs available indifferent categories of classical and Melodies. Write code to play the song chosen by the user from the library of Music.
- 4. Create an application to calculate the Electricity Bill and create an appropriate Alert Message as well as send the value to the given mobile number using SMS.
- 5. Write an android program to demonstrate a Menu 'File' with New and Open as menu items. Give Toast messages on click of each menu item.
- 6. Create an application to fetch the Current Location Information (Latitude and longitude) and display it in the Alert Message.
- 7. Write an android program to implement the following operations using SQLiteDatabase.
  - Create the SQLite Database Object.
  - Execute the CRUD Operations required for the application.
  - Close the Database.
- 8. Develop an application to implement Phone Number Verification by OTP using Firebase in Android.
- 9. Create an application to extract employee information from the JSON message and load it in UI.

10. Develop the following mobile application using android & iOS Platforms

- EducationQuizApp
- TourGuideApp
- NewsFeedApp

## **TOTAL: 45 PERIODS**

#### **Course Outcomes:**

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

- 1. Develop mobile applications using android widgets, layout managers, event listeners, list view, menus, activities and intents for the given problem statements.
- 2. Implement an android application to track the current location, to send SMS and verifying OTP using GPS, SMS Manager, and Firebase respectively.
- 3. Develop an android application for storing and updating data using SQLite and Firebase database.
- 4. Create an application to extract information from the given JSON message using JSON objects.
- 5. Create Mobile Applications using standard Web Technologies such as HTML5, CSS3 and JavaScript for Android and iOS 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	2	2	3	3	1	-	1	-	1	-	-	-	3	2
CO2	2	2	3	3	1	-	1	-	1	-	-	-	3	2
CO3	2	2	3	3	1	-	1	-	1	-	-	-	3	2
CO4	2	2	3	3	1	-	1	-	1	-	-	-	3	2
CO5	2	2	3	3	1	-	1	-	1	-	-	-	3	2

#### Mapping of COs with POs and PSOs:

#### **MINI PROJECT**

#### **Preamble:**

This course enhances the knowledge acquired in computer science and engineering 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.
- 2. Investigate the identified problem and review state of the art literature survey to synthesis system requirements
- 3. Identify the risk/impact/technique and interpret the suitable standards related to the problem 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.

COs/POs	PO 1	<b>PO</b> 2	PO 3	PO 4	PO 5	PO 6	<b>PO</b> 7	PO 8	PO 9	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

#### Mapping of COs with POs and PSOs

#### 22CST71 ECONOMICS AND MANAGEMENT FOR ENGINEERS

#### **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 toEconomics – Scope of Economics – Positive and Normative Science – Methodology of Economics – Economic Laws - Economy and its basic problems: Economy and its working – Kinds of 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 CostOutput Relations – Long Run Cost output relations – Economics of Scale. UNIT 4 INTRODUCTION TO MANAGEMENT 9

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:**

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

#### **REFERENCES:**

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

#### e-RESOURCES:

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

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**TOTAL : 45 PERIODS** 

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

- 1. Summarize how to solve economics principles to solve economic problems in engineering discipline by satisfying the economic laws.
- 2. Discuss the demand and supply process for a market analysis using Price elasticity, Cross elasticity and Income elasticity.
- 3. Interpret short run and long run costs in the process of production for carrying out a business.
- 4. Apply managerial skills to make decisions and solve problems for achieving organizational objectives.
- 5. Express the principles of effective planning for survival and success of all organizations using standing and single use planning methods.

COs/POs	PO 1	<b>PO</b> 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	-	2	1	-	-	-	2	1	-	-
CO2	1	3	-	2	-	2	1	-	-	-	2	1	-	-
CO3	1	3	-	2	-	2	1	-	-	-	2	1	-	-
CO4	1	3	-	1	-	2	1	-	-	-	2	1	-	-
CO5	1	3	-	1	-	2	1	2	-	-	2	1	-	-

#### Mapping of COs with POs and PSOs

#### **CRYPTOGRAPHY AND CYBER SECURITY** 22CST72 L Т 0

#### **Pre-requisites : Nil**

#### Preamble

Cryptography is the study of information and communication security. This course deals with prevailing weaknesses, vulnerabilities, attack methods and mitigation approaches in network security. The course focuses on Authentication, authorization, confidentiality, data integrity and nonrepudiation, real time network and cyber security protocols and system security issues. It is the practice of protecting systems, programs and networks from digital attacks. These cyber attacks are usually aimed at changing, accessing or destroying sensitive information, interrupting normal business processes, extorting money from users. Cryptography and Cyber Security are integral part of the organization's security services.

## **UNIT 1 INTRODUCTION TO SECURITY**

Computer Security Concepts - The OSI Security Architecture - Security Attacks - Security Services and Mechanisms - A Model for Network Security - Classical encryption techniques: Substitution techniques, Transposition techniques, Steganography – Foundations of modern cryptography: Perfect security – Information Theory – Product Cryptosystem – Cryptanalysis.

## **UNIT 2 SYMMETRIC CIPHERS**

Number theory - Algebraic Structures - Modular Arithmetic - Euclid's algorithm - Congruence and matrices -Group, Rings, Fields, Finite Fields

SYMMETRIC KEY CIPHERS: SDES - Block Ciphers - DES, Strength of DES - Differential and linear cryptanalysis - Block cipher design principles - Block cipher mode of operation - Evaluation criteria for AES -Pseudorandom Number Generators – RC4 – Key distribution

## UNIT 3 ASYMMETRIC CRYPTOGRAPHY

MATHEMATICS OF ASYMMETRIC KEY CRYPTOGRAPHY: Primes - Primality Testing - Factorization -Euler's totient function, Fermat's and Euler's Theorem - Chinese Remainder Theorem - Exponentiation and logarithm

ASYMMETRIC KEY CIPHERS: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange -- Elliptic curve arithmetic - Elliptic curve cryptography.

## **UNIT 4 INTEGRITY AND AUTHENTICATION ALGORITHMS**

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function: HMAC, CMAC - SHA-3 - Digital signature and authentication protocols - DSS - Schnorr Digital Signature Scheme - ElGamal cryptosystem - Entity Authentication: Biometrics, Passwords, Challenge Response protocols - Authentication applications - Kerberos

MUTUAL TRUST: Key management and distribution - Symmetric key distribution using symmetric and asymmetric encryption – Distribution of public keys – X.509 Certificates

## UNIT 5 CYBER CRIMES AND CYBER SECURITY

Cyber Crime and Information Security - classifications of Cyber Crimes - Tools and Methods - Password Cracking, Keyloggers, Spywares, SQL Injection - Network Access Control - Cloud Security - Web Security -Wireless Security

## **Total: 45 PERIODS**

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#### **TEXT BOOKS:**

- 1. William Stallings, "Cryptography and Network Security Principles and Practice", 8<sup>th</sup> Edition, Pearson Education, 2023.
- 2. Nina Godbole, Sunit Belapure, "Cyber Security: Understanding Cyber crimes, Computer Forensics and Legal Perspectives", First Edition, Wiley India, 2011.

#### **REFERENCES:**

- 1. Behrouz A. Ferouzan, Debdeep Mukhopadhyay, "Cryptography and Network Security", 3rd Edition, Tata Mc Graw Hill, 2015.
- 2. Charles Pfleeger, Shari Pfleeger, Jonathan Margulies, "Security in Computing", Fifth Edition, Prentice Hall, New Delhi, 2015.

#### e-RESOURCES:

- 1. An Introduction to cryptography, IIT Kharagpur, By Prof. Sourav Mukhopadhyay, https://onlinecourses.nptel.ac.in/noc22\_cs90/preview
- 2. Introduction to Cyber Security, https://onlinecourses.nptel.ac.in/noc23\_cs127/preview By Prof. Saji K Mathew IIT Madras,

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

- CO1 Understand the fundamentals of networks security, security architecture, threats and vulnerabilities
- CO2 Apply the different cryptographic operations of symmetric cryptographic algorithms
- CO3 Apply the different cryptographic operations of public key cryptography
- CO4 Apply the various Authentication schemes to simulate different applications
- CO5 Understand various cyber crimes and cyber security

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

#### Mapping of COs with POs and PSOs

22HST71

# HUMAN VALUES AND PROFESSIONAL ETHICS

(Common to All Programmes)

**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 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 : 45 PERIODS**

#### **TEXT BOOKS:**

- 1. Gaur R R, Sangal R, Bagaria G P, "A Foundation Course in Human Values and Professional Ethics". 2009
- 2. Govindarajan M, Natarajan S and Senthil Kumar V. S, "Engineering Ethics", PHI Learning Pvt. Ltd, New Delhi, 2017.

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#### **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.

#### e-RESOURCES:

- 1. https://www.uhv.org.in/
- 2. https://nptel.ac.in/courses/109/106/109106117/

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

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

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

#### Mapping of COs with POs and PSOs

#### **Preamble:**

This laboratory course is intended to expose the students to different cipher techniques and to implement algorithms like DES, RSA, MD5, SHA-1 and Defeating Malware using Java programming language/Python programming language.

## LIST OF EXPERIMENTS:

- 1. Implement the following Substitution & Transposition Techniques
  - a) Caesar Cipher
  - b) Playfair Cipher
  - c) Hill Cipher
- 2. Implement the following algorithms
  - a) DES
  - b) RSA Algorithm
  - c) Diffiee-Hellman
  - d) MD5
  - e) SHA-3
  - f) ECC
- 2. Implement the Signature Scheme Digital Signature Standard
- 3. Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures (GnuPG).
- 4. Setup a honey pot and monitor the honeypot on network (KF Sensor)
- 5. Installation of rootkits and study about the variety of options
- 6. Perform wireless audit on an access point or a router and decrypt WEP and WPA.( Net Stumbler)
- 7. Demonstrate intrusion detection system (ids) using any tool (snort or any other s/w)
- 8. Defeating Malware i) Building Trojans ii) Rootkit Hunter

#### **TOTAL : 45 PERIODS**

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

- 1. Implement and test symmetric and asymmetric cipher techniques using Java/Python.
- 2. Implement digital signature standard and verify the authentication process using Java/Python.
- 3. Implement and test digital signature standard using GnuPG
- 4. Implement and test honey pot using KF Sensor.
- 5. Implement and test IDS and WEP, WPA using snort, Defeating Malware and Net stumbler respectively

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

Mapping of COs with POs and PSOs

#### 22MCT07 INDIAN CONSTITUTION AND TRADITIONAL KNOWLEDGE L T P C

#### **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

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'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, Rajya Sabha

#### 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

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

#### 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

Basics 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:**

- 1. M.Rajaram, Indian Constitution, New Age International, 2009.
- V.Sivaramakrishnan(Ed.) Cultural Heritage of India (Course Material), Bharatiya Vidya Bhavan, Mumbai, 5<sup>th</sup>Edition, 2014.

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

- 1. Outline the evolution of Indian constitution and Federal structure
- 2. List and explain the functions of Centre, States and District Administrations
- 3. Elaborate the roles of Panchayat raj
- 4. Explain the powers and roles of Election Commission
- 5. Illustrate the Indian traditional knowledge and elucidate their recovery

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	1	1	-	1	-	-
CO2	-	-	-	-	-	3	1	2	1	1	-	1	-	-
CO3	-	-	-	-	-	3	1	2	1	1	-	1	-	-
CO4	-	-	-	-	-	3	1	2	1	1	-	1	-	-
CO5	-	-	-	-	-	3	1	2	1	1	-	1	-	-

Mapping of COs with POs and PSOs

#### **INTERNSHIP**

Pre-requisites: Knowledge of Computer Science and Engineering

#### Preamble

Internships are educational and career development opportunities, providing practical experience in a field or discipline. Internships are far more important, as employers arelooking 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 Computer Science and Engineering 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

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

- 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 Computer Science and Engineering 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	PSO 1	PSO 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

#### 22CSL82

#### **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

- 1. Apply engineering fundamentals to analyze domain specific Issues to identify problem statement with objective and scope.
- 2. Investigate the identified problem and review state of the art literature survey to synthesis system requirements.
- 3. Identify the risk/impact/technique and interpret the suitable standards related to the problem 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.

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	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

#### Mapping of COs with POs and PSOs

# PROFESSIONAL ELECTIVES

#### UNIT 1 **EXPLORATORY DATA ANALYSIS**

22CSE11

Preamble

data.

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.

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

EXPLORATORY DATA ANALYSIS

#### UNIT 2 **EDA USING PYTHON**

**Pre-requisites :** Python Programming

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.

## **TEXT BOOKS:**

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

## **REFERENCES:**

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

## e-RESOURCES:

https://analyticsindiamag.com/ 1.

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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 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 Perform univariate data exploration and analysis.
- CO4 Apply bivariate data exploration and analysis.
- CO5 Apply Data exploration and visualization techniques for multivariate and time series data using Pandas.

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

#### Mapping of COs with POs and PSOs

#### **Pre-requisites : Neural Networks and 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.

#### NATURAL LANGUAGE BASICS UNIT 1

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.

#### **TEXT-TO-SPEECH SYNTHESIS** UNIT 4

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.

## **Total : 45 Periods**

22CSE12

## **TEXT BOOKS:**

Daniel Jurafsky and James H. Martin, "Speech and Language Processing: An Introduction to

- Natural Language Processing, Computational Linguistics, and Speech Recognition", Third Edition, 1. 2022.
- Dipanjan Sarkar, "Text Analytics with Python: A Practical Real-World approach to Gaining 2. Actionable insights from your data", APress, 2018

## **REFERENCES:**

- Tanveer Siddiqui, Tiwary U S, "Natural Language Processing and Information Retrieval", Oxford 1. University Press, 2008.
- Lawrence Rabiner, Biing-Hwang Juang, B. Yegnanarayana, "Fundamentals of Speech 2. Recognition" 1st Edition, Pearson, 2009.

## e-RESOURCES:

- https://nptel.ac.in/courses/106101007,"Natural Language Processing", Prof. Pushpak Bhattacharyya, IIT 1. Bombay.
- https://nptel.ac.in/courses/106105158," Natural Language Processing", Prof. Pawan Goyal, IIT Kharagpur. 2.

VCET, B.E-CSE, R2022 - Curriculum and Syllabus

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

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

#### Mapping of COs with POs and PSOs

#### **Preamble:**

The main aim of this course is to understand the concepts of Social Networks with respect to the information extracted from the social media. This course makes the students to analyze and mine thesocial network to predict the human behavior by representing the relationships between the users. This course will enable the students to visualize and represent the social network using the available representations.

#### UNIT 1 INTRODUCTION

Social Network Analysis: Definition and Features – The Development of Social Network Analysis – Basic Graph Theoretical Concepts of Social Network Analysis – Ties, Density, Path, Length, Distance, Betweenness, Centrality, Clique – Electronic Sources for Network Analysis – Electronic Discussion Networks, Blogs and Online Communities, Web-based Networks – Applications of Social Network Analysis.

#### UNIT 2 SOCIAL NETWORK ANALYSIS

Introduction to Social Networks Profiles – Types of Commercial Social Network Profiles (CSNP) – Quantitative and Qualitative Analysis of CSNP – Analysis of Social Networks Extracted from Log Files – Data Mining Methods Related to SNA and Log Mining – Clustering Techniques – CaseStudy.

#### UNIT 3 SEMANTIC TECHNOLOGY FOR SOCIAL NETWORK ANALYSIS

Introduction to Ontology based Knowledge Representation – Ontology Languages for the Semantic Web – RDF and OWL – Modeling Social Network Data – Network Data Representation, Ontological Representation of Social Individuals and Relationships – Aggregating and Reasoning with Social Network Data – Advanced Representations.

#### UNIT 4 SOCIAL NETWORK MINING

Detecting and Discovering Communities in Social Network: Evaluating Communities – Methods for Community Detection – Applications of Community Mining Algorithms –Ethical Practices in Social Network Mining – Understanding and Predicting Human Behavior for Social Communities – Decentralized Online Social Networks – Multi-Relational Characterization of Dynamic Social Network Communities – Inferential Methods in Social Network Analysis.

#### UNIT 5 VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS

Visualization of Social Networks Node-Edge Diagrams – Random Layout – Force-Directed Layout – Tree Layout – Matrix Representations –Matrix and Node-Link Diagrams – Hybrid Representations – Visualizing Online Social Networks – Applications – Covert Networks – Community Welfare – Collaboration Networks – Co-Citation Networks – Data Privacy in Social Networks. TOTAL: 45 PERIODS

#### **TEXT BOOKS:**

- 1. Peter Mika, "Social Networks and the Semantic Web", Springer, 2010.
- 2. BorkoFurht, "Handbook of Social Network Technologies and Applications", Springer, 2010.

3. Song Yang, Franziska B. Keller, Lu Zheng, "Social Network Analysis: Methods and Examples", Sage Publication, 2016.

#### **REFERENCES:**

- 1. GuandongXu, Yanchun Zhang, Lin Li, "Web Mining and Social Networking Techniques and Applications", Springer, 2011.
- 2. John Scott, Peter J. Carrington, "The SAGE Handbook of Social Network Analysis", Sage 2011.

#### **E-RESOURCES:**

1. https://nptel.ac.in/courses/106106169/, "Social Networks: The challenge", Prof. Sudharshan Iyengar, IIT –Ropar.

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

- 1. Discuss the principles behind the social network analysis using the network features.
- 2. Explain social network profiles and perform quantitative and qualitative analysis of commercial social network profiles using log files and log mining.
- 3. Apply the data mining techniques on social networks analysis to extract the semantic relationship.
- 4. Utilize community mining algorithms to predict human behavior for social communities.
- 5. Examine random layout, force directed layout, tree layout and matrix representations for visualization of social networks.

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

#### Mapping of COs with POs and PSOs

#### 22CSE14

#### 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 – How People Search – Search Interfaces Today – Visualization in Search Interfaces.

#### **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**

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#### **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.

#### 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.
- CO5 Use Link analysis, Hadoop and Map reduce to evaluate relevant scoring and ranking web search for quality results.

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

#### Mapping of COs with POs and PSOs

#### DATA WAREHOUSING AND DATA MINING

#### 22CSE15

#### Preamble:

The main aim of this course is to give basic knowledge about data warehouse and mining algorithms and also it develops research interest towards advances in data mining.

#### UNIT 1 DATA WAREHOUSING, BUSINESS ANALYSIS AND ON-LINE 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 2 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

#### UNIT 3 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 4 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 5 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.

1. Alex Berson and Stephen J. Smith, "Data Warehousing, Data Mining and OLAP", Tata McGraw – Hill Edition, Thirteenth Reprint 2008.

2. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2012. **REFERENCES:** 

- 1. Sam Anahory, Dennis Murray, "Data Warehousing in the real world", A practical Guide for building
- 2. Paulraj Ponniah, "Data warehousing Fundamentals Comprehensive Guide for IT professionals, Wiley,
- 3. Andrew H. Johnston, "Practical Machine Learning: A Beginner's Guide to Data Mining with WEKA", July 2018.

#### e-RESOURCES:

**TEXT BOOKS:** 

- 1. http://nptel.ac.in/courses/106106093/35, "Data mining and Knowledge discovery, Data Mining, Mining for Association rules", Prof. Dr.S.Srinath, IIT-Madras.
- 2. http://nptel.ac.in/courses/106106093/31, "Introduction to Data warehousing and OLAP", Prof. Dr.S.Srinath, IIT-Madras.

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**TOTAL: 45 PERIODS** 

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

- 1. Design a data warehouse and data mart that satisfies the information needs of management using given schema for analysis.
- 2. Predict the interesting patterns for a given database, using data cleaning, data transformation, data normalization and data reduction.
- 3. Apply association algorithm to build analytical applications for a given database using Apriori, FP- tree association.
- 4. Analyze the given scenario using classification and K-means clustering to find the optimal classification tree and cluster for an application.
- 5. Apply data mining algorithms for a given application using WEKA tool.

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

#### Mapping of COs with POs and PSOs

## **Preamble**

**22CSE16** 

Business Intelligence systems provide historical, current, and predictive views of business operations, often using data that has been gathered into a data warehouse or a data mart and working from operationaldata.Softwareelementssupportreporting, interactiveslice-and-dice, pivot-tableanalyses, visualization, and statistical data mining.

#### UNIT 1 **INTRODUCTION TO DIGITAL DATA**

Introduction to digital data and its types-structured, semi-structured and unstructured, Introduction To OLTP and OLAP(MOLAP,ROLAP,HOLAP). 9

#### UNIT 2 **INTRODUCTION TO BUSINESS INTELLIGENCE**

Introduction to OLTP and OLAP, BI Definitions & Concepts, Business Applications of BI,BI Framework, Role of Data Warehousing in BI,BI Infrastructure Components-BI Process, BI Technology, BI Roles & Responsibilities.

#### **BASICS OF DATA INTEGRATION (EXTRACTION TRANSFORMATION** 9 UNIT 3 LOADING)

Concepts of data integration need and advantages of using data integration, introduction to common data integration approaches, introduction to ETL using SSIS, Introduction to data quality, data profiling concepts and applications.

#### INTRODUCTION TO MULTI-DIMENSIONAL DATA MODELING UNIT 4

Introduction to data and dimension modeling, multidimensional data model, ER Modeling vs. multi dimensionalmodeling, concepts of dimensions, facts, cubes, attribute, hierarchies, starands now flake schema, introduction to business metrics and KPIs, creating cubes using SSAS. 9

#### **BASICS OF ENTERPRISE REPORTING** UNIT 5

Introduction to enterprise reporting, concepts of dashboards, balanced scorecards, introduction to SSRS Architecture, enterprise reporting using SSRS.

## **TOTAL: 45 PERIODS**

## **TEXTBOOKS:**

R.N Prasad and Seema Acharya," Fundamentals of Business Analytics", Second Edition, Wiley 1. India PVT. Ltd., 2016.

## **REFERENCES:**

- LarissaT.Moss, S.Atre, "BusinessIntelligenceRoadmap:TheCompleteProjectLifecycle of Decision 1. Making ", AddisonWesley, 2003.
- CarloVercellis, "BusinessIntelligence:DataMiningandOptimizationforDecisionMaking", 2. WileyPublications, 2009.
  - David Loshin Morgan, Second Edition, 2012. Kaufman, "Business Intelligence: The Savvy 3. Managers Guide".

## e-RESOURCES:

https://nptel.ac.in/courses/110105089 1.

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

- 1. Summarize the concept of OLTP & OLAP using real time data.
- 2. Describe the essential components in the development of business intelligence system.
- 3. Describe the need and approaches of data integration.
- 4. Familiarize the concepts of multi-dimensional data modeling.
- 5. Design an enterprise dashboard that depicts the key performance indicators that helps in decision making.

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	3	2	2	2	1	1	-	-	-	1	1	-	2
CO2	3	3	2	2	2	1	1	-	-	-	1	1	-	2
CO3	3	3	2	2	2	1	1	-	-	-	1	1	-	2
CO4	3	3	2	2	2	1	1	-	-	-	1	1	-	2
CO5	3	3	2	2	2	1	1	-	-	-	1	1	-	2

#### Mapping of COs with POs and PSOs

# **Pre-requisites:** Exploratory Data Analysis, Neural Networks and Deep Learning **Preamble**

The main aim of this course is to make understand the basics of image processing techniques for computer vision, to learn the techniques used for image pre-processing, to discuss the various object detection techniques and to understand the various Object recognition mechanisms.

## UNIT 1 INTRODUCTION

Computer Vision – Image representation and image analysis tasks - Image representations – digitization – properties – color images – Data structures for Image Analysis - Levels of image data representation - Traditional and Hierarchical image data structures- Case Study: T-pyramid of an image

## UNIT 2 IMAGE PRE-PROCESSING

Local pre-processing - Image smoothing - Edge detectors - Zero-crossings of the second derivative - Scale in image processing - Canny edge detection - Parametric edge models – Edges in multi-speralct images -Local pre-processing in the frequency domain - Line detection by local pre-processing operators - Image restoration – Case Study: Deriving the quad tree representation of an image using the homogeneity criterion of equal intensity

## UNIT 3 OBJECT DETECTION USING MACHINE LEARNING

Object detection– Object detection methods – Deep Learning framework for Object detection– bounding box approach-Intersection over Union (IoU) –Deep Learning Architectures-R-CNN-Faster R-CNN-You Only Look Once(YOLO)-Salient features-Loss Functions-YOLO architectures-Case Study: Geometric transforms such as Rotation, Change of scale, Skewing, Affine transform calculated from three pairs of corresponding points and Bilinear transform calculated from four pairs of corresponding points.

## UNIT 4 FACE RECOGNITION AND GESTURE RECOGNITION

Face Recognition-Introduction-Applications of Face Recognition-Process of Face Recognition- Deep Face solution by Facebook - FaceNet for Face Recognition- Implementation using FaceNet- Gesture Recognition-Case Study: motion analysis using moving edges, and apply it to your image sequences and Facial Detection and Recognition.

## UNIT 5 VIDEO ANALYTICS

Video Processing – use cases of video analytics-Vanishing Gradient and exploding gradient problem-RestNet architecture-RestNet and skip connections-Inception Network-GoogleNet architecture-Improvement in Inception v2-Video analytics-RestNet and Inception v3 –Case Study: Event detection in video surveillance system

**Total : 45 Periods** 

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## **TEXT BOOKS:**

- 1. Milan Sonka, Vaclav Hlavac, Roger Boyle, "Image Processing, Analysis, and Machine Vision", 4<sup>th</sup> edition, Thomson Learning, 2017.
- 2. Vaibhav Verdhan,(2021, Computer Vision Using Deep Learning Neural Network Architectures with Python and Keras, Apress 2021(UNIT-III,IV and V)

#### **REFERENCES:**

- 1. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer Verlag London Limited, 2011.
- 2. Caifeng Shan, FatihPorikli, Tao Xiang, Shaogang Gong, "Video Analytics for Business Intelligence", Springer, 2012.
- 3. D. A. Forsyth, J. Ponce, "Computer Vision: A Modern Approach", 2<sup>nd</sup> Pearson Education,
- <sup>3.</sup> 2015 .
- 4. E. R. Davies, (2012), "Computer & Machine Vision", Fourth Edition, Academic Press.

#### e-RESOURCES:

- 1. https://onlinecourses.nptel.ac.in/noc21\_cs93/preview
- 2. https://appsilon.com/object-detection-yolo-algorithm/

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

- CO1 Explain image processing techniques in computer vision and video analysis for the T-pyramid of an image .
- CO2 Discuss pre-processing techniques for image smoothing, edge detection, line detection and restoration using the homogeneity criterion of equal intensity.
- CO3 Perform geometric transformation on objects from three and four pairs of corresponding points using IoU, R-CNN and YOLO..
- CO4 Explain the process involved in face recognition and gesture recognition and apply motion analysis for an image.
- CO5 Elaborate on deep learning-based video analytics using ResNet and GoogleNet architectures for video surveillance systems.

Cos/POs	PO 1	PO 2	PO 3	<b>PO</b> 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	2	-	2
CO2	3	3	2	2	2	-	-	-	-	-	1	2	-	2
CO3	3	3	2	2	2	-	-	-	-	-	1	2	-	2
CO4	3	3	2	2	2	-	-	-	-	-	1	2	-	2
CO5	3	3	2	2	2	-	-	-	-	-	1	2	-	2

## Mapping of COs with POs and PSOs
To understand the foundations of the recommender system, To learn the significance of machine learning and data mining algorithms for Recommender systems, To learn about collaborative filtering, To make students design and implement a recommender system. To learn collaborative filtering.

22CSE18

Preamble

**Pre-requisites :-**

## UNIT 1 INTRODUCTION

Introduction and basic taxonomy of recommender systems - Traditional and non-personalized Recommender Systems - Overview of data mining methods for recommender systems- similarity measures- Dimensionality reduction – Singular Value Decomposition (SVD). Case Study : Data similarity measures using Python.

## UNIT 2 CONTENT-BASED RECOMMENDATION SYSTEMS

High-level architecture of content-based systems - Item profiles, Representing item profiles, Methods for learning user profiles, Similarity-based retrieval, and Classification algorithms.

## UNIT 3 COLLABORATIVE FILTERING

A systematic approach, Nearest-neighbor collaborative filtering (CF), user-based and item-based CF, components of neighborhood methods (rating normalization, similarity weight computation, and neighborhood selection. Case Study: collaborative filter techniques.

## UNIT 4 ATTACK-RESISTANT RECOMMENDER SYSTEMS

Introduction – Types of Attacks – Detecting attacks on recommender systems – Individual attack – Group attack – Strategies for robust recommender design - Robust recommendation algorithms. Case Study : Attack for tampering with recommender systems.

## UNIT 5 EVALUATING RECOMMENDER SYSTEMS

Evaluating Paradigms – User Studies – Online and Offline evaluation – Goals of evaluation design – Design Issues – Accuracy metrics – Limitations of Evaluation measures. Case Study : Accuracy metrics like Receiver Operated Characteristic curves.

## **TEXT BOOKS:**

- 1. Charu C. Aggarwal, Recommender Systems: The Textbook, Springer, 2016.
- Dietmar Jannach , Markus Zanker , Alexander Felfernig and Gerhard Friedrich , Recommender
  Systems: An Introduction, Cambridge University Press (2011), 1st ed
- Francesco Ricci, Lior Rokach, Bracha Shapira, Recommender Sytems Handbook, 2<sup>nd</sup> ed, Springer 2015.
- Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, Mining of massive datasets, 3rd edition,
- <sup>4.</sup> Cambridge University Press, 2020.

# **RECOMMENDER SYSTEMS**

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## **REFERENCES:**

- 1. M. Chiang, Networking Life, Cambridge, 2010. (Chapter 4).
- Manouselis N., Drachsler H., Verbert K., Duval E., Recommender Systems For Learning, Springer 2. (2013), 1st ed
- e-RESOURCES:
- 1. https://www.witpress.com/Secure/elibrary/papers/1845641523/1845641523005FU1.pdf
- 2. https://freevideolectures.com/course/4694/nptel-e-business/54

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

- CO1 Explain the concepts of recommender systems.
- CO2 Demonstrate machine-learning and data-mining algorithms in recommender systems data sets.
- CO3 Identify Collaborative Filtering in carrying out performance evaluation of recommender systems based on various metrics
- CO4 Summarize simple recommender system.
- CO5 Organize about advanced topics of recommender 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	3	3	2	2	1	-	1	-	-	-	1	1	-	3
CO2	3	3	2	2	1	-	1	-	-	-	1	1	-	3
CO3	3	3	2	2	1	-	1	-	-	-	1	1	-	2
CO4	3	3	2	2	1	-	1	-	-	-	1	1	-	2
CO5	3	3	2	2	1	-	1	-	-	-	1	1	-	2

## Mapping of COs with POs and PSOs

## 22CSE21

**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, Zaigham Mahood, Ricardo Puttini, "Cloud Computing, Concept, Technology and Architecture", Prentice Hall, 2013.
- 2. K.Chandrasekaran, "Essentials of Cloud Computing", CRC Press, 2015.

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## **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 Computing, 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.

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

- 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	РО 4	PO 5	PO 6	РО 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

## Pre-requisites : Basic Knowledge about DBMS, Database Architecture **Preamble**

This course introduces the Nosql Databases of database concepts to the students and gives practice to create and maintain a database. It also covers the concepts of logical and physical relationships in a data model and the concept of managing a database system. Students will use a computer aided software engineering tool to design, create, and query a database.

### UNIT 1 **INTRODUCTION TO NOSQL CONCEPTS**

Data base revolutions: First generation, second generation, third generation, Managing Transactions and Data Integrity, ACID and BASE for reliable database transactions, Speeding performance by strategic use of RAM, SSD, and disk, Achieving horizontal scalability with Data base sharding, Brewers CAP theorem.

### UNIT 2 NOSQL DATA ARCHITECTURE PATTERNS

NoSQL Data model: Aggregate Models- Document Data Model- Key-Value Data Model-Columnar Data Model, Graph Based Data Model Graph Data Model, NoSQL system ways to handle big data problems, Moving Queries to data, not data to the query, hash rings to distribute the data on clusters, replication to scale reads, Database distributed queries to Data nodes.

### UNIT 3 **KEY VALUE DATA STORES**

From array to key value databases, Essential features of key value Databases, Properties of keys, Characteristics of Values, Key-Value Database Data Modeling Terms, Key-Value Architecture and implementation Terms, Designing Structured Values, Limitations of Key-Value Databases, Design Patterns for Key-Value Databases, Case Study: Key-Value Databases for Mobile Application Configuration

### **DOCUMENT ORIENTED DATABASE** UNIT 4

Document, Collection, Naming, CRUD operation, querying, indexing, Replication, Sharding, Consistency Implementation: Distributed consistency, Eventual Consistency, Capped Collection, Case studies: document oriented database: Mongo DB and/or Cassandra.

COLUMNAR DATA MODEL: Data warehousing schemas: Comparison of columnar and row-oriented Architectures: C-Store Column-store storage, Column-store and Vector-Wise. internals and. Inserts/updates/deletes, Indexing, Adaptive Indexing and Database Cracking.

### **DATA MODELING WITH GRAPH** UNIT 5

Comparison of Relational and Graph Modeling, Property Graph Model Graph Analytics: Link analysis algorithm- Web as a graph, Page Rank- Markov chain, page rank computation, Topic specific page rank (Page Ranking Computation techniques: iterative processing, Random walk distribution Querying Graphs: Introduction to Cypher, case study: Building a Graph Database Application- community detection

## **Total: 45 Periods**

## **TEXT BOOKS:**

**22CSE22** 

- 1. Guy Harrison, Next Generation Database: NoSQL and big data, Apress, 2015.
- Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, 2.

VCET, B.E-CSE, R2022 - Curriculum and Syllabus

Wiley Publications,1st Edition,2019.

## **REFERENCES:**

- Christopher D.manning, Prabhakar Raghavan, Hinrich Schutze, An introduction to 1. Information Retrieval, Cambridge University Press
- Daniel Abadi, Peter Boncz and Stavros Harizopoulas, The Design and Implementation of 2.
- Modern Column-Oriented Database Systems, Now Publishers.

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## Page 145

### С Т Р L 0 3 0 3

## 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

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

- CO1 Explain the detailed architecture, Database properties and storage requirements
- CO2 Differentiate and identify right database models for real time applications
- CO3 Outline Key value architecture and characteristics
- CO4 Design Schema and implement CRUD operations, distributed data operations, implement various column store internals
- CO5 Develop Application with Graph Data model

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

## Mapping of COs with POs and PSOs

## **Pre-requisites:** Software Engineering and Object-Oriented Analysis and Design. 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

22CSE23

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.

### SERVICE ORIENTED ARCHITECTURES UNIT 3

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:**

- 1. 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:**

- Christopher D.manning, Prabhakar Raghavan, Hinrich Schutze, An introduction to 1. Information Retrieval, Cambridge University Press 2015.
- Daniel Abadi, Peter Boncz and Stavros Harizopoulas, The Design and Implementation of 2. 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
- https://www.geeksforgeeks.org/introduction-to-nosql/ 3.
- 4. https://www.javatpoint.com/nosql-databa



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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 application framework.
- CO4 Construct web service architecture using WSDL, SOAP and UDDI for business applications.
- CO5 Discuss the web service specification like WS-BPEL, WS-Coordination, WS-Policy, and WS-Security to build secure vs interaction SOA based applications.

Cos/POs	PO 1	PO 2	PO 3	<b>PO</b> 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	-	-	-	3	-	2	3	2	1
CO2	3	2	2	2	3	-	-	-	2	-	-	2	2	2
CO3	3	3	3	3	-	-	-	-	-	-	-	3	1	1
CO4	3	3	3	3	-	-	-	-	-	-	-	3	2	2
CO5	3	2	2	2	-	2	-	-	-	-	2	2	3	2

## Mapping of COs with POs and PSOs

## Pre-requisites : Basics of website/app design and development **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

22CSE24

UI vs. Design - Core Stages of Design Thinking - Divergent and Convergent Thinking - Brainstorming and Game storming - Observational Empathy.

### FOUNDATIONS OF UI DESIGN UNIT 2

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 - Why You Should Care about User Experience - Understanding User Experience -Defining the UX Design Process and its Methodology - Research in User Experience Design - Tools and Method used for Research - User Needs and its Goals - Know about Business Goals.

### WIREFRAMING, PROTOTYPING AND TESTING UNIT 4

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.

### **RESEARCH, DESIGNING, IDEATING, & INFORMATION ARCHITECTURE** UNIT 5

Identifying and Writing Problem Statements - Identifying Appropriate Research Methods - Creating Personas -Solution Ideation - Creating User Stories - Creating Scenarios - Flow Diagrams - Flow Mapping - Information Architecture.

## **TEXT BOOKS:**

- Joel Marsh, "UX for Beginners", O'Reilly, 2022. 1.
- 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" 3 rd Edition, O'Reilly 2020

VCET, B.E-CSE, R2022 - Curriculum and Syllabus

Steve Schoger, Adam Wathan "Refactoring UI", 2018 2.

## e-RESOURCES:

- 1. https://www.nngroup.com/articles/
- https://www.interaction-design.org/literature 2.

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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.

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

Mapping of COs with POs and PSOs

## 22CSE25

**Pre-requisites :** Knowledge on Software Engineering concepts and Programming languages like Java, Python, Pearl, etc.

DEVOPS

## **Preamble**

DevOps is the combination of cultural philosophies, practices, and tools that increase an organization's ability to deliver applications and services at high velocity: evolving and improving products at a faster pace than organizations using traditional software development and infrastructure management processes.

### 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.

### CONFIGURATION MANAGEMENT USING ANSIBLE UNIT 4

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

## **TEXT BOOKS:**

- Roberto Vormittag, "A Practical Guide to Git and GitHub for Windows Users: From Beginner to Expert 1. 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:**

- Hands-On Azure Devops: Cicd Implementation For Mobile, Hybrid, And Web Applications Using 1. Azure Devops And Microsoft Azure: CICD Implementation for ... DevOps and Microsoft Azure (English Edition) Paperback – 1 January 2020 by Mitesh Soni
- Jeff Geerling, "Ansible for DevOps: Server and configuration management for humans", First Edition, 2. 2015



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Total: 45 Periods

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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

- 1. Understand different actions performed through Version control tools like Git.
- 2. Perform Continuous Integration and Continuous Testing and Continuous Deployment using Jenkins by building and automating test cases using Maven & Gradle.
- 3. Ability to Perform Automated Continuous Deployment
- 4. Ability to do configuration management using Ansible
- <sup>5.</sup> Understand to leverage Cloud-based DevOps tools using Azure DevOps

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

## Mapping of COs with POs and PSOs

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# **Pre-requisites :** Software Engineering **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

Why do we test Software?, 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.

## **Total: 45 Periods**

## **TEXT BOOKS:**

- 1. Yogesh Singh, "Software Testing", Cambridge University Press, 2012
- 2. Unmesh Gundecha, Satya Avasarala, "Selenium WebDriver 3 Practical Guide" Second Edition 2018.

## **REFERENCES:**

- 1. 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.
- 5. Elfriede Dustin, Thom Garrett, Bernie Gaurf, Implementing Automated Software Testing, 2009, Pearson Education, Inc.
- 6. Satya Avasarala, Selenium WebDriver Practical Guide, 2014, Packt Publishing.
- 7. Varun Menon, TestNg Beginner's Guide, 2013, Packt Publishing

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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 Understand the basic concepts of software testing and the need for software testing
- CO2 Design Test planning and different activities involved in test planning
- CO3 Design effective test cases that can uncover critical defects in the application
- CO4 Carry out advanced types of testing
- CO5 Automate the software testing using Selenium and Testing

## 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	1	2	1	-	-	-	-	-	2	1	1	2
CO2	3	3	1	2	1	-	-	-	-	-	2	1	1	2
CO3	3	3	1	2	1	-	-	-	-	-	2	1	1	2
CO4	3	3	1	2	1	-	-	-	-	-	2	1	1	2
CO5	3	3	1	2	1	-	-	-	-	-	2	1	1	2

## PROGRAMMING WITH JAVASCRIPT

**Pre-requisites :** Basic knowledge on HTML and Object Oriented Programming. Preamble

JavaScript is a loosely-typed client side scripting language that executes in the user's web browser. A web page without JavaScript is unimaginable today. There are many open source application development frameworks based on JavaScript.

### UNIT 1 FRONT-END WEB DEVELOPMENT

Introduction to HTML - Introduction to CSS- Basics of JavaScript- Features of JavaScript-Advantages and Disadvantages of JavaScript - How does JavaScript works?-Structure of a JavaScript program- Adding JavaScript in HTML- Including External Javascript In Html – Front-end and back-end connectivitiy- Transfer data from back-end to front-end.

### UNIT 2 JAVASCRIPT CORE

JavaScript Data Types, Keywords, Comments and Variables - JavaScript Expressions and Operators -JavaScript Statements (Conditional and Looping), Functions and Objects- User Input and Output in JavaScript.

### UNIT 3 **GETTING STARTED WITH JQUERY UI**

jQuery - Basics - jQuery CSS Methods - Retrieving Page Content- Manipulating Page Content- Working with Events- Using the jQuery UI Plug-In, jQuery Animations and Effects.

### UNIT 4 NODE.JS

22CSE27

Node.jsBasics-Node.jsModules(Local,ExportModules)-NodePackageManager(NPM)-CreateWebServerinNode.js -Node.jsFile System-Data AccessinNode.js - Access MongoDBinNode.js-Node JS frameworks.

### UNIT 5 **ANGULAR JS**

Angular JS Basics - Angular Expressions and Data Binding- Angular MVC-Angular JS Modules and Forms -AngularJS Bootstrap Application. Responsive Web Design- Twitter Bootstrap - Making our application responsive. Python Backend Web Development with Django - User Registration and Login Authentication in Django – Steps in End to End Web Development – Steps in Host and manage the project live in any public hosting platform.

## **TEXT BOOKS:**

- 1. JavaScript the Definitive Guide 7/ED Paperback – 15 June 2020.
- Eloquent JavaScript 3E: A Modern Introduction to Programming Paperback 4 December 2018. 2.
- JavaScript from Beginner to Professional: Learn JavaScript quickly by building fun, interactive, and 3. dynamic web apps, games, and pages Paperback – Import, 22 January 2021.

## **REFERENCES:**

- 1. https://www.lcg.ufrj.br/nodejs/books/react-beginners-handbook.pdf
- 2. https://pepa.holla.cz/wp-content/uploads/2015/10/Beginning-AngularJS.pdf

## e-RESOURCES:

- 1. https://onlinecourses.swayam2.ac.in/aic20\_sp11/preview, "Principles of Web Programming", by Prof Kannan Moudgalya, IIT Mumbai.
- 2. http://nptel.ac.in/courses/106105084/25
- 3. http://nptel.ac.in/courses/106105084/26
- 4. https://archive.nptel.ac.in/courses/106/106/106106156, "Introduction to modern application development", by Prof. Aamod Sane, Prof. Abhijat Vichare, Prof. Madhavan Mukund, IIT Chennai.

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

- CO1 Understanding the basics concepts of HTML, CSS and Java Script in HTML.
- CO2 JavaScript core: Identify expressions and operators. Summarize flow control. Demonstrate objects and arrays usage. Define functions and methods.
- CO3 Learn key jQuery concepts like callbacks and event handlers and understand the Document Object Model (DOM) and how JavaScript manipulates objects in the DOM.
- CO4 Understanding the concept of Node.JS and accessing database using MongoDB.
- CO5 Gaining knowledge on Angular JS, Responsive web design, and Python with Django.

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

## Mapping of COs with POs and PSOs

## 22CSE28

## Pre-requisites : PYTHON 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.

## **TEXT BOOKS:**

- 1. Fabrizio Romano, Gaston C. Hillar, Arun Ravindran, "Learn Web Development with Python", Packt Publishing 1st edition 2018
- 2. Aidas Bendoraitis, 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/

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

- CO1 Develop a Python program using modules and packages to solve a given problem.
- 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
- CO5 Design and develop Django Web application with hands-on.

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

## Mapping of COs with POs and PSOs

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## 22CSE31

**Pre-requisites : Computer Networks** 

## **Preamble:**

A distributed system is a system whose components are located on different networked computers, which communicate and coordinate their actions by passing messages to one another. The components interact withone another in order to achieve a common goal. An application of distributed systems includes multiplayer online games, web search, mobile and ubiquitous computing, finance and trading systems.

DISTRIBUTED COMPUTING

### **INTRODUCTION** UNIT 1

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.

### **DISTRIBUTED FILE SYSTEM AND NAME SERVICES** UNIT 3

Distributed File Systems -Introduction - File service architecture - Andrew File system. Case study: Google File system. Naming - Introduction-Name services and domain name system-Directory Services-Peer to peer Systems-Napster-Peer to peer middleware- Routing overlays.

### DISTRIBUTED TRANSACTIONS AND CONCURRENCY CONTROL UNIT 4

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

### **PROCESS & RESOURCE MANAGEMENT** UNIT 5

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.

## **REFERENCES:**

Pradeep, "Distributed K Sinha Operating Systems: Concepts and Design", Prentice Hall of India.2012

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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 ComputerScience and Engineering, IIT, Patna.

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

- CO1 Discuss resource sharing principles, trends and challenges in a distributed system using World Wide Webas a case study.
- CO2 Illustrate process communication using remote method invocation for a given distributed environment.
- CO3 Describe 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 process and resource management policies for a given distributed environment using Scheduling algorithms.

COsPOs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	<b>PO</b> 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
<b>CO4</b>	3	3	2	1	-	-	-	-	-	1	-	1	-	2
CO5	3	3	2	1	-	-	-	-	-	1	-	1	-	2

## Mapping of COs with POs and PSOs

## 22CSE32

## **EDGE AND FOG COMPUTING**

## **Pre-requisites : Preamble**

It acquire knowledge on Edge Computing Architectures and Models and helps to understand Edge Computing technologies in which we can develop applications in Edge Computing and to acquire knowledge on the concepts of Fog Computing to understand optimization techniques data management in Fog Computing and to study the application development in Fog Computing

## UNIT 1 EDGE COMPUTING ARCHITECTURES

An overview of edge computing Open challenges - Edge computing in a doudisation mode Standard reference architecture - Edge computing as a VNF - CloudPath-Cloud4Home-Femto Clouds-Scalable and Secure On loading of Edge ections Using AirBox

## **UNIT 2 EDGE COMPUTING MODELS**

Big data analytical models-Data security and privacy models- Networking models and protocols for edge computing - Computing and storage models for edge computing - Resource allocation models for edge computing

## UNIT 3 FOG COMPUTING FUNDAMENTALS

Concepts-Principles and related paradigms-Fog Computing in the loT environment-Fog Computing in the realm of Cloud Computing-Fog Computing in a developing world context

## UNIT 4 OPTIMIZATION PROBLEMS IN FOG COMPUTING

Case for optimization in Fog Computing Formal modelling framework for Fog Computing Optimization opportunities along the Fog archit and rvice life cycle-Towards a taxonomy of optimization problems in Fog Computing-Optimization techniques

### **APPLICATIONS OF FOG AND EDGE COMPUTING** UNIT 5

Snart olies enabled by edge computing-Smart healthcare systems enabled by edge computing Smart hospitals enabled by edge computing Human Object Detection-Object Tracking-Lightweight Human Detection-Data-Driven Intelligent Transportation Systems

## **TEXT BOOKS:**

- Javid Taher Shuguang Deng. "Edge Computing: Models, lecnologies and applications" First 1. Edson, The Institution of Engineering and Technology, 2020 2. Je Can Quen Zhang, Weisong Shi "Edge Computing: A Primer, First Edison, Springer national Publishing 2018.
- Mahmood, Zargham (Ed)" Fog Computing-Concepts, Frameworks and Technologies. First Editon 2. Springer, 2018.

## **REFERENCES:**

- At Singh Edge Computing: Simply in Depth", First Edition, Amazon Digital Services LLC, KDP 1. Print 2019
- 2. Wu, Jie, Chang, Wei (Eds.), "Fog/Edge Computing for Security, Privacy, and Applications", First Edition, Springer International Publishing, 2020

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## e- RESOURCES

1.https://www.e-education.psu.edu/geog583/node/55

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

- CO1 Describe the key architectures in edge computing to ensure all the components are active in the environment.
- CO2 Examine the various edge computing models to brings enterprise applications closer to data sources.
- CO3 Understand principles of Fog Computing and difference between Fog and cloud computing to access data faster and efficient ways.
- CO4 Analyze the various optimization metrics in Fog computing to increase the performance of computation.
- CO5 Designing and modeling the industrial applications for easy communication to maintain networks to store and manage data for improving scalability.

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

## Mapping of COs with POs and PSOs

## SECURITY AND PRIVACY IN CLOUD

## **Pre-requisites : Computer Networks, Cloud Computing, Network Security**

Preamble: The course covers the fundamental Cloud Computing terminology, definition & concepts. It helps students to understand the security design and architectural considerations for Cloud. It also makes the students to get familiar with the Identity, Access control in Cloud. The best practices for Cloudsecurity using various design patterns are discussed. This also introducers learners to monitor and audit cloud applications for security.

### FUNDAMENTALS OF CLOUD SECURITY CONCEPTS UNIT 1

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.

### SECURITY DESIGN AND ARCHITECTURE FOR CLOUD UNIT 2

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.

### ACCESS CONTROL AND IDENTITY MANAGEMENT UNIT 3

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.

### 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. Case study Example

### **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 Example

## **TEXT BOOKS:**

22CSE33

- Raj Kumar Buyya, James Broberg, Andrzej Goscinski, "Cloud Computing: Principles and 1. Paradigms", Wiley 2013
- Dave Shackleford, "Virtualization Security:Protecting Virtualized Environment (SYBEX)", Wiley 2. 2012.

## **REFERENCES:**

- Tim Mather, Subra Kumaraswamy, Shahed Latif, "Cloud Security and Privacy", ORIELLY 2009. 1.
- Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi, "Mastering Cloud Computing: 2. Foundations and Applications Programming", Morgan Kaufmann, 2013.

VCET, B.E-CSE, R2022 - Curriculum and Syllabus

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## e RESOURCES

- 1. http://www.cloudbus.org/cloudsim/
- 2. https://www.youtube.com/watch?v=44IBhZwa4ZM
- 3. https://www.youtube.com/watch?v=xceZmVGNS\_Q

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

- CO1 Explain the fundamental security concepts for any given cloud application.
- CO2 Discuss the strategies for a secure architecture and design of a given cloud application
- CO3 Describe access control and identity management to apply for a given secure cloud application.
- CO4 Explain the different design patterns to provide security for an given cloud application
- CO5 Describe the different monitoring, auditing and management provisions of security to deploy for any given cloud application.

## Mapping of COs with POs and PSOs

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

### **DEVOPS AND SITE RELIABILITY ENGINEERING** L Т Р 22CSE34

**Pre-requisites : Pre-requisites :** Knowledge on Software Engineering concepts and Programming languages like Java, Python, Pearl.

## **Preamble**

DevOps and SRE is the combination of cultural philosophies, practices, and tools that increase an organization's ability to deliver applications and services at high velocities is is done through automation and continuous integration and delivery and to improve the reliability of high-scale systems

### UNIT 1 **INTRODUCTION TO DEVOPS**

Devops Essentials - Introduction To AWS, GCP, Azure - Version control systems: Git and Github.

### **COMPILE AND BUILD USING MAVEN & GRADLE** UNIT 2

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.

### **CONTINUOUS INTEGRATION USING JENKINS** UNIT 3

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 **BASICS OF SITE RELIABILITY ENGINEERING**

Introduction, principle of SRE-SRE roles and responsibilities, SRE implementation

### **UNIT 5** SRE PROCESSESS AND BEST PRACTICES

Improving Enterprise Workflows-Monitoring System Performance-SRE & DEVOPS :Similarities And Difference Building SRE Sucess Culture At Linkedin.

## **Total: 45 Periods**

## **TEXT BOOKS:**

- Roberto Vormittag, "A Practical Guide to Git and GitHub for Windows Users: From 1. Beginner to Expert in Easy Step-By-Step Exercises", Second Edition, Kindle Edition, 2016
- Stephen Fleming, DevOps and Site Reliability Engineering (SRE) Handbook: Non-Programmer's 2. Guide Paperback – Import, 23 November 2018

## **REFERENCES:**

Hands-On Azure Devops: Cicd Implementation For Mobile, Hybrid, And Web Applications 1.

Using Azure Devops And Microsoft Azure: CICD Implementation for ... DevOps and Microsoft Azure (English Edition) Paperback – 1 January 2020 by Mitesh Soni

Site Reliability Engineering by Betsy Beyer, Chris Jones, Niall Richard Murphy, Jennifer Petoff 2. Released April 2016.

## e-RESOURCES:

- https://www.jenkins.io/user-handbook.pdf. 1.
- https://www.linkedin.com/learning/site-reliability-engineering-service-level-agreements-and-2. objectives.

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

- CO1 Understand different actions performed through Version control tools like Git to make comparisons in different code versions.
  - Perform Continuous Integration, Testing and Deployment using Jenkins by building and
- CO2 automating test cases using Maven & Gradle for Making Development and Operations Repeatable, Accessible, and Easier to Manage at Scale.
- CO3 Ability to Perform Automated Continuous Deployment for changing the production environment automatically to the changes in the code.
- CO4 Understanding Basics Concept of SRE to ensure their software applications remain reliable
- CO5 Implementing SRE Process for a given real time application to perform operations to scale with load

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	1	-	-	-	-	-	-	1	2	2
CO2	3	3	2	1	1	-	-	-	-	-	-	1	2	2
CO3	3	3	2	1	1	-	-	-	-	-	-	1	2	2
CO4	3	3	2	1	1	-	-	-	-	-	-	1	2	2
CO5	3	3	2	1	1	-	-	-	-	-	-	1	2	2

## Mapping of COs with POs and PSOs

22CSE35

### UNIT 1 CLOUD SERVICE MANAGEMENT FUNDAMENTALS

Cloud Ecosystem, The Essential Characteristics, Basics of Information Technology Service Management and Cloud Service Management, Service Perspectives, Cloud Service Models, Cloud Service Deployment Models.

### UNIT 2 **CLOUD SERVICES STRATEGY**

Cloud Strategy Fundamentals, Cloud Strategy Management Framework, Cloud Policy, Key Driver for Adoption, Risk Management, IT Capacity and Utilization, Demand and Capacity matching, Demand Queueing, Change Management, Cloud Service Architecture.

### UNIT 3 **CLOUD SERVICE MANAGEMENT**

Cloud Service Reference Model, Cloud Service LifeCycle, Basics of Cloud Service Design, Dealing with Legacy Systems and Services, Benchmarking of Cloud Services, Cloud Service Capacity Planning, Cloud Service Deployment and Migration, Cloud Marketplace, Cloud Service Operations Management.

### **CLOUD SERVICE ECONOMICS** UNIT 4

Pricing models for Cloud Services, Freemium, Pay Per Reservation, Pay per User, Subscription based Charging, Procurement of Cloud-based Services, Capex vs Opex Shift, Cloud service Charging, Cloud Cost Models.

### UNIT 5 **CLOUD SERVICE GOVERNANCE & VALUE**

IT Governance Definition, Cloud Governance Definition, Cloud Governance Framework, Cloud Governance Structure, Cloud Governance Considerations, Cloud Service Model Risk Matrix, Understanding Value of Cloud Services, Measuring the value of Cloud Services, Balanced Scorecard, Total Cost of Ownership.

## **TEXT BOOKS:**

- 1. Enamul Haque, "Cloud Service Management and Governance: Smart Service Management in Cloud Era", Enel Publications, 2020
- 2. Thomas Erl, Ricardo Puttini, Zaigham Mohammad, "Cloud Computing: Concepts, Technology & Architecture", Prentice Hall Press, 2013.
- Thomas Erl, Robert Cope, Amin Naserpour, "Cloud Computing Design Patterns", Pearson, 2015. 3. **REFERENCES:** 
  - 1. Praveen Ayyappa, "Economics of Cloud Computing", LAP Lambert Academic Publishing, 2020
  - Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi, "Mastering Cloud Computing: 2. Foundations and Applications Programming", Morgan Kaufmann, 2013.

# **CLOUD SERVICES MANAGEMENT**

**Pre-requisites : Computer Networks, Cloud Computing, Service Oriented Architecture Preamble** 

This course helps the students to exhibit cloud-design skills to build and automate business solutions using cloud technologies. This makes them to possess strong theoretical foundation leading to excellence and excitement towards adoption of cloud-based services. The students will ge an idea to solve the real world problems using Cloud services and technologies.

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## **Total: 45 Periods**

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## e-RESOURCES:

- 1. https://www.youtube.com/watch?v=1V5FyasVMaM
- 2. https://www.youtube.com/watch?v=\_7TJf\_8LEN8

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

- CO1 Explain the underlying cloud terminologies to use for a given application
- CO2 Describe the various cloud strategies and management strategies to meet the business needs.
- CO3 Identify strategies to reduce risk and eliminate issues associated with adoption of cloud services.
- CO4 Select appropriate structures for designing, deploying and running cloud-based services in a business environment
- CO5 Illustrate the benefits and drive the adoption of cloud-based services to solve real world problems

COsPOs	PO 1	<b>PO</b> 2	PO 3	<b>PO</b> 4	PO 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	-	2	1	-	-	-	1	1	2	3
CO2	3	3	2	2	-	2	1	-	-	-	1	1	2	3
CO3	3	3	2	2	1	2	1	-	-	-	1	1	2	3
CO4	3	3	2	2	1	2	1	-	-	-	1	1	2	3
CO5	3	3	2	2	1	2	1	-	-	-	1	1	2	3

## Mapping of COs with POs and PSOs

## 22CSE36 INFORMATION STORAGE MANAGEMENT

## **Pre-requisites :** Database Management Systems

**Preamble:** Information Storage and Management (ISM) is the Knowledge gap in understanding varied components of information storage infrastructure in classic and virtual environments. It provides a comprehensive learning on storage technology, which will enable to make more informed decisions in an increasingly complex IT environment. It builds a strong understanding of underlying storage technologies and prepares you to learn advanced concepts, technologies and products. Storage networking technologies such as FC-SAN, IP-SAN, NAS, object-based and unified storage; business

continuity solutions such as backup and replication.

## UNIT 1 STORAGE TECHNOLOGY

Introduction to Information storage management-Challenges in data storage and data management-Solutions available for data storage-Core elements of data center infrastructure-Role of each element in supporting business activities.

## UNIT 2 STORAGE SYSTEMS ARCHITECTURE

Evolution of storage architecture-Key characteristics of data center-Physical and logical components of a connectivity environment -Major physical components of a disk drive and their function-logical constructs of a physical disk, access characteristics-and performance Implication- RAID implementation, RAID techniques-RAID levels,-impact of RAID on disk performance

## UNIT 3 INTRODUCTION TO NETWORKED STORAGE

Evolution of networked storage-Architecture, components, and topologies of FC-SAN, NAS, and IP-SAN-Benefits of the different networked storage options-understand the appropriateness of the different networked storage options for different application environments

# UNIT 4 INFORMATION AVAILABILITY, MONITORING & MANAGING DATACENTERS

Business continuity (BC)- BC planning lifecycle-failure analysis and solution - Disaster recovery (DR), architecture of backup/recovery and the different backup/ recovery topologies-replication technologies and their role in ensuring information availability and business continuity-Remote replication technologies and their role in providing disaster recovery and business continuity capabilities.-Identify key areas to monitor in a data center-Industry standards for data center monitoring and management-Key metrics to monitor for different components in a storage infrastructure- Key management tasks in a data center

## UNIT 5 SECURING STORAGE AND STORAGE VIRTUALIZATION

Information security-Risk traid, Storage security domains-Monitoring storage management-Storage infrastructure management activities-Storage infrastructure management challenges-Virtualization technologies-block-level and file-level virtualization technologies and processes

## **TEXT BOOKS:**

- 1. EMC Corporation, "Information Storage and Management: Storing, Managing, and Protecting DigitalInformation", Wiley, India, 2012
- 2. Marc Farley, -Building Storage Networks<sup>I</sup>, Tata McGraw Hill, Osborne, 2001.

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## **REFERENCES:**

- 1. Robert Spalding, -Storage Networks: The Complete Reference—, Tata McGraw Hill, Osborne, 2003.
- 2. Meeta Gupta, Storage Area Network Fundamentals, Pearson Education Limited, 2002

## e - RESOURCES

- 1. https://www.youtube.com/watch?v=A6rfvcF3zi4," Overview of Information Storage and Management"
- 2. https://www.youtube.com/watch?v=mZvmtZA2YH4," Information storage management"

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

- CO1 Select from various storage technologies to suit for required application.
- CO2 Explain the concept of RAID and different RAID levels and their implementations and benefits.
- CO3 Describe the benefits of the different network storage options for different application environments.
- CO4 Discuss the different role in providing disaster recovery and business continuity capabilities.
- CO5 Use the storage security framework and practice storage monitoring and management activities.

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

## Mapping of COs with POs and PSOs

## VIRTUALIZATION

# **Pre-requisites : Computer Networks, Cloud Computing Preamble:**

Learn the basics and types of Virtualization and easy understand the Hypervisors and its types it help 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 2017.
- 2. Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2013.
- 3. David Marshall, Wade A. Reynolds, Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center, Auerbach

## **REFERENCES:**

- 1. Chris Wolf, Erick M. 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/

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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.

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

## Mapping of COs with POs and PSOs

### L 22CSE41 AUGMENTED REALITY AND VIRTUAL REALITY 3

## **Pre-requisites : Computer Graphics & Multimedia**

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.

### **IINTRODUCTION TO AUGMENTED REALITY(AR)** UNIT 1

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.

### AUGMENTED REALITY AND VIRTUAL REALITY FOR 9 UNIT 5 MICROLEARNING

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.

## **Total: 45 Periods**

## **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

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## 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
- 4. https://infyspringboard.onwingspan.com/web/en/app/toc/lex\_auth\_0133115621849497605635\_sh
- \*. ared/overview

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	РО 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

## 22CSE42 HUMAN COMPUTER INTERACTION

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## Preamble:

- 1. To impart the design techniques and fundamentals of Human Computer Interaction(HCI).
- 2. To familiarize various types of existing interfaces and evaluation techniques
- 3. To cognize the applications of HCI in emerging trends

## UNIT 1 FOUNDATIONS OF HUMAN-COMPUTER INTERACTION

Introduction - Good and poor design - Interaction design and its goals - Design and usabilityprinciples. Conceptualizing Interaction - Understanding the problem space – Conceptual models - Interface metaphors and paradigms - From conceptual models to physical design.Cognition - Introduction - What is cognition? -Conceptual frameworks for cognition.

## UNIT 2 BUILDING A SIMPLE GRAPHICAL USER INTERFACE

Collaboration and communication – Introduction - Social mechanisms - Ethnographic studies– frameworks. Interfaces – Introduction - What are affective aspects? - Expressive interfaces -User frustration. Interaction design - Lifecycle models

## UNIT 3 HUMAN-CENTERED SOFTWARE DESIGN

Needs and establishing requirements - What are requirements? - Data gathering - Data interpretation - Task description and analysis. Design, prototyping and construction – Introduction - Conceptual design - Physical design. User-centered approaches - Ethnography in design - Participatory design.

## UNIT 4 HUMAN-CENTERED SOFTWARE EVALUATION

Evaluation - What, why, and when to evaluate, Case Study. An evaluation framework: Introduction-Evaluation paradigms and techniques-D E C I D E: A framework to guide evaluation. Observing users-Introduction - Goals, questions and paradigms - How to observe - Data collection - Indirect observation: Tracking users' activities - Analyzing, interpreting and presenting data.

## UNIT 5 HUMAN-CENTERED SOFTWARE TESTING

Asking users and experts: Introduction - Asking users: interviews, Questionnaires, Inspections, walkthroughs. Testing and modeling users – Introduction - User testing - Doing user testing – Experiments - Predictive models.

## **TOTAL: 45 PERIODS**

## REFERENCES

- 1. Yvonne Rogers, Helen Sharp, Jenny Preece, Interaction Design: beyond human-computer interaction, John-Wiley and Sons Inc., 2019.
- 2. Alan Dix , Janet Finlay, Gregory D.Abowd, Russell Beale, Human Computer Interaction, Pearson Education, 2008.
- 3. Jonathan Lazar Jinjuan, Heidi Feng, Harry Hochheiser, Research Methods in Human-Computer Interaction, Wiley, 2010.
- 4. Dov Te'eni, Jane Carey, Ping Zhang, Human-Computer Interaction: Developing Effective Organizational Information Systems, John-Wiley and Sons Inc., 2007.
- 5. Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edition, O'Reilly, 2009

## e-RESOURSES:

- 1. http://www.tandfonline.com/loi/hihc20
- 2. http://www.guide2research.com/journals/human-computer-interaction
- 3. https://www.journals.elsevier.com/international-journal-of-human-computer-studies/

## **COURSE OUTCOMES**

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

- 1. Describe the requirements and specifications for the interaction design.
- 2. Describe the different types of interactions and interfaces.
- 3. Identify the techniques to support data analysis, interpretation and presentation
- 4. Analyze the evaluation techniques of human interaction
- 5. Determine the most appropriate HCI methods to test the needs of a practical software development project

COsPOs	PO 1	PO 2	PO 3	<b>PO</b> 4	PO 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1	1	-	-	-	-	-	-	-	1	-	3
CO2	3	2	1	1	-	-	-	-	-	-	-	1	-	3
CO3	3	2	1	1	-	-	-	-	-	-	-	1	-	3
CO4	3	2	1	1	-	-	-	-	-	-	-	1	-	3
CO5	3	2	1	1	-	-	-	-	-	-	-	1	-	3

## Mapping of COs with POs and PSOs
# **BRAIN COMPUTER INTERFACE**

# **Preamble:**

22CSE43

- To allow the users to communicate or control external devices using brain signals rather than the brain's 1. normal output pathways of peripheral nerves and muscles..
- To review the BCI-relevant signals from the human brain, and describe the functional components of BCIs 2.
- To review current clinical applications of BCI technology, and identify potential users and potential 3. applications.
- To discuss current limitations of BCI technology, impediments to its widespread clinical use, and 4. expectations
  - for the future.

# **UNIT 1** INTRODUCTION TO BCI

Introduction - Brain structure and function, Brain Computer Interface Types - Synchronous and Asynchronous -Invasive BCI -Partially Invasive BCI - Non Invasive BCI, Structure of BCI System, BCI Monitoring Hardware, EEG, ECoG, MEG, fMRI

# **UNIT 2 BRAIN ACTIVATION**

Brain activation patterns - Spikes, Oscillatory potential and ERD, slow cortical potentials, Movement related potentials-Mu rhythms, motor imagery, Stimulus related potentials - Visual Evoked Potentials -P300 and Auditory Evoked Potentials, Potentials related to cognitive tasks.

# **UNIT 3 FEATURE EXTRACTION METHODS**

Data Processing - Spike sorting, Frequency domain analysis, Wavelet analysis, Time domain analysis, Spatial filtering -Principal Component Analysis (PCA), Independent Component Analysis (ICA), Artifacts reduction, Feature Extraction - Phase synchronization and coherence.

# **UNIT 4 MACHINE LEARNING METHODS FOR BCI**

Classification techniques -Binary classification, Ensemble classification, Multiclass Classification, Evaluation of classification performance, Regression - Linear, Polynomial, RBF's, Perceptron's, Multilayer neural networks, Support vector machine, Graph theoretical functional connectivity analysis

# UNIT 5 APPLICATIONS OF BCI

Case Studies - Invasive BCIs: decoding and tracking arm (hand) position, controlling prosthetic devices such as orthotic hands, Cursor and robotic control using multi electrode array implant, Cortical control of muscles via functional electrical stimulation. Noninvasive BCIs: P300 Mind Speller, Visual cognitive BCI, Emotion detection, Ethics of Brain Computer Interfacing

# **TOTAL: 45 PERIODS**

# REFERENCES

- Ella Hassianien, A & Azar. A.T (Editors), "Brain-Computer Interfaces Current Trends and Applications", 1. Springer, 2015.
- 2. Bernhard Graimann, Brendan Allison, Gert Pfurtscheller, "Brain-Computer Interfaces: Revolutionizing Human-Computer Interaction", Springer, 2010
- 3. Ali Bashashati, Mehrdad Fatourechi, Rabab K Ward, Gary E Birch," A survey of signal Processing algorithms in brain-computer interfaces based on electrical brain signals" Journal of Neural Engineering, Vol.4, 2007, PP.32-57.
- Arnon Kohen, "Biomedical Signal Processing", Vol I and II, CRC Press Inc, Boca Rato, Florida. 4.
- Bishop C.M., "Neural networks for Pattern Recognition", Oxford, Clarendon Press, 1995. 5.
- Andrew Webb, "Statistical Pattern Recognition", Wiley International, Second Edition, 2002. 6.

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### e-RESOURSES:

- 1. https://www.youtube.com/watch?v=WjEG0mv4O24
- 2. https://www.youtube.com/watch?v=rsehh0SgpZs
- 3. https://www.youtube.com/watch?v=LoGBCsFPNzU

### **COURSE OUTCOMES Upon completion of the course, students will be able to:**

- 1. Comprehend and appreciate the significance and role of this course in the present contemporary world
- 2. Differentiate various concept of BCI.
- 3. Allocate functions appropriately to the human and to the machine.
- 4. Select appropriate for feature extraction methods.
- 5. Design a system using machine learning algorithms for translation.

COsPOs	PO 1	<b>PO</b> 2	PO 3	PO 4	PO 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	3	1	-	-	-	-	-	-	1	1	2
CO2	3	-	-	3	3	-	-	-	-	-	-	1	1	2
CO3	3	-	-	3	3	-	-	-	-	-	-	1	1	2
<b>CO4</b>	3	-	-	3	3	-	-	-	-	-	-	1	1	2
CO5	3	-	3	3	3	-	-	-	-	-	-	1	1	2

### Mapping of COswith POs and PSOs

# **Pre-requisites :** Mathematics

**22CSE44** 

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:**

- Mikell.P.Groover, "Industrial Robotics Technology, Programming and applications" McGraw Hill 2ND 1. edition 2017.
- Ganesh.S.Hedge,"A textbook of Industrial Robotics", Lakshmi Publications, 2006 2.

# **REFERENCES:**

- Fu K.S. Gonalz R.C. and ice C.S.G."Robotics Control, Sensing, Vision and Intelligence", McGraw Hill 1 book co. 2007.
- YoramKoren, "Robotics for Engineers", McGraw Hill Book, Co., 2015. 2.

# e-RESOURCES:

- https://nptel.ac.in/courses/107106090, "Introduction to robotics" by Dr. Krishna Vasudevan, Dr. T 1. Asokan, Dr. Balaraman Ravindran, IIT Madras.
- https://onlinecourses.nptel.ac.in/noc19\_me74/preview, "Robotics" by Prof.Dilip Kumar Pratihar, IIT 2. Kharagpur.

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**Total: 45 Periods** 

**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.

COsPOs	PO 1	PO 2	PO 3	<b>PO</b> 4	PO 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1	1	-	-	-	-	-	-	-	1	-	3
CO2	3	2	1	1	-	-	-	-	-	-	-	1	-	3
CO3	3	2	1	1	-	-	-	-	-	-	-	1	-	3
<b>CO4</b>	3	2	1	1	-	-	-	-	-	-	-	1	-	3
CO5	3	2	1	1	-	-	-	-	-	-	-	1	-	3

Mapping of COs with POs and PSOs

Pre-requisites : Data Structures using Python

Preamble: Blockchain is a self-sustaining, peer to peer distributed database ledger technology for managing and recording transactions with no central regulatory and ownership involvement. It is like an online bank ledger, open to both parties in a transaction. Blockchain gained increasing importance because of its relevance in facilitating a single shared version of the truth for any digital asset

# **UNIT 1 GETTING STARTED WITH BLOCK CHAIN**

What is Blockchain – Centralized Vs. Decentralized Systems – Layers of Blockchain – Why is Blockchain Important – Blockchain uses and Use Cases.

# **UNIT 2 WORKING OF BLOCK CHAIN**

Blockchain foundation - Cryptography - Game Theory - Merkle Trees - Properties of Blockchain solutions - Blockchain Transactions - Distributed Consensus Mechanisms.

# **UNIT 3 WORKING OF BITCOIN AND ETHERIUM**

Bitcoin Blockchain - The Bitcoin Network - Bitcoin Scripts - Bitcoin Wallets - Ethereum Blockchain -Transaction and Message Structure - Smart Contracts - Ethereum Virtual Machine

### **UNIT 4 INTRODUCTION TO FINTECH**

Definition, History, concept, meaning, architecture, significance, Goals, key areas in FinTech, Importance of FinTech, role of FinTech in economic development, opportunities and challenges in FinTech, Evolution of FinTech in different sectors of the industry - Infrastructure, Banking Industry, Startups and Emerging Markets, recent developments in FinTech, future prospects and potential issues with FinTech.

# **UNIT 5 PAYMENT INDUSTRY**

FinTech in Payment Industry-Multichannel digital wallets, applications supporting wallets, onboarding and KYC application, FinTech in Lending Industry- Formal lending, Informal lending, P2P lending, POS lending, Online lending, Payday lending, Microfinance, Crowd funding.

# **TEXT BOOKS:**

- Bikramaditya Singhal, Gautam Dhameja and Priyansu Sekhar Panda, "Beginning Blockchain A 1. Beginner's Guide to Building Blockchain Solutions", Apress Publication, 2018.
- 2. Susanne Chishti, Janos Barberis, "The FINTECH Book: The Financial Technology Handbook for Investors, Entrepreneurs and Visionaries", Wiley Publications, 2016
- Swee Won Lo Yu Wang David Kuo Chuen Lee, "Blockchain and Smart Contracts: Design 3. Thinking and Programming for FinTech", Singapore University of Social Sciences - World Scientific Future Economy Series, 2021.

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# **Total: 45 Periods**

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

- CO1 Identify and explain the key benefits of block chain for a business or a network environment
- CO2 Explain the components of block chain to develop a block chain system
- CO3 Design a bitcoin wallet and Develop Ethereum Virtual Machine for the given business model.
- CO4 Describe the history, importance and evolution of Fintech.
- CO5 Analyze evolving financial landscapes in the payment industry to improve payment processes, financial services, and customer experiences.

COsPOs	PO 1	PO 2	PO 3	<b>PO</b> 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	2
CO2	3	3	2	2	1	-	-	-	-	-	-	1	3	2
CO3	3	3	2	2	1	-	-	-	-	-	-	1	3	2
CO4	3	3	2	2	1	-	-	-	-	-	-	1	3	2
CO5	3	3	2	2	1	-	-	-	-	-	-	1	3	2

# Mapping of COs with POs and PSOs

### **Pre-requisites :** Java Programming

22CSE46

**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

GAME DEVELOPMENT

### 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.

### **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", 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. Mallikarjuna Rao, 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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**Total: 45 Periods** 

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 Select a suitable platform and framework to design a game.
- CO5 Develop a simple game using Pygame.

COsPOs	PO 1	PO 2	PO 3	<b>PO</b> 4	PO 5	PO 6	<b>PO</b> 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

# Mapping of COs with POs and PSOs

# **3D PRINTING AND DESIGN**

# **Pre-requisites :**

22CSE47

**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.

# **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.
- https://www.coursera.org/learn/introduction-to-3d-modeling, "Introduction to 3D Modeling", Prof.

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2. Glenn Wilcox, University of Michigan.

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**Total: 45 Periods** 

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

- CO1 Outline and examine 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	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	3	-	3	1	-	-	-	-	-	1	3	2
CO2	2	2	3	-	3	1	-	-	-	-	-	1	3	2
CO3	2	2	3	-	3	1	-	-	-	-	-	1	3	2
<b>CO4</b>	2	2	3	-	3	1	-	-	-	-	-	1	3	2
CO5	2	2	3	-	3	1	-	-	-	-	-	1	3	2

# Mapping of COs with POs and PSOs

# 22CSE48

Pre-requisites : Artificial Intelligence, Machine Learning Preamble

Generative AI refers to a branch of artificial intelligence focused on creating new data instances that resemble real data. It involves the use of various techniques, including neural networks, to generate new content such as text, images, videos, and more. This course is designed to span a broad understanding of generative AI, covering theory, applications, challenges, practical implementation techniques, and leveraging it for content creation, programming tasks, website development, chatbots, and the lifecycle of Large Language Model (LLM)-based generative AI.

**GENERATIVE AI** 

#### UNIT 1 **INTRODUCTION TO GENERATIVE AI**

Introduction to Generative AI: Define Generative AI- how Generative AI works-Generative AI Applications- Challenges and Opportunities in Generative AI- ChatGPT: What is ChatGPT? -ChatGPT and its working. Prompt Engineering Fundamentals: What is a Prompt? - Elements of a Prompt- Evolution of Prompt Engineering- Tips for Designing Prompt- Case Study: Example Prompts for various use cases.

#### UNIT II **GENERATIVE AI FOR TEXTS, IMAGES AND VIDEOS**

Generative Texts: Introduction to AI Chatbots- Working of AI Chatbots- Popular AI Chatbots- How to use Chatbots- Usecases of Chatbots for various users. Generative Images and Videos: Role of AI in Image and Video Generation - Image Sourcing Vs Image Generation- Popular AI tools for Image Generation and Video Makers. Case Study - Prompts for Image Generation and AI Videos.

#### UNIT 3 **GENERATIVE CODES & OPENALAPIS**

Generative Codes: Role of AI Tools in Programming- Popular AI tools for Code Generation Build a website using Gen AI Tools. OpenAI APIs : Understanding OpenAI APIs - OpenAI playground-Creating API keys – Authentication - Making Requests. Case Study: Building AI Powered Chatbots.

#### FOUNDATIONS OF NEURAL NETWORKS AND DEEP LEARNING 9 UNIT 4 **ARCHITECTURES**

Neural Network Fundamentals: From simple Perceptron to multi-layer perceptron and its training. Deep Learning and its Architectures: Introducing deep learning and architectures such as CNN, RNN, GAN and Transformers.

#### ADVANCED TOPICS IN DEEP LEARNING: TRANSFORMERS, LLMS 9 UNIT 5 GANS

Transformer and Large Language Model (LLM): Fundamentals of Transformers Architecture -Applications of LLMs in Data Science- Use Cases and various Models for Natural Language Processing. Training LLM for Natural Language Processing: Training, Fine Tuning, Evaluation and Feedback through Reinforcement Learning. Generative Adversarial Networks (GAN) for Image Generation: Detailed description of GAN architecture- its training and variants.

Total: 45 Periods

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# **TEXT BOOKS:**

- 1. Modern Mind Publications, "Generative AI for Beginners Made Easy: Master Artificial Intelligence and Machine Learning Fundamentals, Learn Creative AI, and Enhance Your Skills With Interactive Real-World Exercises", Kindle Edition.
- 2. Ben Auffarth, "Generative AI with LangChain: Build large language model (LLM) apps with Python, ChatGPT, and other LLMs", Kindle Edition.
- 3. Bernard Marr, "Generative AI in Practice: 100+ Amazing Ways Generative Artificial Intelligence is Changing Business and Society", March 2024.
- 4. David Sweenor, Yves Mulkers, "Generative AI Business Applications: An Executive Guide with Real-Life Examples and Case Studies (TinyTechGuides)", Kindle Edition.
- 5. Divit Gupta and Anushree Srivastava, "The Potential of Generative AI: Transforming technology, business and art through innovative AI applications", Kindle Edition.
- 6. https://www.databricks.com/resources/ebook/big-book-generative-ai-"The Big Book of Generative AI-How to successfully build GenAI applications"

# **REFERENCES:**

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

- 1. Provide a comprehensive understanding of Generative AI, covering theory, applications, challenges, and practical implementation techniques.
- 2. Leverage generative AI methods for creating content across text, images, and videos.
- 3. Gain proficiency in utilizing generative AI tools for programming tasks, website development, and creating AI-powered Chatbots.
- 4. Develop a comprehensive understanding of neural networks, from basic perceptrons to advanced architectures like CNNs, RNNs, GANs, and Transformers
- 5. Understand LLM-based generative AI lifecycle, from data gathering and model selection, to performance evaluation and deployment.

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

# Mapping of Cos with Pos and PSOs:

# **Pre-requisites :** Artificial Intelligence, Machine Learning

Preamble

22CSE51

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 - Inquiry-driven 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, Dorin Marcu, Mihai Boicu, David A. Schum, Knowledge Engineering Building Cognitive
- 1. 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:**

Ronald J. Brachman, Hector J. Levesque: Knowledge Representation and Reasoning, Morgan 1.

VCET, B.E-CSE, R2022 - Curriculum and Syllabus

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

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**Total: 45 Periods** 

# e-RESOURCES:

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

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

- CO1 Understand the basics of Knowledge Engineering
- CO2 Apply methodologies and modelling for Agent Design and Development
- CO3 Implementing Ontologies for design and development
- CO4 Apply reasoning with ontologies and rules in learning and development
- CO5 Understand learning and rule learning using Machine learning.

# Mapping of COs with POs and PSOs

Cos/POs	PO 1	<b>PO</b> 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	-	-	-	-	2	1	-	2
CO2	3	3	2	2	1	1	-	-	-	-	2	1	-	2
CO3	3	3	2	2	1	1	-	-	-	-	2	1	-	2
<b>CO4</b>	3	3	2	2	1	1	-	-	-	-	2	1	-	2
CO5	3	3	2	2	1	1	-	-	-	-	2	1	-	2

#### 22CSE52

#### **PROMPT ENGINEERING**

# **Pre-requisites : AI, NLP**

### Preamble

Primary aim of the course is to introduce learners with essentials of prompt engineering. Prompt engineering is a concept in artificial intelligence, particularly natural language processing. In prompt engineering, the description of the task that the AI is supposed to accomplish is embedded in the input, the essentials cover techniques and applications and challenges of prompt engineering core algorithms for solving basic tasks with ChatGPT.

#### UNIT 1 **INTRODUCTION**

Introduction to Prompt Engineering- What is Prompt Engineering? - Importance of Prompt Engineering - Types of Prompts. Basic Principles of Prompt Engineering : Understanding Language Models - Data Pre-Processing - Generating Prompt.

#### UNIT 2 **TECHNIQUES FOR PROMPT ENGINEERING**

Pattern Matching - Template-Based Prompt Generation - Text Augmentation. Advanced Prompt Engineering: Transfer Learning for Prompt Engineering - Fine-Tuning Models for Specific Tasks - Adversarial Prompt Engineering

#### **EVALUATING AND TESTING PROMPTS** UNIT 3

Metrics for Evaluating Prompts - Human Evaluation of Prompts - Testing Prompts on Different Models and Tasks. ChatGPT Prompt Engineering: Challenges & Best Practices - Standard Prompts - Role Prompting - Chain of Thoughts Prompting.

#### UNIT 4 **CREATING A PERFECT PROMPT WITH ChatGPT**

Structure - How to use word document - Using Industries - Using Tone, Voice, & Style - Mentioning Types of Customers - Using Context Background - Follow-up Prompts Structure.

#### **UNIT 5** APPLICATIONS AND CHALLENGES OF PROMPT ENGINEERING

Knowledge Probing - Information Extraction - "Reasoning" in NLP - Meta-Applications. Challenges : Prompt Design -Selection of Tuning Strategy - 5 Selection of Pre-trained Models - 6 Theoretical and Empirical Analysis of Prompting.

# **TEXT BOOKS:**

- Nathan Hunter The Art of Prompt Engineering with chatGPT: A Hands-On Guide Independently published, 1. Pearson Publication, 2023.
- **REFERENCES:**
- Ryan Turner ChatGPT & Social Media Marketing: The Ultimate Guide to Succeeding on Social Media. Discover 1. how Artificial Intelligence can make you the world's best Social Media Manager, Independently published, 2023.
- Pengfei Liu, Weizhe Yuan, Pre-train, Prompt, and Predict: A Systematic Survey of Prompting Methods in 2. Natural Language Processing, arXiv:2107.13586v1, 2021
- Bruce Brown , ChatGPT Prompt Engineering: PROMPTS (ver. 3a), 2022 3.

### e-RESOURCES:

- 1. https://www.udemy.com/course/chatgpt-prompt-engineering-for-beginners/
- https://www.theknowledgeacademy.com/in/courses/artificial-intelligence-tools-training/chatgpt-prompt-2. engineering-training/

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# **Total: 45 Periods**

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

- CO1 Understand the with basic principles of prompt engineering
- CO2 Implement a techniques for prompt engineering
- CO3 Design a tag set to be used for evaluating and testing prompts.
- CO4 Use tools to creating a perfect prompt with chatGPT
- CO5 Compare and contrast the use of different applications and challenges of prompt engineering.

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

# Mapping of COs with POs and PSOs

### 22CSE53

### **COMPUTER VISION**

#### С Р L Т 3 3

### 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.

#### INTRODUCTION TO IMAGE FORMATION AND PROCESSING UNIT 1

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 matters - Face recognition -Instance recognition - Category recognition - Context and scene understanding- Recognition databases and test sets.

### **Total: 45 Periods**

# **TEXT BOOKS:**

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

# **REFERENCES:**

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

# e-RESOURCES:

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

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

- CO1 Understand basic knowledge, theories and methods in image processing and computer vision.
- CO2 Implementing basic and some advanced image processing techniques in OpenCV.
- CO3 Apply 2D feature-based image alignment by segmentation and motion estimations.
- CO4 Implementing Representation and Reconstruction by Apply 3D image reconstruction techniques
- CO5 Design and develop innovative image processing and computer vision 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	3	3	2	3	-	-	-	2	1	2	2	-	2
CO2	3	3	3	2	3	-	-	-	2	1	2	2	-	2
CO3	3	3	3	2	3	-	-	-	2	1	2	2	-	2
CO4	3	3	3	2	3	-	-	-	2	1	2	2	-	2
CO5	3	3	3	2	3	-	-	-	2	1	2	2	-	2

### Mapping of COs with POs and PSOs

# **Pre-requisites :** Nil **Preamble**

22CSE54

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, Part-of-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, DynamicProgramming 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.
- 4. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.

# e-RESOURCES:

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

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

- CO1 Tag a given text with basic Language features
- 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

Cos/POs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	<b>PO</b> 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	3
CO2	3	3	2	2	2	1	-	1	-	-	-	1	1	3
CO3	3	3	2	2	2	1	-	1	-	-	-	1	1	3
CO4	3	3	2	2	2	1	-	1	-	-	-	1	1	3
CO5	3	3	2	2	2	1	-	1	-	-	-	1	1	3

# Mapping of COs with POs and PSOs

### 22CSE55

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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.

# **Total : 45 Periods**

# 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, 2001.

# e-RESOURCES:

- 1. 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 Understand 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 to learn new things faster.

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

# Mapping of COs with POs and PSOs

#### 22CSE56

#### **DEEP LEARNING**

### Pre-requisites : Probability and Random Processes, Linear Algebra

**Preamble:** In the last decade due to availability of cheap computation, several neural network approaches had been explored in order to advance the performance of many state-of-the-art visual recognition problems such as image searching, understanding, medical applications, autonomous vehicles such as drones and self-driving cars etc. All these problems relies of efficient, accurate and robust solutions for basic vision tasks such like image classification, localization and detection. In this course students will be given an exposure to the details of neural networks as well as deep learning architectures.

### UNIT 1 FOUNDATIONS OF NEURAL NETWORK AND DEEP LEARNING

**Basics of Artificial Neural Networks (ANN):** Introduction to Deep Learning- Neural Network Basics-Artificial Neural Network and its layers- Computational Models of Neurons, Structure of Neural Networks, Functional Units of ANN for Pattern Recognition Tasks. Feed forward Neural Networks: Pattern Classification using Perceptron, Multilayer Feed-Forward Neural Networks (MLFFNNs), Back propagation in Feed-Forward Networks.

### UNIT 2 DEEP NEURAL NETWORKS (DNNS)

**Deep Neural Networks (DNNs):** Difficulty of training DNNs, Greedy layer wise training, Optimization for training DNNs, Newer Optimization Methods for Neural Networks (AdaGrad, RMSProp, Adam), Second order methods for training, Regularization methods (dropout, drop connect, batch normalization).

# UNIT 3 CONVOLUTIONAL NEURAL NETWORKS (CNNS)

**Convolutional Neural Networks (CNNs):** Introduction to CNN- Understanding Convolution and Pooling- Different Classic CNN Architectures-Variants of the Basic Convolution Function - Structured Outputs - Data Types - Efficient Convolution Algorithms - Random or Unsupervised Features - LeNet, AlexNet.

### UNIT 4 RECURRENT NEURAL NETWORKS

**Recurrent Neural Networks (RNNs):** Sequence modeling using RNNs, Back propagation through time, Long Short Term Memory (LSTM), Bidirectional LSTMs, Bidirectional RNNs, Gated RNN Architecture Deep Recurrent Networks Recursive Neural Networks. **Deep Generative Models:** Boltzmann Machines -Restrictive Boltzmann Machines (RBMs), Stacking RBMs, Application of RBM in Recommender Systems.

# UNIT 5 APPLICATIONS OF DEEP LEARNING

**Applications:** Application of CNN in Computer Vision: Image Classification, Object Detection - Automatic Image Captioning – Image Generation with Generative Adversarial Networks – Video to Text with LSTM models – Computer - Speech Recognition - Application of RNN in NLP and Time Series Forecasting.

**Total : 45 Periods** 

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# **TEXT BOOKS:**

- 1. Ian J. Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, Available online: http://www.deeplearningbook.org, 2017.
- 2. Nikhil Baruma, Fundamentals of Deep Learning, O'Reilly publication, 2022.
- 3. Charu C. Aggarwal. Neural Networks and Deep Learning: A Textbook. Springer. 2019.

# **REFERENCES:**

- 1. Bengio, Yoshua. "Learning deep architectures for AI." Foundations and trends in Machine Learning 2.1 (2009): 1127.
- 2. Francois Chollet, "Deep Learning with Python", Manning Publications, 2018

# e-RESOURCES:

- 1. https://www.tensorflow.org/
- https://archive.nptel.ac.in/courses/106/106/106106184/, "Deep Learning", Mitesh M Khapra, IIT Madras Ropar

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

- CO1 Explain the basics concepts of deep learning and various deep learning algorithms
- CO2 Illustrate the skills to optimize neural networks, prevent overfitting, and improve the performance and generalization of trained models
- CO3 Apply the knowledge about different variants of the convolution function, structured outputs, data types, and efficient algorithms for real world applications
- CO4 Apply LSTM, deep recurrent networks, recursive neural networks, and deep generative models to applications viz. natural language processing, speech recognition, machine translation, and recommendation systems.
- CO5 Demonstrate how CNNs and RNNs can be applied to various real-world scenarios

COsPOs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3	3	2	3	3	-	1	-	-	-	1	3	3
CO2	2	3	3	2	3	3	-	1	-	-	-	1	3	3
CO3	2	3	3	2	3	3	-	1	-	-	-	1	3	3
<b>CO4</b>	2	3	3	2	3	3	-	1	-	-	-	1	3	3
CO5	2	3	3	2	3	3	-	1	-	-	-	1	3	3

# Mapping of COs with POs and PSOs

# 22CSE61AD HOC AND WIRELESS SENSOR NETWORKSLTPC3003

#### **Pre-requisites : Computer Networks**

**Preamble:** This course enables the student to understand the fundamental concepts of adhoc wireless sensor networking system that facilitate the erection of infrastructure less networks in unknown time and place, MAC protocol, routing and transport layer protocol design issues. This course enables the students to evaluate the QoS related performance measurements of ad hoc and sensor networks.

### UNIT 1 TUNING TO SENSOR NETWORKS FUNDAMENTALS

Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio propagation Mechanisms – Characteristics of the wireless channel – Mobile Ad hoc Networks (MANETs) and Wireless Sensor networks (WSNs): concepts and architectures – Applications of Ad Hoc and Sensor networks – Design Challenges in Ad hoc and Sensor Networks

### UNIT 2 MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS

Issues in designing a MAC Protocol – Classification of MAC Protocols – Contention based protocols – Contention based protocols with Reservation Mechanisms – Contention based protocols with Scheduling Mechanisms – Multi channel MAC – IEEE 802.11.

# UNIT 3 ROUTING PROTOCOLS AND TRANSPORT LAYER IN AD HOC WIRELESS NETWORKS

Issues in designing a routing and Transport Layer protocol for Ad hoc networks – proactive routing, reactive routing (on – demand), hybrid routing – Classification of Transport Layer solutions – TCP over Ad hoc networks.

#### UNIT 4 WIRELESS SENSOR NETWORKS (WSNS) AND MAC PROTOCOLS

Single node architecture: hardware and software components of a sensor node – WSN Network architecture: typical network architectures – data relaying and aggregation strategies – MAC layer protocols: self – organizing, Hybrid TDMA/FDMA and CSMA based MAC – IEEE 802.15.4 – Case study: Wireless Sensor Network in Sustainable Agriculture.

### UNIT 5 WSN ROUTING, LOCALIZATION & QOS

Issues in WSN routing – OLSR – Localization – Indoor and Sensor Network Localization – absolute and relative localization, triangulation – QOS in WSN – Energy Efficient Design – Synchronization – Transport Layer Issues – Case study: WBAN revisited.

### **TEXT BOOKS:**

- 1. C. Siva Ram Murthy, and B. S. Manoj, "Ad hoc Wireless Networks: Architectures and Protocols", Prentice Hall Professional Technical Reference, First Edition, 2008
- 2. Kazem Sohraby, Daniel Minoli, &TaiebZnati, "Wireless Sensor Networks-Technology, Protocols, and Applications", John Wiley, 2010.

### **REFERENCES:**

- 1. Carlos De Morais Cordeiro, Dharma Prakash Agrawal "Ad Hoc & Sensor Networks: Theory and Applications", World Scientific Publishing Company, 2006.
- 2. Feng Zhao and LeonidesGuibas, "Wireless Sensor Networks", Elsevier Publication 2004.
- 3. Holger Karl and Andreas Willig "Protocols and Architectures for Wireless Sensor Networks", Wiley, 2005.
- 4. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.

### e-RESOURCES:

- 1. http://nptel/courses/video/106105160/, "Medium Access Control in Wireless Networks", Prof Sudip Misra, IIT Kharagpur.
- 2. https://nptel.ac.in/courses/106105160/, "Introduction: Wireless Ad Hoc Networks", Prof Sudip Misra, IIT Kharagpur.

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**Total: 45 Periods** 

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

- Outline the fundamentals of wireless communication technology that facilitate the insight of CO1 infrastructure less networks formation, application and design issues of the given Ad hoc and Sensor networks
  - Describe the MAC Protocol designing issues and contention-based algorithms with reservation
- CO2 and scheduling to achieve node mobility, time synchronization, bandwidth efficiency and QoS support for the given Ad hoc wireless network
- CO3 Explain the issues behind the routing protocol blueprint and classification in transport layer to suit with Ad hoc Wireless Network
- CO4 Delineate the MAC layer protocols to emphasize the energy efficient operation, efficient neighbor discovery and channel assignment operations for the Wireless sensor networks
- CO5 Discuss the architecture, data handling and localization techniques to optimize the location discovery of sensor nodes for the given wireless sensor networks

COsPOs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	-	1	-	-	-	-	-	-	-	-	-	1
CO2	3	2	-	1	-	-	-	-	-	1	-	-	-	1
CO3	3	2	-	1	-	-	1	-	-	2	-	-	-	2
CO4	3	2	2	1	-	-	-	-	-	-	-	2	-	1
CO5	3	2	2	1	-	-	-	1	-	-	-	2	-	2

### Mapping of COs with POs and PSOs

# **Pre-requisites : Analog and Digital Data Communication / Digital Electronics /Computer Networks Preamble:**

To understand the basic concepts of mobile computing.

- To learn the basics of mobile telecommunication system .
- To be familiar with the network layer protocols and Ad-Hoc networks.
- To know the basis of transport and application layer protocols.
- To gain knowledge about different mobile platforms and application development.

# UNIT 1 INTRODUCTION TO MOBILE COMMUNICATION

Introduction to Mobile Computing – Applications of Mobile Computing- Generations of Mobile Communication Technologies (1G,2G,3G,4G,5G)- Multiplexing – Spread spectrum - MAC Protocols – SDMA- TDMA- FDMA-OFDMA - CDMA – Massive MIMO

# UNIT 2 MOBILE TELECOMMUNICATION SYSTEM

Introduction to Cellular Systems - GSM – Services & Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security – GPRS- UMTS – Architecture – Handover – Security- Bluetooth – Li-Fi.

# UNIT 3 MOBILE NETWORK LAYER

Mobile IP – DHCP – AdHoc– Proactive protocol-DSDV, Reactive Routing Protocols – DSR, AODV, Hybrid routing –ZRP, Multicast Routing- ODMRP, Vehicular Ad Hoc networks (VANET) –MANET Vs VANET – Security

# UNIT 4 MOBILE TRANSPORT AND APPLICATION LAYER

Mobile TCP-WAP - Architecture - WDP - WTLS - WTP - WSP - WAE - WTA Architecture - WML

# UNIT 5 MOBILE PLATFORMS AND APPLICATIONS

Mobile Device Operating Systems – Special Constraints & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – MCommerce – Structure – Pros & Cons – Mobile Payment System – Security Issues

# **TEXT BOOKS:**

- 1. Jochen Schiller, —Mobile Communications, PHI, Second Edition, Reprint edition 2008.
- 2. Prasant Kumar Pattnaik, Rajib Mall, —Fundamentals of Mobile Computing, PHI Learning Pvt.Ltd, New Delhi 2019

# **REFERENCES:**

- 1. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2010
- 2. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, —Principles of Mobile Computingl, Springer, 2006.
- 3. William.C.Y.Lee,—Mobile Cellular Telecommunications-Analog and Digital Systems<sup>I</sup>, Second Edition,TataMcGraw Hill Edition,2006.

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**Total: 45 Periods** 

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# e-RESOURCES:

- 1. Android Developers : http://developer.android.com/index.html
- 2. Windows Phone DevCenter : http://developer.windowsphone.com
- 3. https://nptel.ac.in/courses/106106147
- 4. https://alison.com/course/introduction-to-mobile-and-cloud-computing-revised

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

- CO1 Explain the basics of mobile telecommunication systems.
- CO2 Illustrate the generations of telecommunication systems in wireless networks
- CO3 Determine the functionality of MAC, network layer and Identify appropriate routing protocol for a given Ad hoc network
- CO4 Explain the functionalities and architecture of mobile Transport and Application layers
- CO5 Develop a mobile application using android/blackberry/ios/Windows SDK

# Mapping of COs with POs and PSOs

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

# ETHICAL HACKING

**Pre-requisites :** Cryptography And Network 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

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, 2013.
- 2. Basics of Hacking and Penetration Testing Patrick Engebretson, SYNGRESS, Elsevier, 2013.
- 3. The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws, Dafydd Stuttard and Marcus Pinto, 2011.

# **REFERENCES:**

1. Black Hat Python: Python Programming for Hackers and Pentesters, Justin Seitz , 2014.

VCET, B.E-CSE, R2022 - Curriculum and Syllabus

# 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	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	2	-	-	1	-	1	2	-	1	1	2
CO2	3	2	1	1	3	-	1	-	2	1	1	1	1	2
CO3	3	2	2	1	3	-	1	-	1	2	1	1	1	2
CO4	3	1	1	2	3	-	1	-	1	2	1	1	1	2
CO5	3	3	1	1	3	-	1	-	2	1	1	1	1	1

### Mapping of COs with POs and PSOs

# 22CSE64

# **Preamble:**

The course introduces software defined networks, an emerging paradigm in computer networking that allows a logically centralized software program to control the behavior of an entire network and to deal with the ever increasing network management burden created by our interconnected world. The goal of SDN is to improve network control by enabling enterprises and service providers to respond quickly to changing business requirements.

# UNIT 1 EVOLUTION AND GENESIS OF SDN

Basic Packet-Switching Terminology- The Modern Data Center- Traditional Switch Architecture-Autonomous and Dynamic Forwarding Tables-Evolution of Switches and Control Planes-Cost-SDN Implications for Research and Innovation-Data Center Innovation-Data Center Needs-The Evolution of Networking Technology- Forerunners of SDN - Birth of Software Defined Networking

# UNIT 2 WORKING OF SDN

Sustaining SDN Interoperability- Network Virtualization-Virtual LANs – OpenFlow VLAN Support -Fundamental Characteristics of SDN- SDN Operation-SDN Devices- SDN Controller- Alternate SDN Methods.

# UNIT 3 SDN IN DATA CENTER AND OTHER ENVIRONMENTS

Data Center definition and demands- Tunneling Technologies for the Data Center- Path Technologies in the Data Center-Ethernet Fabrics in the Data Center - SDN Use Cases in the Data Center - Open SDN versus Overlays in

the Data Center- Real-World Data Center- SDN in Other Environments: Wide Area Networks- Service Provider and Carrier Networks- Campus Networks.

# UNIT 4 PLAYERS IN SDN ECOSYSTEM

Players in the SDN Ecosystem: Academic Research Institutions - Industry Research Labs - Network Equipment Manufacturers-Software Vendors-White-Box Switches-Merchant Silicon Vendors-Original Device Manufacturers-Enterprises-Standards Bodies and Industry Alliances.

# UNIT 5 SDN APPLICATIONS

SDN Applications: Reactive versus Proactive Applications-Analyzing Simple SDN Applications-A Simple Reactive Java Application-Background on Controllers-Using the Floodlight Controller- Using the Cisco XNC Controller- Switch Considerations- Creating Network Virtualization Tunnels-Offloading Flows in the Data Center Access Control for the Campus-Traffic Engineering for Service

Offloading Flows in the Data Center-Access Control for the Campus-Traffic Engineering for Service Providers. TOTAL: 45PERIODS

# **TEXT BOOKS:**

- 1. Paul Goransson and Chuck Black, —Software Defined Networks: A Comprehensive Approach, First Edition, Morgan Kaufmann, 2016.
- 2. Thomas D. Nadeau, Ken Gray, —SDN: Software Defined Networks, O'Reilly Media, 2013, First Edition.

# **REFERENCES:**

- 1. SiamakAzodolmolky, -Software Defined Networking with Open Flow, Packet Publishing, 2013.
- 2. Vivek Tiwari, —SDN and Open Flow for Beginners, Amazon Digital Services, Inc., 2013.
- 3. Fei Hu, Editor, —Network Innovation through Open Flow and SDN: Principles and Design, CRC Press, 2014.

# e-RESOURCES:

- $\frac{1}{2}$  Website: Open Networking Foundation :http://opennetworking.org.
- 2. Website: Project Floodlight:http://www.projectfloodlight.org/floodli ght/
- 3. Website: OpenDaylight:https://www.opendaylight.org/
- 4. Website: Mininet An Instant Virtual Network on your laptop:http://mininet.org/

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

- 1. Explain the challenges and opportunities associated with adopting SDN compared to traditional approaches of networking.
- 2. Explain the operation of SDN to centralize network intelligence for controlling an enterprise network.
- 3. Identify the pros and cons of applying SDN in WAN and data centers.
- 4. Describe techniques to enable applications for controlling the underlying network using SDN.
- 5. Describe the use of SDN for a given networking application.

# Mapping of COs with POs and PSOs

Cos/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	1	1	-	-	1	-	1	-	3
CO2	3	3	2	2	-	1	1	-	-	1	-	1	-	3
CO3	3	3	-	-	-	1	1	-	-	1	-	1	-	3
CO4	3	3	2	2	-	1	1	-	-	1	1	1	1	3
CO5	3	3	3	2	2	1	1	-	-	1	1	1	1	3

# **Pre-requisites : Python**

22CSE65

**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–2019.

# 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 analyzing data stealing malware during the cyber attack and compare the features of E-mail,

- CO3 analyzing data steaming marware 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.

COsPOs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	<b>PO</b> 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	-	3
CO2	3	3	2	2	2	1	1	1	-	-	-	1	-	3
CO3	3	3	2	2	1	1	1	1	-	-	-	1	-	3
CO4	3	3	2	2	1	1	1	1	-	-	1	1	-	3
CO5	3	3	2	2	2	1	1	1	-	-	1	1	-	3

# Mapping of COs with POs and PSOs

#### 22CSE66

**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 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.

### **Total: 45 Periods**

# **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.

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# e-RESOURCES:

1.https://nptel.ac.in/courses/106106139&sa=D&source=editors&ust=1707130049800751&usg=AOvVaw2 d9EWfmJktE7xjZKPofxQb

2.https://nptel.ac.in/courses/106106198/&sa=D&source=editors&ust=1707130049787713&usg=AOvVaw 2nM5G\_nNVaI1nqBFS9VI5Z

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

- CO1 Describe the fundamental concepts of machine learning.
- CO2 Illustrate the classification and regression.
- CO3 Examine the concepts of neural networks and ensemble learning.
- CO4 Illustrate the features of unsupervised learning.
- CO5 Describe the applications of machine learning.

### 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	1	-	-	-	-	-	-	-	-	-	1	2	2
CO2	3	2	2	1	1	-	-	-	-	-	-	1	2	2
CO3	3	2	2	1	1	-	-	-	-	-	-	1	2	2
CO4	3	2	2	1	1	-	-	-	-	-	-	1	2	2
CO5	3	2	3	2	1	-	-	-	-	-	-	1	2	2
AVG	3	2	2	1	1	-	-	-	-	-	-	1	2	2
- 2. Stuart McClure, Joel Scrambray, George Kurtz, -Hacking Exposed, Tata McGrawHill, 2003
- Matt Bishop, Computer Security Art and Science, Pearson/PHI, 2018.

# e-RESOURCES:

1.

- https://nptel.ac.in/courses/106106129, "Introduction to Information Security", Prof. V. 1.
  - Kamakoti, Department of Computer Science and Engineering, IIT-Madras.
- https://nptel.ac.in/courses/106106141, "Information Security-II", Prof. V. Kamakoti, 2.
  - Department of Computer Science and Engineering, IIT-Madras.

Physical Security, Security and Personnel.

# **UNIT 3 SECURITY ANALYSIS**

**UNIT 2 SECURITY INVESTIGATION** 

Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk - Systems: Access Control Mechanisms, Information Flow and Confinement Problem.

# **UNIT 4 LOGICAL DESIGN**

Blueprint for Security, Information Security Policy, Standards and Practices, ISO 17799/BS 7799, NIST Models, VISA International Security Model, Design of Security Architecture, Planning for Continuity.

# **UNIT 5 PHYSICAL DESIGN**

CRCPress LLC, 2012.

Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices,

# **TEXT BOOKS:**

**REFERENCES:** 

- Michael E Whitman and Herbert J Mattord, "Principles of Information Security", Sixth Edition, 1. Cengage Learning, 2017.
  - Nina Godbole, Information Systems Security: Security Management, Metrics, Frameworks and

Micki Krause, Harold F. Tipton, - Handbook of Information Security Management, Vol 1-3

Best Practices, John Wiley & Sons, 2<sup>nd</sup> edition 2017.

2.

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22CSE67

**Pre-requisites :** 

Preamble: Information security, sometimes shortened to InfoSec, is the practice of preventing unauthorized access, use, disclosure, disruption, modification, inspection, recording or destruction of information. The information or data may take any form, e.g. electronic or physical. Information security's primary focus is the balanced protection of the confidentiality, integrity and availability of data.

UNIT 1 SECURITY REQUIREMENTS AND SECURE SDLC 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.

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

# **INFORMATION SECURITY**

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**Total: 45 Periods** 

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

- CO1 Explain security principles and components in information management using security SDLC for a business Environment.
- CO2 Understand security threats and attacks and apply a security policy to overcome the threats in a given Environment.
- CO3 Identify and analyze risk factors, vulnerabilities to provide a security solution for managing the risks.
- CO4 Analyze security models and frameworks and use best practices and standards to develop a security policy for an organization.
- CO5 Apply security technologies for informational protection in an organization.

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	1	2	-	2	-	1	1	1	1	2	-	2
CO2	3	3	1	2	-	2	-	1	1	1	1	2	-	2
CO3	3	3	2	2	-	1	1	1	1	1	2	2	-	2
CO4	3	2	2	1	-	1	1	1	2	1	2	2	1	3
CO5	3	2	2	2	-	1	1	1	2	1	2	2	1	3

Mapping of COs with POs and PSOs

# **OPEN ELECTIVES**

#### 22CSO01

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# **Pre-requisites : Nil**

### Preamble

This course introduces the fundamentals of the Virtual Reality and Augmented Reality to efficiently incorporate user experience, identifying and resolving conflicts in real life. It aims to analyze the application of AR and VR in architecture, gaming, entertainment etc.

## UNIT 1 DESIGN ,ART ACROSS DIGITAL REALITIES AND EXTENDED REALITY 9

How Humans Interact with Computers-Modalities Through the Ages-Types of Common HCI Modalities -The Current State of Modalities for Spatial Computing Devices - Current Controllers for Immersive Computing Systems-A Note on Hand Tracking and Hand Pose Recognition-Designing for Our Senses, Not Our Devices-Sensory Design-Five Sensory Principles.Virtual Reality for Art-3D Art Optimization-Introduction-Draw Calls- Using VR Tools for Creating 3D Art -Acquiring 3D Models Versus Making Them from Scratch.

### UNIT 2 HARDWARE, SLAM, TRACKING

How the Computer Vision That Makes Augmented Reality Possible Works-A Brief History of AR-Select an AR Platform-MappingPlatforms- Apple's ARKit- Other Development Considerations – Lighting-The AR Cloud- The Dawn of the AR Cloud-The Bigger Picture— Privacy and AR Cloud Data

# UNIT 3 CREATING CROSS-PLATFORM AUGMENTED REALITY AND VIRTUAL 9

Virtual Reality and Augmented Reality: Cross-Platform Theory-The Role of Game Engines-Understanding 3D Graphics-Portability Lessons from Video Game Design-Simplifying the Controller Input-Virtual Reality Toolkit: Open Source Framework for the CommunityThree Virtual Reality and Augmented Reality Development Best Practices.

### UNIT 4 ENHANCING DATA REPRESENTATION:DATA VISUALIZATION AND 9 ARTIFICIAL INTELLIGENCE IN SPATIAL COMPUTING

Data and Machine Learning Visualization Design and Development in Spatial Computing-Introduction-Understanding Data VisualizationPrinciples for Data and Machine Learning Visualization-2D Data Visualizations versus 3D Data Visualization-Animation-Data Representations, Infographics, and Interactions-3D Reconstruction and Direct Manipulation of Real-World Data.

# UNIT 5 CHARACTER AI ,BEHAVIORS AND USE CASES IN EMBODIED REALITY 9

Introduction - Behaviors -Current Practice: Reactive AI-More Intelligence in the System: Deliberative AI-The Virtual and Augmented Reality Health Technology Ecosystem-VR/AR Health Technology Application Design - Standard UX Isn't Intuitive-The Fan Experience: SportsXR.

# Total : 45 PERIODS

### **TEXT BOOKS:**

1. Creating Augmented and Virtual Realities by Erin Pangilinan, Steve Lukas, Vasanth Mohan Released March 2019, Publisher(s): O'Reilly Media, Inc., ISBN: 9781492044147

## **REFERENCES:**

1. Paul Mealy, Virtual & Augmented Reality For Dummies, ISBN: 978-1-119-48134-8 July 2018

### e-RESOURCES:

 Augmented Reality and Virtual Reality: The Power of AR and VR for Business (2019) ISBN: 9783030062460, 3030062465, Publisher: Springer International Publishing, Editors: M. Claudia tom Dieck, Timothy Jung. Course Outcomes: Upon completion of this course, students will be able to:

- CO1 Apply the fundamentals of design, art across digital realities and extended reality
- CO2 Make use of components of hardware, slam, and tracking
- CO3 Apply the concept by creating cross-platform augmented reality and virtual reality
- CO4 Apply the techniques for enhancing data representation for data visualization and artificial intelligence in spatial computing
- CO5 Utilize the character of ai ,behaviors and use cases in embodied reality

Cos/POs	PO 1	PO 2	PO 3	<b>PO</b> 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	-	-	-	-	-	-	-	-	3	2
CO2	3	2	2	1	-	-	-	-	-	-	-	-	3	2
CO3	3	2	2	1	-	-	-	-	-	-	-	-	3	2
CO4	3	2	2	1	-	-	-	-	-	-	-	-	3	2
CO5	3	2	2	1	-	-	-	-	-	-	-	-	3	2

# Mapping of COs with POs and PSOs

#### 22CSO02

#### WEB DESIGNING

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#### **Preamble:**

Web design refers to the writing, mark-up and coding involved in Web development, which includes Web content, Web client and scripting. This course deals with most common web programming technologies such as HTML, CSS and Java Script.

#### UNIT 1 **WEBSITES BASICS, HTML 5**

Web Essentials: Evolution of the Internet and World Wide Web- Web Basics- Client-Side Scripting versus Server-Side Scripting- World Wide Web Consortium (W3C)-HTML5: Introduction- Editing HTML5- First HTML5 Example- Headings- Linking- Images- Special Characters and Horizontal Rules- Lists- Tables.

#### UNIT 2 HTML5 - FORM ELEMENTS AND CANVAS

Form- Internal Linking- meta Elements- New HTML5 Form input Types- Input and data list Elements and auto complete Attribute- Page-Structure Elements- Canvas: Introduction- Coordinate System-Rectangles- Using Paths to Draw Lines- Drawing Arcs and Circles- Shadows- Linear Gradients- Radial Gradients- Images- Transformations- Text.

#### **CASCADING STYLE SHEETS (CSS3)** UNIT 3

Types of CSS- Inline Styles- Embedded Style Sheets- Conflicting Styles- Linking External Style Sheets- Positioning Elements- Backgrounds- Element Dimensions- Box Model and Text Flow- Media Types and Media Queries- Drop-Down Menus- Text Shadows- Rounded Corners- Color- Box Shadows- Linear Gradients- Radial Gradients- Image Borders- Transitions and Transformations.

#### UNIT 4 INTRODUCTION TO SCRIPTING LANGUAGE

JavaScript: Introduction to Java script- Modifying Your First Script - Memory Concepts- Arithmetic-Decision Making-Obtaining User Input with prompt Dialogs-Control Statements- Functions- Objects. 9

#### UNIT 5 DOCUMENT OBJECT MODEL AND EVENT HANDLING

Document Object Model: Introduction- Modeling a Document: DOM Nodes and Trees- Traversing and Modifying a DOM Tree- DOM Collections- Dynamic Styles- Using a Timer and Dynamic Styles to Create Animated Effects- Event Handling: Introduction- Reviewing the load Event- Event mouse move and the event Object- Rollovers with mouse over and mouse out- Form Processing with focus and blur- More Form Processing with submit and reset- Event Bubbling- Case Study: Creation of a website using express studio.

#### **TOTAL: 45PERIODS**

### **TEXT BOOKS:**

- 1. Paul Deitel, Harvey DeitelandAbbeyDeitel, "Internet and World Wide Web - How to Program", 5th Edition, Pearson Publications, 2012.
- Danny Goodman, Michael Morrison, Paul Novitski, and Tia GustaffRayl, "JavaScript Bible", 7th 2. Edition, Wiley Publications, 2010.

### **REFERENCES:**

- David Flanagan, "JavaScript The Definitive Guide", 6th Edition, O'Reilly Media Publications, 1. 2011.
- 2. cholas C. Zakas, "Professional JavaScript for Web Developer", 3rd Edition, Wrox Publications, 2012.
- Ian Lloyds, "Build your own website the Right Way Using HTML & CSS", Site point publications, 3. 2008.

#### e-RESOURCES:

- 1. http://nptel.ac.in/courses/106105084/1, Internet Technologies, Prof. I. Sengupta, Department of Computer Science and Engineering, IIT Kharagpur.
- 2. p://www.w3schools.com/html/
- 3. www.liveweaver.com.

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

- 1. Construct a web page with essential elements using HTML5.
- 2. plain the form and canvas elements for a given web page using HTML5.
- 3. Design the web page and specify how to apply styles using CSS3.
- 4. Develop a script for a given scenario using components of JavaScript.
- 5. Exhibit the ability to design dynamic web pages with validation using JavaScript objects and event handling mechanisms.

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	-	-
CO2	-	3	2	-	2	-	-	-	-	-	-	1	-	-
CO3	-	3	2	-	2	-	-	-	-	-	-	1	-	-
CO4	-	3	2	-	2	-	-	-	-	-	-	1	-	-
CO5	-	3	2	-	2	-	-	-	-	-	-	1	-	-

## Mapping of COs with POs and PSOs

# 22CS003BLOCK CHAIN FUNDAMENTALSLTP300

# **Pre-requisites : Nil**

# Preamble

Blockchain technology is a method of storing information that makes it near-impossible for the system to be changed, hacked, or manipulated. It is a distributed or decentralized ledger duplicating and distributing transactions across the network of computers participating in the Blockchain.

# UNIT I INTRODUCTION TO BLOCKCHAIN

The history of blockchain -Blockchain -Definition -Generic elements of a Blockchain-How blockchain works - Benefits and limitations of blockchain.

# UNIT II BLOCKCHAIN TECHNOLOGY

Blockchain technology-Tiers of Blockchain technology-Features of a Blockchain-Types of Blockchain-Consensus-Types of consensus mechanisms -Consensus in Blockchain-CAP theorem and Blockchain.

# UNIT III DECENTRALIZATION AND CRYPTOGRAPHIC TECHNIQUES

Decentralization using blockchain - Methods of decentralization-The decentralization framework example - Cryptograpy primitives.

# UNIT IV BITCOIN

Bitcoin - The transaction life cycle-The transaction data structure-Types of transactions. The structure of a block-Mining-Tasks of the miners-Mining rewards-Proof of Work (PoW)-The mining algorithm-Proof of Storage-Proof of Stake (PoS),

# UNIT V ETHEREUM

Ethereum blockchain-Components of the Ethereum ecosystem-Types of accounts-Transactions and messages-Ether cryptocurrency / tokens (ETC and ETH)-The Ethereum Virtual Machine (EVM).

# **TEXT BOOKS:**

1. Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, Decentralization, and Smart Contracts Explained", Second Edition, Packt Publishing, 2018.

# **REFERENCES:**

1. Bikramaditya Singhal, Gautam Dhameja and Priyansu Sekhar Panda, "Beginning Blockchain – A Beginner's Guide to Building Blockchain Solutions", Apress Publication, 2018.

2. Michael J. Casey and Paul Vigna , "The Truth Machine – The Blockchain and the Future of Everything", St. Martin's Press, 2018

# **E-RESOURCES:**

1. https://nptel.ac.in/courses/106/104/106104220/#

2.https://www.udemy.com/course/build-your-blockchain-az

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

- CO1 Understand the Concepts and working of Block chain and summarize their Benefits limitations.
- CO2 Explore the Features and technology behind Blockchain,Mechanism of consensus and CAP Theorem in Blockchain
- CO3 Summarize the concepts of Decentralization , methods of Decentralization and cryptography primitive.
- CO4 Understand the lifecycle of a Bitcoin, MiningTasks and Mining algorithm.
- CO5 Explore the components of Ethereum Ecosysytem and Ethereum Virtual Machine.

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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	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2
CO1	2	1	1	1	1	2	2	1	1	2	3	-	-	-
CO2	1	1	1	1	2	2	2	2	1	2	3	-	-	-
CO3	2	2	1	1	2	2	2	2	1	2	3	-	-	-
CO4	2	1	1	1	2	2	2	2	1	2	3	-	-	-
CO5	1	1	1	1	2	2	2	2	1	2	3	-	-	-

# institutions, KM systems and its application in knowledge generation and transfer, and in the

22CSO04

**Preamble** 

representation, organization, and exchange of knowledge, knowledge codification and system development, its testing, KM tools and portals, and finally ethical, managerial and legal issues in knowledge management.

Knowledge Management addresses contemporary issues in managing knowledge, intellectual capital and other intangible assets by discussing the fundamental concepts of knowledge and its creation, acquisition, representation, dissemination, use and re-use, the role and use of knowledge in organizations and

#### UNIT 1 **KNOWLEDGE MANAGEMENT**

An Introduction to Knowledge Management - The foundations of knowledge management- including cultural issues- technology applications organizational concepts and processes- management aspects- and decision support systems. The Evolution of Knowledge management: From Information Management to Knowledge Management - Key Challenges Facing the Evolution of Knowledge Management - Ethics for Knowledge Management.

#### CREATING THE CULTURE OF LEARNING AND KNOWLEDGE UNIT 2 SHARING

Organization and Knowledge Management - Building the Learning Organization. Knowledge Markets: Cooperation among Distributed Technical Specialists – Tacit Knowledge and Quality Assurance.

#### **KNOWLEDGE MANAGEMENT-THE TOOLS** UNIT 3

Telecommunications and Networks in Knowledge Management - Internet Search Engines and Knowledge Management - Information Technology in Support of Knowledge Management - Knowledge Management and Vocabulary Control - Information Mapping in Information Retrieval -Information Coding in the Internet Environment - Repackaging Information. 9

#### UNIT 4 **KNOWLEDGEMANAGEMENT-APPLICATION**

Components of a Knowledge Strategy - Case Studies (From Library to Knowledge Center, Knowledge Management in the Health Sciences, Knowledge Management in Developing Countries).

#### UNIT 5 **FUTURE TRENDS AND CASE STUDIES**

Advanced topics and case studies in knowledge management - Development of a knowledge management map/plan that is integrated with an organization's strategic and business plan - A case study on Corporate Memories for supporting various aspects in the process life -cycles of an organization.

# TOTAL : 45 PERIODS

# **TEXT BOOKS:**

Srikantaiah.T. K., Koenig, M., "Knowledge Management for the Information Professional" 1. Information Today, Inc., 2000.

# **REFERENCES:**

Nonaka, I., Takeuchi, H., "The Knowledge-Creating Company: How Japanese Companies Create 1. the Dynamics of Innovation", Oxford University Press, 1995.

VCET, B.E-CSE, R2022 - Curriculum and Syllabus

# e-RESOURCES:

- http://nptel.ac.in/courses/110105076/ 1.
- 2. http://study.com/academy/lesson/knowledge-management-theory-strategies.html.

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

- 1. Explain the evolution of knowledge management, challenges, ethical and legal issues and corporate social responsibilities of KM in organizations.
- 2. Determine the quality of organizational knowledge, knowledge sharing using knowledge market approach.
- 3. Use KM tools and portals to develop a quality knowledge bank/ repository.
- 4. Analyze KM applications to identify the key components for a successful management.
- 5. Use current trends and develop enterprise knowledge management applications for a business plan.

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	3	1	-	2	1	-	-
CO2	-	-	-	-	1	-	3	1	1	-	2	1	-	-
CO3	-	-	-	-	3	-	3	1	1	-	2	1	-	-
CO4	-	-	-	-	1	-	3	1	1	-	2	1	-	-
CO5	-	-	-	-	1	-	3	1	1	-	2	1	-	-

## Mapping of COs with POs and PSOs

# CLOUD COMPUTING ESSENTIALS

# Pre-requisites : Nil

### Preamble

Cloud computing involves delivering different types of services over the internet. Fromsoftware 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". Nowdays, 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 INTRODUCTION

Introduction to Cloud Computing – Roots of Cloud Computing – Desired Features of Cloud Computing – Challenges and Risks – Benefits and Disadvantages of Cloud Computing

# UNIT 2 VIRTUALIZATION

Basics of Virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices – Virtualization Support and Disaster Recovery.

# UNIT 3 CLOUD ARCHITECTURE, SERVICES AND STORAGE

NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds - laaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage.

# UNIT 4 RESOURCE MANAGEMENT AND SECURITY IN CLOUD

InterCloud Resource Management – Resource Provisioning Methods – Security Overview – Cloud Security Challenges – Data Security and Software Protection Techniques – Virtual Machine Security.

# UNIT 5 CASE STUDIES

Google App Engine (GAE) – GAE Architecture – Functional Modules of GAE – Amazon Web Services (AWS) – Microsoft Azure – Cloud Software Environments – Eucalyptus – Open Nebula – Open Stack.

# Total : 45 PERIODS

# **TEXT BOOKS:**

- 1. Buyya R., Broberg J., Goscinski A., "Cloud Computing: Principles and Paradigm", 1st Edition, John Wiley & Sons, 2011. (For Unit I)
- 2. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2017. (For Units II,III,IV,V)

# **REFERENCES:**

- 2. Rittinghouse, John W., and James F. Ransome, "Cloud Computing: Implementation, Management and Security", CRC Press, 2017.
- 3. RajkumarBuyya, Christian Vecchiola, S. ThamaraiSelvi, "Mastering Cloud Computing", Tata McGraw Hill, 2013
- 4. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing A Practical Approach", Tata McGraw Hill, 2009.

# e-RESOURCES:

1. https://nptel.ac.in/courses/106/105/106105223/,"Google Cloud Computing Foundation Course", Prof. SoumyaKantiGhosh, IIT Kharagpur.

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

- CO1 Summarize The Main Concepts, Key Technologies, Strengths, And Limitations Of Cloud Computing And Identify Suitable Scenarios For Moving To The Cloud Platform
- Interpret The Role Of Virtualization As The Key Enabling Technology That Helped In The CO2 Development Of The Cloud Platform
- CO3 Develop The Ability To Understand And Use The Architecture Of Compute Cloud And Storage Cloud Services And Delivery Models
- CO4 Examine The Core Issues Of Cloud Computing Architecture Namely Resource Management And Security
- CO5 Experiment With Several Public Cloud Offerings And Cloud Development Tools To Choose The Appropriate Service Provider For One's Requirements

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

### Mapping of COs with POs and PSOs

# VALUE ADDED COURSES

22CSV01

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. Understand the basics of R programming and able to develop R script using GUI.
- 2. Understand 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.

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• 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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# 22CSV02

# **Prerequisite:**

Knowledge on Algorithms, Computer Programming, C programming, Visual Studio Code IDLE and a little conceptual insight about cloud computing and server side programming.

# **Preamble:**

Go is an open source programming language that makes it easy to build simple, reliable, and efficient software. Go was originally built for programs related to networking and infrastructure. Go is expressive, concise, clean, and efficient. Its concurrency mechanisms make it easy to write programs that get the most out of multi-core and networked machines, while its novel type system enables flexible and modular program construction. Go compiles quickly to machine code yet has the convenience of garbage collection and the power of run-time reflection. It's a fast, statically typed, compiled language that feels like a dynamically typed, interpreted language. It was intended to replace popular high-performance server-side languages like Java and C++. Today, Go is used for a variety of applications like cloud and server side applications, DevOps, command line tools and much more.

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

1 Develop algorithm and write Go programs for a given problem statement using appropriate Go language construct.

# Module 1 – Fundamentals of Go Lang

- Environmental Setup and Installation
- Variables, Identifiers, Operators, Expressions
- Data Types •
- Conditional Statements

# Module 2 – Go Routines, Go Structures and Error Handling

- Functions, Go Methods struct type receiver, non struct type receiver, pointer receiver.
- Go Routines- creation, anonymous Go Routines, multiple Go Routines, and Channels •
- Structures –defining a struct, accessing fields of struct, pointers to struct, nested struct •
- Interfaces •
- Defer and Error Handling.

# **REFERENCES:**

- 1. Nathan Youngman and Roger Peppé "Get Programming with Go"- Manning Publication, 2018
- 2. Alan A. A. Donovan and Brian Kernighan "The Go Programming Language", Addison Wesley publication, 2018

# e-Resources:

- 1. https://tour.golang.org.
- 2. https://golang.org/doc/effective go.html.
- 3. http://www.golangbootcamp.com/book/

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**TOTAL : 30 PERIODS** 

# 22CSV03 Prerequisite:

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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# 22CSV04 Prerequisite:

C programming, Python Programming and Object Oriented Programming

#### Preamble:

A Raspberry Pi is a credit-card sized computer that can be used when a typical PC is overkill, such as in robotics or with embedded systems. It's a great learning tool, and since it's a fully functional computer with input/output, storage, and WiFi capabilities, it can be used to interface and control other things. This course aims to impart knowledge about the implementation and use of Raspberry Pi to the student community.

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

1. Build projects with Raspberry Pi

#### Module 1 – Architecture and Booting up of RPi

- Introduction and comparison of Raspberry Pi models
- Understanding SoC architecture and SoCs used in Raspberry Pi
- Pin Description of Raspberry Pi
- Raspbian O.S Tools like Leafpad Editor
- Installing Raspbian on Pi
- First boot and Basic Configuration of Pi

#### Module 2 – Working with RPi, IoT design and Applications using RPi

- Working with RPi using Python
- Imbibing RPi with C
- LAMP Web-server
- GPIO Control over Web Browser
- Creating Custom Web Page for LAMP
- Communicating data using on-board module
- Node RED, MQTT Protocol
- Using Node-RED Visual Editor on RPi

### **TOTAL : 30 PERIODS**

#### **REFERENCES:**

1. Simon Monk, "Raspberry Pi Cookbook: Software and hardware problems and solutions", OReilly Publications, 2013.

2. 'The official raspberry Pi Projects Book' – from the makers of the official Raspberry Pi magazine.

#### e-Resources:

- 1. https://www.raspberrypi.org/
- 2. https://opensource.com/resources/raspberry-pi
- 3. https://tutorials-raspberrypi.com/

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# 22CSV05Practical Machine Learning with TensorFlowL T P C0 0 2 1

# **Prerequisite:**

Programming in Python, Data Mining or Machine Learning or Data Science

# Preamble:

Machine learning often requires heavy computation and for that Tensor flow was developed as an open source library. Tensor flow not only does the heavy computation but can also build data flows. Apart from machine learning, it is also used in wide variety of other domains by the experts. This course contains different topics to make you understand everything about next-generation machine learning by Tensor flow. It includes all the basics of Tensor flow with detail description of tensors, operators and variables. Installation of Tensor flow on Windows, Mac and Linux is clearly shown. Additionally, it gives insights into the basics of machine learning and its types. This course also covers various algorithms like linear regression, logistic regression, NN regression, K-Means algorithm and others. Herein, advanced machine learning is also well elaborated with the topics of neural networks, convolution neural networks, recurrent neural networks and so on.

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

1 Able to work with ML algorithms with tensorflow

# Module 1 – Fundamentals of Tensors

- Getting started with Tensor flow
- Overview of Machine Learning
- Data Input and Preprocessing with Tensor flow
- Machine Learning Model Building

# Module 2 – Neural Networks & Model Training

- Prediction with Tensorflow
- Monitoring and evaluating models using Tensorboard
- Advance Tensorflow (Building custom models CNNs, Scaling up for large datasets)
- Distributed training with hardware accelerators

### **REFERENCES:**

 Nishant Shukla, Kenneth Fricklas, "Machine Learning with TensorFlow", Manning Publications, January 2018

### e-Resources:

1. https://nptel.ac.in/courses/106/106/106106213/# "Practical Machine Learning with TensorFlow" by Prof. Balaraman Ravindran and Mr. Ashish Tendulkar

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**TOTAL : 30 PERIODS** 

# 22CSV06

# **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 Visualization 20

- 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**

10

### **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/ overview

22CS	M41 STATISTICS FOR MANAGEMENT	L 3	Т 0	Р 0	C 3
Cour CO1 CO2	se Outcomes: Upon completion of this course, students will be able to Facilitate objective solutions in business decision making. Understand and solve business problems				
CO3 CO4 CO5	Apply statistical techniques to data sets, and correctly interpret the results. Develop skill-set that is in demand in both the research and business environmen Enable the students to apply the statistical techniques in a work setting.	nts			0
UNII Basic distril	definitions and rules for probability, Baye's theorem and random variables, butions: Binomial, Poisson, Uniform and Normal distributions.	Proba	abilit	у	9
UNIT Introc Point	<b>C 2 SAMPLING DISTRIBUTION AND ESTIMATION</b> duction to sampling distributions, Central limit theorem and applications, sam and Interval estimates of population parameters.	pling	tech	niqu	<b>9</b> 1es,
UNIT Hypo two s	<b>T3 TESTING OF HYPOTHESIS - PARAMETIRC TESTS</b> thesis testing: one sample and two sample tests for means of large samples (z-test ample tests for means of small samples (t-test), ANOVA one way.	), one	e sam	ple	9 and
UNIT Chi-se goodi	<b>4 TESTING OF HYPOTHESIS - PARAMETIRC TESTS</b> quare tests for independence of attributes and goodness of fit, Kolmogorov-Seness of fit, Mann – Whitney U test and Kruskal Wallis test.	mirno	ov –	test	<b>9</b> for
UNIT Corre Stand	<b>5 CORRELATION AND REGRESSION</b> Elation – Rank Correlation – Regression – Estimation of Regression line – Method elard Error of estimate.	of Le	ast S	qua	<b>9</b> res –
TFY'	T ROOKS.	Fotal	: 45	Per	iods
1. 2	Richard I. Levin, David S. Rubin, Masood H.Siddiqui, Sanjay Rastogi, Statistics Pearson Education, 8th Edition, 2017.	for N	/Iana	gem	ent,
Z. REFI	ERENCES:				
3.	T N Srivastava and Shailaja Rego, Statistics for Management, Tata McGraw 2017.	Hill,	3rd	Edi	tion
4. 5.	Ken Black, Applied Business Statistics, 7th Edition, Wiley India Edition, 2012. David R. Anderson, Dennis J. Sweeney, Thomas A.Williams, Jeffrey D.Camm, Statistics for business and economics, 13th edition, Thomson (South – Western) 2016	Jame Asia	s J.C ı, Sir	lochi Igap	ran, ore,
6.	N. D. Vohra, Business Statistics, Tata McGraw Hill, 2017				

22CSN	<b>DATAMINING FOR BUSINESS INTELLIGENCE</b>	L 3	Т 0	Р 0	C 3
Course	e Outcomes: Upon completion of this course, students will be able to				
CO1	Learn to apply various data mining techniques into various areas of different domains.				
CO2	Be able to interact competently on the topic of data mining for business intelligence.				
CO3	Apply various prediction techniques.				
CO4	Learn about supervised and unsupervised learning technique				
CO5	Develop and implement machine learning and Artificial algorithms				
UNIT	1 INTRODUCTION				9
Data m	nining, Text mining, Web mining, Data ware house				
UNIT	2 DATA MINING PROCESS				9
Data m	nining process – KDD, CRISP-DM, SEMMA Prediction performance measures				
UNIT	<b>3 PREDICTION TECHNIQUES</b>				9
Data v	isualization, Time series – ARIMA, Winter Holts,				
UNIT	4 CLASSIFICATION AND CLUSTERING TECHNIQUES				9
Classif	ication, Association, Clustering.				
UNIT	5 MACHINE LEARNING AND AI				9
Genetic	algorithms, Neural network, Fuzzy logic, Ant Colony optimization, Particle Swarm optin	nizati	on		

# **Total: 45 Periods**

# **TEXT BOOKS:**

- 1. Jaiwei Ham and Micheline Kamber, Data Mining concepts and techniques, Kauffmann Publishers 2006
- 2. Efraim Turban, Ramesh Sharda, Jay E. Aronson and David King, Business Intelligence, Prentice Hall, 2008.

# **REFERENCES:**

- 3. W.H.Inmon, Building the Data Warehouse, fourth edition Wiley India pvt. Ltd. 2005.
- 4. Ralph Kimball and Richard Merz, The data warehouse toolkit, John Wiley, 3rd edition, 2013.
- 5. Michel Berry and Gordon Linoff, Mastering Data mining, John Wiley and Sons Inc, 2nd Edition, 2011
- 6. Michel Berry and Gordon Linoff, Data mining techniques for Marketing, Sales and Customer support, John Wiley, 2011.

#### L Т P С 22CSM43 HUMAN RESOURCE ANALYTICS 3 A 0 3 **Course Outcomes:** Upon completion of this course, students will be able to CO1 Conversant about HR metrics and ready to apply at work settings. CO2 Resolve HR issues using people analytics in Recruitment CO3 Analyze HR analytics in Training and Development CO4 Analyze HR Analytics in Employee Engagement And Career Progression CO5 Analyze HR Analytics in Workforce Diversity And Development **UNIT 1 INTRODUCTION TO HR ANALYTICS** 9 People Analytics - stages of maturity - Human Capital in the Value Chain : impact on business - HR metrics and KPIs. **UNIT 2 HR ANLYTICS I - RECRUITMENT** 9 Recruitment Metrics : Fill-up ratio - Time to hire - Cost per hire - Early turnover - Employee referral hires - Agency hires - Lateral hires - Fulfillment ratio- Quality of hire. UNIT 3 HR ANALYTICS II - TRAINING AND DEVELOPMENT 9 Training & Development Metrics : Percentage of employees trained- Internally and externally trained -Training hours and cost per employee - ROI. HR ANALYTICS III - EMPLOYEE ENGAGEMENT AND CAREER UNIT 4 9 PROGRESSION Employee Engagement Metrics : Talent Retention index - Voluntary and involuntary turnover- grades, performance, and service tenure - Internal hired index Career Progression Metrics: Promotion index -Rotation index - Career path index. 9 UNIT 5 HR ANALYTICS IV- WORKFORCE DIVERSITY AND DEVELOPMENT Workforce Diversity and Development Metrics : Employees per manager - Workforce age profiling - Workforce service profiling - Churnover index - Workforce diversity index - Gender mix **Total: 45 Periods TEXT BOOKS:** 1. JacFitzenz, The New HR Analytics, AMACOM, 2010. Edwards M. R., & Edwards K, Predictive HR Analytics: Mastering the HR Metric.London: Kogan

2. Page.2016.

# **REFERENCES:**

- 3. Human Resources kit for Dummies 3 rd edition Max Messmer, 2003
- 4. Dipak Kumar Bhattacharyya, HR Analytics ,Understanding Theories and Applications, SAGE Publications India ,2017.
  - Sesil, J. C., Applying advanced analytics to HR management decisions: Methods fo selection,
- 5. developing incentives, and improving collaboration. Upper Saddle River, New Jersey: Pearson Education, 2014.
- 6. Pease, G., & Beresford, B, Developing Human Capital: Using Analytics to Plan and Optimize
- 6. Your Learning and Development Investments. Wiley,2014

# 22CSM44 DIGITAL MARKETING AND SOCIAL NETWORK ANALYTICS $\begin{array}{ccc} L & T & P \\ 3 & 0 & 0 \end{array}$

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

- CO1 Analyze the Marketing Budget and performance.
- CO2 Create a community building in social media.
- CO3 Use the techniques in Social Media Policies And Measurements
- CO4 Analyze the web analytics in data collection.
- CO5 Apply the search analytics in various data visualization.

# UNIT 1 MARKETING ANALYTICS

Marketing Budget and Marketing Performance Measure, Marketing - Geographical Mapping, Data Exploration, Market Basket Analysis

# UNIT 2 COMMUNITY BUILDING AND MANAGEMENT

History and Evolution of Social Media-Understanding Science of Social Media –Goals for using Social Media-Social Media Audience and Influencers - Digital PR- Promoting Social Media Pages- Linking Social Media Accounts-The Viral Impact of Social Media.

# UNIT 3 SOCIAL MEDIA POLICIES AND MEASUREMENTS

Social Media Policies-Etiquette, Privacy- ethical problems posed by emerging social media technologies - The Basics of Tracking Social Media.

# UNIT 4 WEB ANALYTICS

Data Collection, Overview of Qualitative Analysis, Business Analysis, KPI and Planning, Critical Components of a Successful Web Analytics Strategy, Proposals & Reports, Web Data Analysis.

# UNIT 5 SEARCH ANALYTICS

Search engine optimization (SEO), user engagement, user-generated content, web traffic analysis, online security, online ethics, data visualization

# **TEXT BOOKS:**

- 1. K. M. Shrivastava, Social Media in Business and Governance, Sterling Publishers Private Limited, 2013
- 2. Christian Fuchs, Social Media a critical introduction, SAGE Publications Ltd, 2014

### **REFERENCES:**

- 3. Bittu Kumar, Social Networking, V & S Publishers, 2013
- 4. Avinash Kaushik, Web Analytics An Hour a Day, Wiley Publishing, 2007
- 5. Ric T. Peterson, Web Analytics Demystified, Celilo Group Media and CafePress 2004
- 6. Takeshi Moriguchi, Web Analytics Consultant Official Textbook, 7th Edition, 2016

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# **Total : 45 Periods**

# SUPPLY CHAIN ANALYTICS

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

Enable quantitative solutions in business decision making under conditions of certainty, risk and CO1 uncertainty.

- CO2 Apply Warehousing Decisions in data collections
- CO3 Apply the various strategies in Inventory Management.
- CO4 Explain various Transportation Network Models
- CO5 Explain various MCDM Models

#### UNIT 1 **INTRODUCTION**

22CSM45

Descriptive, predictive and prescriptive analytics, Data Driven Supply Chains - Basics, transforming supply chains.

#### WAREHOUSING DECISIONS UNIT 2

P-Median Methods - Guided LP Approach, Greedy Drop Heuristics, Dynamic Location Models, Space Determination and Layout Methods.

# **UNIT 3 INVENTORY MANAGEMENT**

Dynamic Lot sizing Methods, Multi-Echelon Inventory models, Aggregate Inventory system and LIMIT, Risk Analysis in Supply Chain, Risk pooling strategies.

#### TRANSPORTATION NETWORK MODELS UNIT 4

Minimal Spanning Tree, Shortest Path Algorithms, Maximal Flow Problems, Transportation Problems, Set covering and Set Partitioning Problems, Travelling Salesman Problem, Scheduling Algorithms.

# UNIT 5 MCDM MODELS

Analytic Hierarchy Process(AHP), Data Envelopment Analysis (DEA), Fuzzy Logic an Techniques, the analytical network process (ANP), TOPSIS.

### **TEXT BOOKS:**

- Nada R. Sanders, Big data driven supply chain management: A framework for implementing 1. analytics and turning information into intelligence, Pearson Education, 2014.
- Michael Watson, Sara Lewis, Peter Cacioppi, Jay Jayaraman, Supply Chain Network Design: 2.
- Applying Optimization and Analytics to the Global Supply Chain, Pearson Education, 2013. **REFERENCES:**
- Anna Nagurney, Min Yu, Amir H. Masoumi, Ladimer S. Nagurney, Networks Against Time: 2. Supply Chain Analytics for Perishable Products, Springer, 2013.

Muthu Mathirajan, Chandrasekharan Rajendran, Sowmyanarayanan Sadagopan, Arunachalam

- Ravindran, Parasuram Balasubramanian, Analytics in Operations/Supply Chain Management, 3. I.K. International Publishing House Pvt. Ltd., 2016.
- Gerhard J. Plenert, Supply Chain Optimization through Segmentation and Analytics, CRC Press, 4. Taylor & Francis Group, 2014.



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VCET, B.E-CSE, R2022 - Curriculum and Syllabus

**Total: 45 Periods** 

# 22CSM46

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

- CO1 Perform financial analysis for decision making using Corporate Finance Analysis
- CO2 Perform financial analysis for decision making using Financial Market Analysis
- CO3 Perform financial analysis for decision making using Portfolio Analysis
- CO4 Perform financial analysis for decision making using Technical Analysis
- CO5 Perform financial analysis for decision making using Credit Risk Analysis

# UNIT 1 CORPORATE FINANCE ANALYSIS

Basic corporate financial predictive modelling- Project analysis- cash flow analysis- cost of capital, Financial Break even modelling, Capital Budget model-Payback, NPV, IRR.

FINANCIAL ANALYTICS

# UNIT 2 FINANCIAL MARKET ANALYSIS

Estimation and prediction of risk and return (bond investment and stock investment) – Time seriesexamining nature of data, Value at risk, ARMA, ARCH and GARC

# UNIT 3 PORTFOLIO ANALYSIS

Portfolio Analysis – capital asset pricing model, Sharpe ratio, Option pricing models- binomial model for options, Black Scholes model and Option implied volatility.

# UNIT 4 TECHNICAL ANALYSIS

Prediction using charts and fundamentals – RSI, ROC, MACD, moving average and candle charts, simulating trading strategies. Prediction of share prices.

# UNIT 5 CREDIT RISK ANALYSIS

Credit Risk analysis- Data processing, Decision trees, logistic regression and evaluating credit risk model.

# **TEXT BOOKS:**

- 1. Financial analytics with R by Mark J. Bennett, Dirk L. Hugen, Cambridge university press.
- 2. Haskell Financial Data Modeling and Predictive Analytics Paperback Import, 25 Oct 2013 by Pavel Ryzhov.

# **REFERENCÉS:**

- 3. Quantitative Financial Analytics: The Path To Investment Profits Paperback Import, 11 Sep 2017 by Edward E Williams (Author), John A Dobelman
- 4. Python for Finance Paperback Import, 30 Jun 2017 by Yuxing Yan (Author).
- 5. Mastering Python for Finance Paperback Import, 29 Apr 2015 by James Ma Weiming.

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## Total : 45 Periods