SHREE VENKATESHWARA HI-TECH ENGINEERING COLLEGE
(Autonomous)
Gobichettipalayam, Erode-638455

Regulation 2023 (Autonomous)

Curriculum and Syllabus

Choice Based Credit System (CBCS)

B.Tech.-Artificial Intelligence and Data Science

SHREE VENKATESHWARA HI-TECH ENGINEERING COLLEGE
(Autonomous)
Gobichettipalayam, Erode -638455

Regulation 2023 (UG)
Curriculum and Syllabus
B.Tech. – Artificial Intelligence and Data Science

I. Program Educational Objective (PEO)

PEO1 : Basic Skills : Utilize their proficiencies in the fundamental knowledge of basic sciences, mathematics, Artificial Intelligence, data science and statistics to build systems that require management and analysis of large volumes of data.

PEO2 : Technical Skills : Advance their technical skills to pursue pioneering research in the field of AI and Data Science and create disruptive and sustainable solutions for the welfare of ecosystems.

PEO3 : Multi-Disciplinary & Managerial Skills : Pursue lifelong learning and collaborate with an ethical attitude in a multidisciplinary team and Design and model AI based solutions to critical problem domains in the real world.

II. Program Outcomes (POs)

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

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

3. **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.

4. **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.

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

6. **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.

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7. **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.

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

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **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.

11. **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.

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

III. Program Specific Outcomes (PSOs)

PSO1 : Computing Solutions: Create, select and apply the theoretical knowledge of AI and Data Analytics along with practical industrial tools and techniques to manage and solve societal problems.

PSO2 : Professional Practice: Develop data analytics and data visualization skills, skills pertaining to knowledge acquisition, knowledge representation and knowledge engineering, and hence be capableof coordinating complex projects.

PSO3 : Emerging Technologies: Able to carry out fundamental research to cater the critical needs of the society through cutting edge technologies of AI arrive at Foresight, Insight, hindsight from data for solving business and engineering problems.

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Mapping of Course Outcome and Programme Outcome

Year	Sem	Course name	PO												PSO		
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
I	I	Induction Programme															
		Professional English - I	-	-	-	2	-	1	-	-	2	3	-	3	-	-	-
		Matrices and Calculus	3	3	1	1	-	-	-	-	2	-	2	3	-	-	-
		Engineering Physics	3	3	2	1	2	-	-	-	-	-	-	1	-	-	-
		Engineering Chemistry	3	2	2	1	1	2	3	-	-	-	-	1	-	-	-
		Problem Solving and Python Programming	2	3	3	3	2	-	-	-	-	-	2	2	3	3	3
		தமிழர் மரபு /Heritage of Tamils	-	-	-	-	-	1	1	1	-	1	-	-	-	-	-
		Problem Solving and Python Programming Laboratory	2	3	3	3	2	-	-	-	-	-	2	2	3	3	3
		Physics and Chemistry Laboratory	3	3	1	1	-	-	-	-	-	-	-	-	-	-	-
			3	2	1	-	1	3	2	1	-	-	-	1	-	-	-
		English Laboratory	-	-	-	-	-	-	-	1	3	3	-	2	-	-	-
	II	Professional English - II	-	1	1	-	-	-	1	1	2	3	-	2	-	-	-
		Numerical Methods and Statistics	3	3	1	1	1	-	-	-	2	-	2	3	-	-	-
		Physics for Information Science	3	1	2	1	2	1	1	1	-	-	-	-	-	-	-
		Basic Electrical and Electronics Engineering	3	3	2	2	-	-	-	-	-	1	-	-	3	3	2
		Engineering Graphics	3	1	2	-	2	-	-	-	-	3	-	2	2	2	-
		Programming in C	2	2	2	1	2	1	1	1	2	-	3	2	2	2	2
		தமிழரும் தொழில்நுட்பமும் /Tamils and Technology	2	-	-	-	-	2	2	2	2	2	-	2	-	-	-
		Engineering Practices Laboratory	3	-	-	3	-	-	-	-	-	-	-	-	2	1	1
		Programming in C Laboratory	2	2	3	2	1	2	-	-	2	1	2	2	2	2	2
		Communication Laboratory	-	-	2	-	-	-	-	1	3	3	-	3	-	-	-
		Mandatory Course - I Yoga for Human Excellence	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

1 - low, 2 - medium, 3 - high, '-' - no correlation

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Mapping of Course Outcome and Programme Outcome

Year	Sem	Course name	PO												PSO		
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
II	III	Discrete Mathematics	3	3	2	2	-	2	-	-	-	2	-	2	-	-	-
		Foundations of Data Science	2	2	1	2	2	1	1	-	1	1	1	2	2	2	2
		Data Structures and Algorithms	2.2	2.6	2.6	2.6	1.6	-	-	-	3	-	2	2	3	2	2
		Data Exploration and Visualization	2	1	2	2	1	-	-	-	2	2	2	2	2	2	2
		Digital Principles and Computer Organization	3	3	3	3	1.8	1.6	1	1	1	1	1.6	2.6	1.4	2.6	1.6
		Entrepreneurship and Startup	2	2	2	1.6	1	-	-	-	-	-	-	-	2	2	2
		Data Science Laboratory	2	2	2	2	1	-	-	-	2	2	2	2	2	3	2
		Data Structures and Algorithms Laboratory	2.8	1.8	1.8	0.8	1	-	-	-	2	3	1	2	1.2	2.6	1
	IV	Probability and Linear Algebra	3	3	3	-	-	-	-	-	2	-	-	1	-	-	-
		Machine Learning	2	2	3	2	2	-	-	-	2	2	2	2	2	2	1
		Database Design and Management	2	2	2	2	1	-	-	-	2	2	1	1	2	2	2
		Artificial Intelligence	2	1	2	2	1	-	-	-	2	2	2	2	2	2	2
		Operating Systems	2	2	2	2	1	-	-	-	2	2	2	2	2	1	2
		Environmental Sciences and Sustainability	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Machine Learning Laboratory	2	2	2	2	2	-	-	-	2	2	2	2	2	2	2
		Database Design and Management Laboratory	2	2	2	2	1	-	-	-	2	2	2	2	2	2	2
		Artificial Intelligence Laboratory	2	1	2	2	1	-	-	-	2	2	2	2	2	2	2
		Mandatory Course - II Soft and Analytical Skills-I	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

1 - low, 2 - medium, 3 - high, '-' - no correlation

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Mapping of Course Outcome and Programme Outcome

Year	Sem	Course name	PO												PSO		
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
III	V	Deep Learning	2.8	2.4	2	2.4	2.2	-	-	-	1.6	2.4	1.4	2.4	2	1.8	2.6
		Distributed Computing	1.8	2.4	1.8	2.4	2	-	-	-	2.6	2.2	2.2	1.6	2	1.8	1.6
		Computer Networks	-	1-	-	-	1	-	-	-	-	1	-	-	-	1	1
		Big Data Analytics	2.8	3	2.8	2.8	2.8	-	-	-	2.2	1.8	2.6	2	2.2	2.8	2.6
		Professional Elective I*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Professional Elective II*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Deep Learning Laboratory	2.6	2.6	1.6	2	1.4	-	-	-	2	2.4	2.2	1.6	2.4	2.8	2
		Mandatory Course – III Soft and Analytical Skills-II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Mandatory Course – IV&	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	VI	Embedded Systems and IoT	2.6	2	3	2.4	1.5	-	-	-	1	2.2	2.2	2.4	2.2	1.6	2.6
		Data and Information Security	2.4	2.6	2.4	2.2	1.5	-	-	-	1.4	2.2	1.2	2.2	1.8	2	1.6
		Professional Elective III*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Professional Elective IV*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Professional Elective V*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Professional Elective VI*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Open Elective – I**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Mandatory Course – V&	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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SUMMARY OF CREDITS

S.No	Course Category	Credits per Semester								Total Credits	Credits in %	Credits as per AU Curriculum R21	Credits as per AICTE Model Curriculum 2022
		I	II	III	IV	V	VI	VII	VIII				
1	HSS	4	3					5		12	7.27	12	12
2	BS	12	7	4	6					29	17.57	29	25
3	ES	5	9							14	8.48	14	24
4	PC		5	18	17.5	14.5	7			62	37.57	62	48
5	PE					6	12			18	10.90	18	18
6	OE						3	9		12	7.27	12	18
7	EEC	1	2	1		0		4	10	18	10.90	16	15
8	MC		√		√	√ / √	√						-
Total Credits / Semester		**22**	**26**	**23**	**23.5**	**20.5**	**22**	**18**	**10**	**165**	**100**	**163**	**163**

CATEGORIZATION OF COURSES

i. Humanities and Social Sciences including Management Courses (HSS)
ii. Basic Science Courses (BS)
iii. Engineering Science Courses (ES)
iv. Professional Core Courses (PC)
v. Professional Elective Courses (PE)
vi. Open Elective Courses (OE)
vii. Mandatory Courses (MC)
viii. Employability Enhancement Courses (EEC)
ix. Other Courses (OC)

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,

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Curriculum and Syllabus
B.Tech. – Artificial Intelligence and Data Science

SEMESTER I

S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
Induction Program											
1.	23IPA11	Induction Programme	-	-	-	-	-	0	-	-	-
Theory											
2.	23ENT11	Professional English - I	HSS	3	0	0	3	3	40	60	100
3.	23MAT11	Matrices and Calculus	BS	3	1	0	4	4	40	60	100
4.	23PHT11	Engineering Physics	BS	3	0	0	3	3	40	60	100
5.	23CYT11	Engineering Chemistry	BS	3	0	0	3	3	40	60	100
6.	23CST11	Problem Solving and Python Programming	ES	3	0	0	3	3	40	60	100
7.	23TAT11	தமிழர் மரபு /Heritage of Tamils	HSS	1	0	0	1	1	40	60	100
Practicals											
8.	23CSL11	Problem Solving and Python Programming Laboratory	ES	0	0	4	4	2	60	40	100
9.	23PCL11	Physics and Chemistry Laboratory	BS	0	0	4	4	2	60	40	100
10.	23ENL11	English Laboratory	EEC	0	0	2	2	1	60	40	100
			Total	**16**	**1**	**10**	**27**	**22**			

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SEMESTER II

S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
Theory											
1.	23ENT21	Professional English - II	HSS	2	0	0	2	2	40	60	100
2.	23MAT21	Numerical Methods and Statistics	BS	3	1	0	4	4	40	60	100
3.	23PHT21	Physics for Information Science	BS	3	0	0	3	3	40	60	100
4.	23EET22	Basic Electrical and Electronics Engineering	ES	3	0	0	3	3	40	60	100
5.	23MET21	Engineering Graphics	ES	2	0	4	6	4	40	60	100
6.	23CST21	Programming in C	PC	3	0	0	3	3	40	60	100
7.	23TAT21	தமிழரும் தொழில்நுட்பமும் /Tamils and Technology	HSS	1	0	0	1	1	40	60	100
Practicals											
8.	23MEL21	Engineering Practices Laboratory	ES	0	0	4	4	2	60	40	100
9.	23CSL21	Programming in C Laboratory	PC	0	0	4	4	2	60	40	100
10.	23ENL21	Communication Laboratory	EEC	0	0	4	4	2	60	40	100
Mandatory Courses											
11.	23MDC21	Mandatory Course - I Yoga for Human Excellence	MC	0	0	1	1	0	100	-	100
			Total	**17**	**1**	**17**	**35**	**26**			

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SEMESTER III

S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
Theory											
1.	23MAT31	Discrete Mathematics	BS	3	1	0	4	4	40	60	100
2.	23CST31	Foundations of Data Science	PC	3	0	0	3	3	40	60	100
3.	23ITT31	Data Structures and Algorithms	PC	3	0	0	3	3	40	60	100
4.	23ADI31	Data Exploration and Visualization	PC	3	0	2	5	4	50	50	100
5.	23ECI32	Digital Principles and Computer Organization	PC	3	0	2	5	4	50	50	100
6.	23EST31	Entrepreneurship and Startup	EEC	1	0	0	1	1	100	-	100
Practicals											
7.	23CSL31	Data Science Laboratory	PC	0	0	4	4	2	60	40	100
8.	23ITL31	Data Structures and Algorithms Laboratory	PC	0	0	4	4	2	60	40	100
		Total		**16**	**1**	**12**	**29**	**23**			

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SEMESTER IV

S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
Theory											
1.	23MAT42	Probability and Linear Algebra	BS	3	1	0	4	4	40	60	100
2.	23ADT41	Machine Learning	PC	3	0	0	3	3	40	60	100
3.	23ADT42	Data Base Design and Management	PC	3	0	0	3	3	40	60	100
4.	23ADT43	Artificial Intelligence	PC	3	0	0	3	3	40	60	100
5.	23CSI41	Operating Systems	PC	3	0	2	5	4	50	50	100
6.	23CYT41	Environmental Sciences and Sustainability	BS	2	0	0	2	2	40	60	100
Practicals											
7.	23ADL41	Machine Learning Laboratory	PC	0	0	3	3	1.5	60	40	100
8.	23ADL42	Database Design and Management Laboratory	PC	0	0	3	3	1.5	60	40	100
9.	23ADL43	Artificial Intelligence Laboratory	PC	0	0	3	3	1.5	60	40	100
Mandatory Courses											
10.	23MDC41	Mandatory Course - II Soft and Analytical Skills-I	MC	1	0	0	1	0	100	-	100
			Total	**18**	**1**	**11**	**30**	**23.5**			

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SEMESTER V

S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
Theory											
1.	23ADT51	Deep Learning	PC	3	0	0	3	3	40	60	100
2.	23CST52	Distributed Computing	PC	3	0	0	3	3	40	60	100
3.	23CSI51	Computer Networks	PC	3	0	2	5	4	50	50	100
4.	23CSE18	Big Data Analytics	PC	2	0	2	4	3	50	50	100
5.		Professional Elective I*	PE	-	-	-		3	-	-	100
6.		Professional Elective II*	PE	-	-	-		3	-	-	100
Practicals											
7.	23ADL51	Deep Learning Laboratory	PC	0	0	3	3	1.5	60	40	100
Mandatory Courses											
8.	23MDC51	Mandatory Course – III Soft and Analytical Skills-II	MC	1	0	0	1	0	100	-	100
9.		Mandatory Course – IV&	MC	3	0	0	3	0	100	-	100
			Total	-	-	-	-	**20.5**			

*** Professional Elective – I & II shall be chosen from the list of Professional electives (Verticals) offered by same Programme**

& Mandatory Course-IV is a Non-credit Course (Student shall select one course from the list given under Mandatory Course-IV)

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SEMESTER VI

S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
Theory											
1.	23ECI62	Embedded Systems and IoT	PC	3	0	2	5	4	50	50	100
2.	23ADT61	Data and Information Security	PC	3	0	0	3	3	40	60	100
3.		Professional Elective III*	PE	-	-	-	-	3	-	-	100
4.		Professional Elective IV*	PE	-	-	-	-	3	-	-	100
5.		Professional Elective V*	PE	-	-	-	-	3	-	-	100
6.		Professional Elective VI*	PE	-	-	-	-	3	-	-	100
7.		Open Elective – I**	OE	-	-	-	-	3	-	-	100
Mandatory											
8.	23MCT61	Mandatory Course-V&	MC	3	0	0	3	0	100	-	100
			Total	-	-	-	-	22			

* Professional Elective – III to VI shall be chosen from the list of Professional electives (Verticals) offered by same Programme

** Open Elective – I shall be chosen from the list of open electives offered by other Programmes

& Mandatory Course-V is a Non-credit Course (Student shall select one course from the list of given under Mandatory Course-V)

@ The students individually undergo training in reputed Firms/Research Institute/ Laboratories for the specified duration (04 weeks) during VI semester summer vacation. After completion of training, a detailed report should be submitted within ten days from the commencement of VII semester.

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SEMESTER VII

S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
Theory											
1.	23UHV71	Universal Human Values - II	HSS	3	0	0	3	3	40	60	100
2.		Elective - Management#	HSS	3	0	0	3	3	40	60	100
3.		Open Elective – II**	OE	-	-	-	-	3	-	-	100
4.		Open Elective – III**	OE	-	-	-	-	3	-	-	100
5.		Open Elective – IV**	OE	-	-	-	-	3	-	-	100
Practicals											
6.	23ADL71	Summer internship@	EEC	0	0	0	0	2	100	-	100
7.	23ADL72	Mini Project	EEC	0	0	2	2	1	40	60	100
			Total	-	-	-	-	**18**			

 # Elective - Management shall be chosen from the list of Elective Management courses.

**** Open Elective – II to IV shall be chosen from the list of open electives offered by other Programmes**

@ - The students undergone summer internship during VI semester summer vacation and same will be evaluated in VII semester.

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SEMESTER VIII

S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
Practicals											
1.	23ADL81	Project Work	EEC	0	0	20	20	10	60	40	100
			Total	**0**	**0**	**20**	**20**	**10**			

TOTAL CREDITS: 165

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MANDATORY COURSES IV											
S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
1.	23MDC52	Introduction to Women and Gender Studies	MC	3	0	0	3	0	100	-	100
2.	23MDC53	Elements of Literature	MC	3	0	0	3	0	100	-	100
3.	23MDC54	Film Appreciation	MC	3	0	0	3	0	100	-	100
4.	23MDC55	Disaster Risk Reduction and Management	MC	3	0	0	3	0	100	-	100

MANDATORY COURSES V											
S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
1.	23MDC61	Well Being with Traditional Practices -Yoga, Ayurveda and Siddha	MC	3	0	0	3	0	100	-	100
2.	23MDC62	History of Science and Technology in India	MC	3	0	0	3	0	100	-	100
3.	23MDC63	Political and EconomicThought for a Humane Society	MC	3	0	0	3	0	100	-	100
4.	23MDC64	State, Nation Building and Politics in India	MC	3	0	0	3	0	100	-	100
5.	23MDC65	Industrial Safety	MC	3	0	0	3	0	100	-	100

ELECTIVE – MANAGEMENT COURSES											
S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
1.	23MSE71	Principles of Management	HSS	3	0	0	3	3	40	60	100
2.	23MSE72	Total Quality Management	HSS	3	0	0	3	3	40	60	100
3.	23MSE73	Engineering Economics and Financial Accounting	HSS	3	0	0	3	3	40	60	100
4.	23MSE74	Human Resource Management	HSS	3	0	0	3	3	40	60	100
5.	23MSE75	Knowledge Management	HSS	3	0	0	3	3	40	60	100
6.	23MSE76	Industrial Management	HSS	3	0	0	3	3	40	60	100

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PROFESSIONAL ELECTIVE COURSES: VERTICALS

Vertical for AIDS I	Vertical II Full Stack Development for IT	Vertical III Cloud Computing and Data Center Technologies	Vertical IV Cyber Security and Data Privacy	Vertical V Creative Media	Vertical VI Emerging Technologies	Vertical for AIDS II
Knowledge Engineering	Cloud Computing	Cloud Computing	Ethical Hacking	Augmented Reality/Virtual Reality	Augmented Reality/Virtual Reality	Bio-Inspired Optimization Techniques
Recommender Systems	App Development	Virtualization	Digital and Mobile Forensics	Multimedia and Animation	Robotic Process Automation	App Development
Soft Computing	Cloud Services Management	Cloud ServicesManagement	Social NetworkSecurity	Video Creationand Editing	Neural Networks and Deep Learning	Health Care Analytics
Text and Speech Analysis	UI and UX Design	Data Warehousing	Modern Cryptography	UI and UX Design	Cyber security	Cyber security
Business Analytics	Software Testing and Automation	Storage Technologies	Engineering Secure Software Systems	Digital marketing	Quantum Computing	Optimization Techniques
Image and Video Analytics	Web Application Security	Software DefinedNetworks	Cryptocurrency and Blockchain Technologies	Multimedia Data Compression and Storage	Cryptocurrency and Blockchain Technologies	Game Theory
Computer Vision	DevOps	Stream Processing	Network Security	Game Development	Game Development	Cognitive Science
Exploratory Data Analysis	Principles of Programming Languages	Security and Privacy in Cloud	Security and Privacy in Cloud	Visual Effects	3D Printing andDesign	Ethics And AI

Registration of Professional Elective Courses from Verticals:

Professional Elective Courses will be registered in Semesters V and VI. These courses are listed in groups called verticals that represent a particular areaof 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.

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 2023 (Clause 12).

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PROFESSIONAL ELECTIVE COURSES: VERTICALS

VERTICAL 1: AIDS I											
S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
1.	23CSE71	Knowledge Engineering	PE	2	0	2	4	3	50	50	100
2.	23CSE12	Recommender Systems	PE	2	0	2	4	3	50	50	100
3.	23CSE72	Soft Computing	PE	2	0	2	4	3	50	50	100
4.	23CSE14	Text and Speech Analysis	PE	2	0	2	4	3	50	50	100
5.	23CSE15	Business Analytics	PE	2	0	2	4	3	50	50	100
6.	23CSE16	Image and Video Analytics	PE	2	0	2	4	3	50	50	100
7.	23CSE17	Computer Vision	PE	2	0	2	4	3	50	50	100
8.	23CSE11	Exploratory Data Analysis	PE	2	0	2	4	3	50	50	100

VERTICAL 2: FULL STACK DEVELOPMENT for IT											
S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
1.	23CSE31	Cloud Computing	PE	2	0	2	4	3	50	50	100
2.	23CSE22	App Development	PE	2	0	2	4	3	50	50	100
3.	23CSE23	Cloud Services Management	PE	2	0	2	4	3	50	50	100
4.	23CSE24	UI and UX Design	PE	2	0	2	4	3	50	50	100
5.	23CSE25	Software Testing and Automation	PE	2	0	2	4	3	50	50	100
6.	23CSE26	Web Application Security	PE	2	0	2	4	3	50	50	100
7.	23CSE27	DevOps	PE	2	0	2	4	3	50	50	100
8.	23CSE28	Principles of Programming Languages	PE	3	0	0	3	3	40	60	100

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VERTICAL 3: CLOUD COMPUTING AND DATA CENTER TECHNOLOGIES											
S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
1.	23CSE31	Cloud Computing	PE	2	0	2	4	3	50	50	100
2.	23CSE32	Virtualization	PE	2	0	2	4	3	50	50	100
3.	23CSE23	Cloud Services Management	PE	2	0	2	4	3	50	50	100
4.	23CSE34	Data Warehousing	PE	2	0	2	4	3	50	50	100
5.	23CSE35	Storage Technologies	PE	3	0	0	3	3	40	60	100
6.	23CSE36	Software Defined Networks	PE	2	0	2	4	3	50	50	100
7.	23CSE37	Stream Processing	PE	2	0	2	4	3	50	50	100
8.	23CSE38	Security and Privacy in Cloud	PE	2	0	2	4	3	50	50	100

VERTICAL 4: CYBER SECURITY AND DATA PRIVACY											
S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
1.	23CSE41	Ethical Hacking	PE	2	0	2	4	3	50	50	100
2.	23CSE42	Digital and Mobile Forensics	PE	2	0	2	4	3	50	50	100
3.	23CSE43	Social Network Security	PE	2	0	2	4	3	50	50	100
4.	23CSE44	Modern Cryptography	PE	2	0	2	4	3	50	50	100
5.	23CSE45	Engineering Secure Software Systems	PE	2	0	2	4	3	50	50	100
6.	23CSE46	Cryptocurrency and Blockchain Technologies	PE	2	0	2	4	3	50	50	100
7.	23CSE47	Network Security	PE	2	0	2	4	3	50	50	100
8.	23CSE38	Security and Privacy in Cloud	PE	2	0	2	4	3	50	50	100

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VERTICAL 5: CREATIVE MEDIA											
S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
1.	23CSE51	Augmented Reality/Virtual Reality	PE	2	0	2	4	3	50	50	100
2.	23CSE52	Multimedia and Animation	PE	2	0	2	4	3	50	50	100
3.	23CSE53	Video Creation and Editing	PE	2	0	2	4	3	50	50	100
4.	23CSE24	UI and UX Design	PE	2	0	2	4	3	50	50	100
5.	23CSE55	Digital marketing	PE	2	0	2	4	3	50	50	100
6.	23CSE58	Multimedia Data Compression and Storage	PE	2	0	2	4	3	50	50	100
7.	23CSE57	Game Development	PE	2	0	2	4	3	50	50	100
8.	23CSE56	Visual Effects	PE	2	0	2	4	3	50	50	100

VERTICAL 6: EMERGING TECHNOLOGIES											
S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
1.	23CSE51	Augmented Reality/Virtual Reality	PE	2	0	2	4	3	50	50	100
2.	23CSE62	Robotic Process Automation	PE	2	0	2	4	3	50	50	100
3.	23CSE13	Neural Networks and Deep Learning	PE	2	0	2	4	3	50	50	100
4.	23CSE64	Cyber security	PE	2	0	2	4	3	50	50	100
5.	23CSE65	Quantum Computing	PE	2	0	2	4	3	50	50	100
6.	23CSE46	Cryptocurrency and Blockchain Technologies	PE	2	0	2	4	3	50	50	100
7.	23CSE57	Game Development	PE	2	0	2	4	3	50	50	100
8.	23CSE68	3D Printing and Design	PE	2	0	2	4	3	50	50	100

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VERTICAL 7: AIDS II											
S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
1.	23ADE71	Bio-Inspired Optimization Techniques	PE	2	0	2	4	3	50	50	100
2.	23CSE22	App Development	PE	2	0	2	4	3	50	50	100
3.	23ADE72	Health care Analytics	PE	2	0	2	4	3	50	50	100
4.	23CSE64	Cyber Security	PE	2	0	2	4	3	50	50	100
5.	23CSE75	Optimization Techniques	PE	2	0	2	4	3	50	50	100
6.	23CSE76	Game Theory	PE	2	0	2	4	3	50	50	100
7.	23CSE77	Cognitive Science	PE	2	0	2	4	3	50	50	100
8.	23CSE78	Ethics And AI	PE	2	0	2	4	3	50	50	100

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OPEN ELECTIVES

Sl. No	Course Code	Course Title	Category	Periods /Week			Total Contact Periods	Credits	Max. Marks		
				L	T	P			CA	ES	TM
OFFERED BY DEPARTMENT OF CIVIL ENGINEERING											
1	23CEO11	Civil and Infrastructure Engineering	OE	3	0	0	3	3	40	60	100
2	23CEO12	Environmental Pollution and waste management	OE	3	0	0	3	3	40	60	100
3	23CEO13	Environmental Impact Assessment	OE	3	0	0	3	3	40	60	100
4	23CEO14	Building Services	OE	3	0	0	3	3	40	60	100
5	23CEO15	Water, Sanitation and Health	OE	3	0	0	3	3	40	60	100
OFFERED BY DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING											
1	23CSO11	Foundation of AR/VR	OE	3	0	0	3	3	40	60	100
2	23CSO12	Web Designing	OE	3	0	0	3	3	40	60	100
3	23CSO13	Block Chain fundamentals	OE	3	0	0	3	3	40	60	100
4	23CSO14	Knowledge Management	OE	3	0	0	3	3	40	60	100
5	23CSO15	Cloud Computing Essentials	OE	3	0	0	3	3	40	60	100
OFFERED BY DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING											
1	23ECO11	Basics of Electronics in Automation	OE	3	0	0	3	3	40	60	100
2	23ECO12	Wireless Optical Communication	OE	3	0	0	3	3	40	60	100
3	23ECO13	Soft Computing techniques	OE	3	0	0	3	3	40	60	100
4	23ECO14	Consumer electronics	OE	3	0	0	3	3	40	60	100
5	23ECO15	Principles of communication Engineering	OE	3	0	0	3	3	40	60	100
OFFERED BY DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING											
1	23EEO11	Renewable Energy Sources	OE	3	0	0	3	3	40	60	100
2	23EEO12	Electrical Vehicle	OE	3	0	0	3	3	40	60	100
3	23EEO13	Energy Auditing and Conservation	OE	3	0	0	3	3	40	60	100
4	23EEO14	Domestic and Industrial Electrical Installations	OE	3	0	0	3	3	40	60	100
5	23EEO15	Microcontroller Based System Design	OE	3	0	0	3	3	40	60	100
OFFERED BY DEPARTMENT OF MECHANICAL ENGINEERING											
1.	23MEO11	Industrial Instrumentation	OE	3	0	0	3	3	40	60	100
2.	23MEO12	Energy Technology	OE	3	0	0	3	3	40	60	100

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3.	23MEO13	Reverse Engineering	OE	3	0	0	3	3	40	60	100
4.	23MEO14	Fire Safety Engineering	OE	3	0	0	3	3	40	60	100
5.	23MEO15	Nano Technology	OE	3	0	0	3	3	40	60	100
6.	23MEO16	Entrepreneurship Development	OE	3	0	0	3	3	40	60	100
OFFERED BY DEPARTMENT ARTIFICIAL INTELLIGENCE AND DATA SCIENCE											
1	23ADO11	Introduction to Big Data	OE	3	0	0	3	3	40	60	100
2	23ADO12	Principles of Data Science	OE	3	0	0	3	3	40	60	100
3	23ADO13	Data Visualization and its Applications	OE	3	0	0	3	3	40	60	100
4	23ADO14	Data Warehousing and Mining	OE	3	0	0	3	3	40	60	100
5	23ADO15	Principles of Cyber Security	OE	3	0	0	3	3	40	60	100
OFFERED BY DEPARTMENT INFORMATION TECHNOLOGY											
1	23ITO11	Basics of Java Programming	OE	3	0	0	3	3	40	60	100
2	23ITO12	Ethical Hacking	OE	3	0	0	3	3	40	60	100
3	23ITO13	E-Commerce and Applications	OE	3	0	0	3	3	40	60	100
4	23ITO14	Basics of Android Application Development	OE	3	0	0	3	3	40	60	100
5	23ITO15	Introduction to Web Design	OE	3	0	0	3	3	40	60	100
OFFERED BY DEPARTMENT OF PHARMACEUTICAL TECHNOLOGY											
1	23PTO11	Nutraceuticals	OE	3	0	0	3	3	40	60	100
2	23PTO12	IPR for Pharma Industry	OE	3	0	0	3	3	40	60	100
3	23PTO13	Pharmaceutical Nanotechnology	OE	3	0	0	3	3	40	60	100
4	23PTO14	Basics of Human Anatomy and physiology	OE	3	0	0	3	3	40	60	100
OFFERED BY DEPARTMENT BIOMEDICAL ENGINEERING											
1	23BMO11	Biosensors and Instrumentation	OE	3	0	0	3	3	40	60	100
2	23BMO12	Medical Robotics	OE	3	0	0	3	3	40	60	100
3	23BMO13	Biometric systems and their applications	OE	3	0	0	3	3	40	60	100
4	23BMO14	Healthcare Management systems	OE	3	0	0	3	3	40	60	100
5	23BMO15	IoT in Healthcare	OE	3	0	0	3	3	40	60	100

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23IPA11	INDUCTION PROGRAMME (Common to B.E./B.Tech. all Branches)	L	T	P	C
		-	-	-	0

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

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

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

"One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character. "

Hence, the purpose of this programme is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

(i) Physical Activity:

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

(ii) Creative Arts:

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

(iii) Universal Human Values:

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

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

(iv) Literary Activity:

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

(v) Proficiency Modules:

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

(vi) Lectures by Eminent People:

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

(vii) Visits to Local Area:

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

(viii) Familiarization to Dept./Branch & Innovations:

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

(ix) Department Specific Activities:

About a week can be spent in introducing activities (games, quizzes, social interactions, small experiments, design thinking etc.) that are relevant to the particular branch of Engineering/Technology/Architecture that can serve as a motivation and kindle interest in building things (become a maker) in that particular field. This can be conducted in the form of a workshop.

For example, CSE and IT students may be introduced to activities that kindle computational thinking, and get them to build simple games. ECE students may be introduced to building simple circuits as an extension of their knowledge in Science, and so on. Students may be asked to build stuff using their knowledge of science.

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

REFERENCES:

1. Guide to Induction program from AICTE

22/09/2023

23ENT11	PROFESSIONAL ENGLISH – I (Common to B.E./B.Tech. all Branches)	L T P C 3 0 0 3

COURSE OBJECTIVES:

- To improve the communicative competence of learners.
- To learn to use basic grammatical structures in suitable contexts.
- To acquire lexical competence and use them appropriately in a sentence and understand their meaning in a text.
- To help learners use language effectively in professional contexts.
- To develop learners' ability to read and write complex texts, summaries, articles, blogs,de initions, essays and user manuals.

UNIT-I **INTRODUCTION TO EFFECTIVE COMMUNICATION AND FUNDAMENTALS OF COMMUNICATION** **10**

Introduction to Effective Communication- Barriers of Communication, Seven C's of Effective Communication, Effective Listening, Effective Speaking, Excellence in Reading, Ways to Develop Language and Communication Skills.

Reading- Reading Brochures (Technical Context), Telephone Messages/ Social Media Messages Relevant to Technical Contexts and Emails.

Writing- Writing Emails / Letters Introducing Oneself.

Grammar- Present Tense (Simple and Progressive); Question Types: Wh/ Yes or No/ and Tags.

Vocabulary- Synonyms; One Word Substitution; Abbreviations & Acronyms (as Used in Technical Contexts)

UNIT-II **NARRATION AND SUMMATION** **9**

Reading - Reading Biographies, Travelogues, Newspaper Reports, Excerpts from Literature, and Travel & Technical Blogs.

Writing - Guided writing, Paragraph Writing, Short Report on an Event (Field Trip etc.)

Grammar - Past Tense (Simple); Subject-Verb Agreement; and Prepositions.

Vocabulary - Word Forms (Pre ixes& Suf ixes); Synonyms and Antonyms; Phrasal Verbs.

UNIT-III **DESCRIPTION OF A PROCESS / PRODUCT** **9**

Reading - Reading Advertisements, Gadget Reviews; User Manuals.

Writing - Writing De initions; Instructions; and Product /Process Description.

Grammar - Imperatives; Adjectives; Degrees of Comparison; Present & Past Perfect Tenses.

Vocabulary- Compound Nouns, Homonyms; and Homophones, Discourse Markers (Connectives & Sequence Words)

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UNIT-IV **CLASSIFICATION AND RECOMMENDATIONS** **9**

Reading - Newspaper Articles; Journal Reports –and Non Verbal Communication (Tables, Pie Charts etc...)
Writing - Note-making / Note-taking (*Study skills to be taught, not tested); Writing Recommendations; Transferring Information from Non Verbal (Chart , Graph etc, to Verbal Mode)
Grammar - Articles; Pronouns - Possessive & Relative Pronouns.
Vocabulary - Collocations; Fixed / Semi Fixed Expressions

UNIT-V **EXPRESSION** **8**

Reading - Reading Editorials; and Opinion Blogs;
Writing - Essay Writing (Descriptive or Narrative).
Grammar- Future Tenses, Punctuation; Negation (Statements & Questions); and Simple, Compound & Complex Sentences.
Vocabulary - Cause & Effect Expressions – Content vs. Function Words.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the Course the students will able to

CO1:	Use appropriate words in a professional context
CO2:	Gain understanding of basic grammatical structures and use them in right context
CO3:	Read and infer the denotative and connotative meanings of technical text
CO4:	Read and interpret information presented in tables, charts and other graphic forms
CO5:	Write de initions, descriptions, narrations and essays on various topics

TEXT BOOKS:

1. Department of English, Anna University, "English for Engineers & Technologists" Orient Blackswan Private Ltd, 2020.
2. Dr.Veena Selvam, Dr.Sujatha Priyadarshini, & CO, Department of English, Anna University, "English for Science & Technology" Cambridge University Press, 2021.

REFERENCE BOOKS:

1. Meenakshi Raman & Sangeeta Sharma, "Technical Communication–Principles and Practices", Oxford Univ. Press, New Delhi, 2016.

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2 Lakshminarayanan, "A Course Book on Technical English", Scitech Publications (India) Pvt.Ltd. 2012.
3 Aysha Viswamohan, "English For Technical Communication (With CD)", Mcgraw HillEducation, ISBN : 0070264244, 2008.
4 Effective Communication Skill, Kulbhusan Kumar, R S Salaria, Khanna Publishing House, 2016.

E. RESOURCES:

- https://learnenglish.britishcouncil.org/

CO's-PO's MAPPING :

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	2	3	-	3
CO2	-	-	-	-	-	1	-	-	2	3	-	2
CO3	-	-	-	-	-	1	-	-	3	3	-	3
CO4	-	-	-	2	-	-	-	-	3	3	-	3
CO5	-	-	-	-	-	-	-	-	2	3	-	2
AVR	-	-	-	2	-	1	-	-	2	3	-	3

1- Low, 2- Medium, 3-High, "-" No Correlation

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23MAT11	MATRICES AND CALCULUS (Common to B.E./B.Tech. all Branches)	L T P C 3 1 0 4

COURSE OBJECTIVES:

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications
- To familiarize the students with differential calculus
- To familiarize the student with functions of several variables. This is needed in many branches of engineering
- To make the students understand various techniques of integration
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications

UNIT-I **MATRICES** **9+3**

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley - Hamilton theorem – Diagonalization of matrices by orthogonal transformation – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms – Applications : Stretching of an elastic membrane.

UNIT-II **DIFFERENTIAL CALCULUS** **9+3**

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

UNIT-III **FUNCTIONS OF SEVERAL VARIABLES** **9+3**

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Applications : Maxima and minima of functions of two variables and Lagrange's method of undetermined multipliers.

UNIT-IV **INTEGRAL CALCULUS** **9+3**

Definite and Indefinite integrals - Substitution rule - Techniques of Integration : Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Improper integrals - Applications : Hydrostatic force and pressure, moments and centre of mass.

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UNIT-V **MULTIPLE INTEGRALS** **9+3**

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals – Applications: Moments and centre of mass, moment of inertia.

TOTAL : 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to :

CO1:	Use the matrix algebra methods for solving practical problems
CO2:	Apply differential calculus tools in solving various application problems.
CO3:	Use differential calculus ideas on several variable functions
CO4:	Apply different methods of integration in solving practical problems
CO5:	Apply multiple integral ideas in solving areas, volumes and other practical problems

TEXT BOOKS :

1. James Stewart, "Calculus : Early Transcendentals", Cengage Learning, 8th Edition, New Delhi, 2019. [For Units II & IV - Sections 1.1, 2.2, 2.3, 2.5, 2.7 (Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1 (Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5,7.1 - 7.4 and 7.8]
2. Grewal. B. S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2018

REFERENCE BOOKS :

1. Thomas. G. B., Hass. J, and Weir. M.D, "Thomas Calculus", 14th Edition, Pearson India, 2022
2. Anton. H, Bivens. I and Davis. S, " Calculus ", Wiley, 10th Edition, 2021
3. Jain. R.K. and Iyengar. S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 5th Edition, 2016
4. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016

CO's – PO's MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1	-	-	-	-	2	-	2	3
CO2	3	3	1	1	-	-	-	-	3	-	2	3
CO3	3	3	1	1	-	-	-	-	2	-	2	3
CO4	3	3	1	1	-	-	-	-	2	-	2	3
CO5	3	2	1	1	-	-	-	-	2	-	2	3
AVG	3	3	1	1	-	-	-	-	2	-	2	3

1- Low, 2- Medium , 3-High, "-" No Correlation

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23PHT11	ENGINEERING PHYSICS (Common to B.E./B. Tech. all branches)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To make the students effectively achieve an understanding of mechanics
- Provide knowledge of elastic property, thermal property of materials and its applications
- Impart knowledge of laser and their applications
- Introduce the essential principles of fiber optics and its applications
- Equipping the students to successfully understand the importance of quantum physics

UNIT-I MECHANICS 10

Multi-particle dynamics: Center of mass (CM) – CM of continuous bodies – motion of the CM – kinetic energy of the system of particles. Rotation of rigid bodies: Rotational kinematics – rotational kinetic energy and moment of inertia – theorems of M.I – M.I of a diatomic molecule – torque – rotational dynamics of rigid bodies – rotational energy state of a rigid diatomic molecule – torsional pendulum – double pendulum

UNIT-II PROPERTIES OF MATTER AND THERMAL PHYSICS 10

Elasticity- Hooke's law – stress – strain diagram – Poisson's ratio – Factors affecting elasticity –bending of beams-Bending moment equation – Depression of a cantilever–Young's modulus by uniform bending – I-shaped girders-Modes of heat transfer – thermal conductivity – Newton's law of cooling – Linear heat flow – Lee's disc method – conduction through compound media (series and parallel)

UNIT-III LASER 9

Lasers: Stimulated absorption – Spontaneous emission – Stimulated emission – Population inversion-Einstein's coefficients derivation and their relations – Pumping methods – Types of lasers – Nd:YAG, CO_2 laser, Semiconductor lasers (homojunction & heterojunction) – Industrial and Medical Applications of lasers

UNIT-IV FIBER OPTICS 8

Principle and propagation of light in optical fibres – Numerical aperture and Acceptance angle – Types of optical fibres (material, refractive index, mode) – attenuation, dispersion, bending – Fiber optics communication system (qualitative) – Temperature and displacement sensors – fiber optic endoscope

UNIT-V QUANTUM PHYSICS 8

Photons and light waves – Electrons and matter waves – Compton effect: theory of scattering –Derivation and experimental verification – The Schrodinger equation (Time dependent and

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time independent forms) – particle in a one-dimensional rigid box for eigen value and eigen function – tunneling (qualitative) – scanning tunneling microscope

TOTAL: 45 PERIODS

COURSE OUTCOME:

At the end of the course the students will be able to

CO1:	Understand the importance of mechanics.
CO2:	Describe the Elastic property of solid materials and thermal conductivity of solids in industrial applications
CO3:	Demonstrate a foundational knowledge in lasers
CO4:	The students will get knowledge on fiber optics
CO5:	Understand the importance of quantum physics

TEXT BOOKS:

1. D.Kleppner and R.Kolenkow, "An Introduction to Mechanics," McGraw Hill Education (IndianEdition), 2017
2. Arthur Beiser, Shobhit Mahajan, S.Rai Choudhury, "Concepts of Modern Physics," McGraw-Hill (Indian Edition), 2017

REFERENCE BOOKS:

1. K.Thyagarajan and A.Ghatak, "Lasers: Fundamentals and Applications," Laxmi Publications, (Indian Edition), 2023
2. D.Halliday, R.Resnick and J.Walker, "Principles of Physics," Wiley (Indian Edition), 2021
3. N.Garcia, A.Damask and S.Schwarz, "Physics for Computer Science Students," Springer-Verlag, 2012

CO's- PO's MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	1	-	-	-	-	-	-	-
CO2	3	3	2	1	1	-	-	-	-	-	-	-
CO3	3	2	2	1	2	-	-	-	-	-	-	1
CO4	3	2	2	1	2	-	-	-	-	-	-	1
CO5	3	3	1	1	2	-	-	-	-	-	-	-
AVG	3	3	2	1	2	-	-	-	-	-	-	1

1- Low, 2- Medium , 3-High, "-" No Correlation

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23CYT11	ENGINEERING CHEMISTRY (Common to B.E./B. Tech. all branches)	L T P C 3 0 0 3

COURSE OBJECTIVES:

- To inculcate sound understanding of water quality parameters and water treatment techniques
- To impart knowledge on the basic principles and preparatory methods of nanomaterials
- To introduce the basic concepts and applications of phase rule and composites
- To facilitate the understanding of different types of fuels, their preparation, properties and combustion characteristics
- To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices

UNIT-I **WATER AND ITS TREATMENT** 9

Water: Sources and impurities, **Water quality parameters:** turbidity, pH, hardness, alkalinity, TDS, COD and BOD. **Desalination of brackish water:** Reverse Osmosis. **Boiler troubles:** Scale and sludge, Boiler corrosion, Caustic embrittlement, Priming & foaming. **Treatment of boiler feed water:** Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) and External treatment – Ion exchange demineralisation and zeolite process. **Municipal water treatment:** primary treatment and disinfection (UV, Ozonation, break-point chlorination)

UNIT-II **NANOCHEMISTRY** 9

Basics: Distinction between molecules, nanomaterials and bulk materials; **Size-dependent properties** (optical, electrical, mechanical and magnetic); **Types of nanomaterials:** De inition, properties and uses of – nanoparticle, nanowire and nanotube. **Preparation of nanomaterials:** sol-gel, solvothermal, laser ablation, electrochemical deposition. **Applications** of nanomaterials with examples in medicine, agriculture, energy, electronics and catalysis.

UNIT-III **PHASE RULE AND COMPOSITES** 9

Phase rule: Introduction, de inition of terms with examples. One component system - water system; Reduced phase rule; Construction of a simple eutectic phase diagram - Thermal analysis; Two component system: lead-silver system – Pattinson's process.

Composites: Introduction: De inition & Need for composites; **Constitution:** Matrix materials (Polymer matrix, metal matrix and ceramic matrix) and Reinforcement (iber, particulates, lakes and whiskers). **Properties and applications of:** Metal matrix composites (MMC), Ceramic matrix composites and Polymer matrix composites.

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UNIT-IV **FUELS AND COMBUSTION** **9**

Fuels: Introduction: Classi ication of fuels; **Coal and coke:** Analysis of coal (proximate and ultimate), Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). **Petroleum and Diesel:** Manufacture of synthetic petrol (Bergius process), Knocking - octane number, diesel oil - cetane number; **Solid biofuels, Compressed biogas, Power alcohol and biodiesel.**

Combustion of fuels: Introduction: Calori ic value - higher and lower calori ic values, Theoretical calculation of calori ic value; **Flue gas analysis** - ORSAT Method. **CO_2 emission and carbon foot print.**

UNIT-V **ENERGY SOURCES AND STORAGE DEVICES** **9**

Nuclear energy: light water nuclear power plant, breeder reactor. Solar energy conversion: Principle, working and applications of solar cells; **Recent developments in solar cell materials. Wind energy; Geothermal energy; Batteries:** Types of batteries, Primary battery - dry cell, Secondary battery - lead acid battery and lithium-ion-battery; **Electric vehicles-working principles; Fuel cells:** H_2-O_2 fuel cell, microbial fuel cell; **Supercapacitors:** Storage principle, types and examples

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able

CO1:	To infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.
CO2:	To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.
CO3:	To apply the knowledge of phase rule and composites for material selection requirements.
CO4:	To recommend suitable fuels for engineering processes and applications.
CO5:	To recognize different forms of energy resources and apply them for suitable applications in energy sectors

TEXT BOOKS:

1. P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, DhanpatRai Publishing Company (P) Ltd, New Delhi, 2018
2. S.S. Dara, "A text book of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2018

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REFERENCE BOOKS:

1. Shashi Chawla, "A Text Book of Engineering Chemistry", Dhanpar Rai & Co (Pvt.) Ltd, New Delhi, 2011
2. O.G. Palanna, "Engineering Chemistry", McGraw Hill Education (India) Private Limited, 2nd Edition, 2017
3. Dr. A.Ravikrishnan, "Engineering Chemistry", Sri Krishna Hitech Publishing Company Pvt. Limited, 23rd Edition, 2023

CO's- PO's MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	1	1	3	3	-	-	-	-	-
CO2	3	2	1	1	2	2	-	-	-	-	-	1
CO3	3	3	1	1	1	1	-	-	-	-	-	-
CO4	3	2	1	1	1	1	-	-	-	-	-	-
CO5	3	2	2	1	2	2	2	-	-	-	-	-
AVG	3	2	2	1	1	2	3	-	-	-	-	1

1- Low, 2- Medium , 3-High, "-" No Correlation

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23CST11	PROBLEM SOLVING AND PYTHON PROGRAMMING (Common to: B.E. / B.Tech. all Branches)	L 3	T 0	P 0	C 3

COURSE OBJECTIVES:

- To solve problems using computational thinking methods using pseudo code and flowchart
- To understand the fundamentals of algorithmic problem solving basics and strategies
- To define variables data types and error messages
- To learn to solve problems using Python conditionals loops lists tuples and dictionaries to represent complex data
- To understand the functions modules and do input/output with files in Python

UNIT-I **COMPUTATIONAL THINKING** **8**

Introduction - Problem solving and Decomposition - Abstraction - Notations Pseudo code - Flow chart - Programming language

UNIT-II **ALGORITHMIC PROBLEM SOLVING** **8**

Algorithm Implementation - Top down design - Simple strategies for developing algorithms - Iteration - Recursion - Fundamental algorithms - Anticipating and Dealing with Errors

UNIT-III **BASICS BUILDING BLOCKS OF PYTHON** **9**

Variables - Immutable variables - Data types - Operators - Python Reserved Words - Understanding error messages

UNIT-IV **CONTROL STATEMENTS AND STRUCTURED TYPES** **10**

Control Flow - Indenting - if Statement - while Loop - break and continue - for Loop - String - Lists - Tuples - Sets - Dictionaries

UNIT-V **FUNCTIONS, MODULES AND FILES** **10**

Definition - Hiding redundancy - Arguments and return values - Variable Number of Arguments - Scope - Passing Functions to a Function - Mapping Functions in a Dictionary - Lambda function – Recursive Functions - Modules: Standard Modules - OS and SYS modules - User defined Modules - Importing modules – Writing into a File - Reading from a File - File Methods

TOTAL : 45 PERIODS

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COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Develop algorithmic solutions for simple computational problems to develop and execute simple Python programs.

CO2 : Write the Algorithms for problem solving basics and strategies to solve complex problems

CO3 : Compose simple Python programs using to illustrate variables data types and error messages.

CO4 : Represent compound data using Python conditionals loops lists tuples dictionaries for solving problems

CO5 : Create functions modules read and write data from/to files in Python programs.

TEXT BOOKS:

1. R. G. Dromey "How to Solve it by Computer", Pearson Education., 2015
2. Charles Dierbach "Introduction to Computer Science using Python: A Computational Problem- Solving Focus", Wiley India., 2015

REFERENCE BOOKS:

1. John V. Guttag "Introduction to Computation and Programming using Python", The MIT press. 2021 (3rd Edition).
2. Paul Gries, Jennifer Campbell, Jason Montojo "Practical Programming: An Introduction to Computer Science using Python 3", Pragmatic Programmers., 2013 , Second edition
3. Robert Sedgewick, Kevin Wayne, Robert Dondero "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India., 2016
4. Karl Beecher "Computational Thinking - A beginner's guide to problem solving and Programming", BCS Learning &Development., 2017

E-RESOURCES:

1. http://www.flowgorithm.org/
2. https://www.python.org/
3. https://nptel.ac.in/courses/106104074

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	3	2	-	-	-	-	-	2	2	3	3	3
CO2	2	3	3	3	2	-	-	-	-	-	2	-	3	3	3
CO3	2	2	-	2	2	-	-	-	-	-	1	-	3	3	3
CO4	1	2	-	-	1	-	-	-	-	-	1	-	2	3	3
CO5	2	2	-	-	2	-	-	-	-	-	1	2	2	3	3
AVG	**2**	**3**	**3**	**3**	**2**	-	-	-	-	-	**2**	**2**	**3**	**3**	**3**

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23TAT11	தமிழர் மரபு	L T P C 1 0 0 1

(B.E./B.Tech- அனைத்து பாடப்பிரிவுகளுக்கும் பொதுவானது)

பாடநெறி நோக்கங்கள்:

- தமிழின் இலக்கியங்கள் மற்றும் நவீன இலக்கியங்களைப் புரிந்துகொள்ளுதல்
- தமிழ் கலாச்சார பாரம்பரியத்தைக் கற்றுக்கொள்ளுதல்
- தமிழர்களின் பல்வேறு கலைவடிவங்களைக் கண்டறிதல்
- தமிழர்களின் திணைக்கோட்பாடுகளை விளக்குதல்
- இந்திய சுதந்திர போராட்ட இயக்கங்களுக்கும் இந்திய கலாச்சாரத்திற்குமான தமிழர்களின் பங்களிப்பை உணர்தல்

அலகு - I மொழி மற்றும் இலக்கியம் 3

இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமய சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் ஆறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த மதங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு - II மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை 3

நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப்பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளுவர் சிலை - இசைக்கருவிகள் - மிருதங்கம், பறை வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு - III நாட்டப்புறக் கலைகள் மற்றும் வீரவிளையாட்டுகள் 3

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு - IV தமிழர்களின் திணைக் கோட்பாடுகள் 3

தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவு, கல்வியும் - சங்ககால நகரங்களும் துறைமுகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி

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அலகு - V இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு 3

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிற்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

மொத்தம்: 15 பாடவேளைகள்

பாடநெறி முடிவுகள்:

இப்பாடத்தைப் படிப்பதின் முடிவில் மாணவர்கள்

CO1: தமிழின் பல்வேறு இலக்கியங்களைப் பற்றிய அறிவைப் பெறுவார்கள்
CO2: தமிழ் கலாச்சார பாரம்பரியத்தின் தனித்தன்மையைக் கற்றுக்கொள்வார்கள்
CO3: தமிழகத்தின் பல்வேறு கலைவடிவங்களைக் கண்டறிவார்கள்
CO4: தமிழர்களின் திணைக்கோட்பாடுகளை அறிந்துகொள்வார்கள்
CO5: தமிழ் சுதந்திரப்போராட்ட வீரர்கள் மற்றும் தமிழ் கலாச்சாரத்தை இந்தியாவின் மற்ற பகுதியுடன் ஒப்பிடும் திறனைப் பெறுவார்கள்

மின் -ஆதாரங்கள்:

1. https://www.tamilvu.org/

CO's -PO's விவரணையாக்கம்:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	1	1	1	-	1	-	-
CO2	-	-	-	-	-	1	1	1	-	1	-	-
CO3	-	-	-	-	-	1	1	1	-	1	-	-
CO4	-	-	-	-	-	1	1	1	-	1	-	-
CO5	-	-	-	-	-	1	1	1	-	1	-	-
AVG	-	-	-	-	-	1	1	1	-	1	-	-

1- Low, 2- Medium , 3-High, "-" No Correlation

Chairman
BoS / S&H

23TAT11	HERITAGE OF TAMILS (Common to B.E./B. Tech. all branches)	L T P C 1 0 0 1

COURSE OBJECTIVES:

- To understand the Sangam and modern literature of Tamil
- To learn the heritage of Tamil culture
- To recognize the various art forms of Tamils
- To explain the Thinai concept of Tamils
- To realize the contribution of Tamils to Indian national movement and Indian culture

UNIT-I **LANGUAGE AND LITERATURE** 3

Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature- Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land- Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modernliterature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

UNIT-II **HERITAGE – ROCK ART PAINTINGS TO MODERN ART - SCULPTURE** 3

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

UNIT-III **FOLK AND MARTIAL ARTS** 3

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

UNIT-IV **THINAI CONCEPTS OF TAMILS** 3

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

UNIT-V **CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE** 3

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

TOTAL: 15 PERIODS

Chairman
BoS / S&H

COURSE OUTCOMES:

At the end of the course the student will be able to

CO1:	Gain knowledge about various literatures of Tamil
CO2:	Learn the uniqueness of Tamil cultural heritage
CO3:	Find various art forms of Tamil Nadu
CO4:	Understand the Thinai concepts in Tamil
CO5:	Distinguish the contribution of Tamils to Indian national movement and Indian culture

E- RESOURCES:

1. https://www.tamilvu.org/

CO's -PO's MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	1	1	1	-	1	-	-
CO2	-	-	-	-	-	1	1	1	-	1	-	-
CO3	-	-	-	-	-	1	1	1	-	1	-	-
CO4	-	-	-	-	-	1	1	1	-	1	-	-
CO5	-	-	-	-	-	1	1	1	-	1	-	-
AVG	-	-	-	-	-	1	1	1	-	1	-	-

1- Low, 2- Medium , 3-High, "-" No Correlation

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BoS / S&H

		L	T	P	C
23CSL11	**PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY**	0	0	4	2

(Common to: B.E. / B.Tech. all Branches)

COURSE OBJECTIVES:

- To understand the problem solving approaches.
- To learn the basic programming constructs in Python.
- To practice various computing strategies for Python-based solutions to real world problems.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python

LIST OF EXPERIMENTS

Note: The examples suggested in each experiment are only indicative. The lab instructor is expected to design other problems on similar lines. The Examination shall not be restricted to the sample experiments listed here.

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)
4. 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)
5. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)
6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
7. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters)
8. Implementing programs using written modules and Python Standard Libraries (pandas, numpy. Matplotlib, scipy)
9. Implementing real-time/technical applications using File handling. (copy from one file to another, word count, longest word)
10. Implementing real-time/technical applications using Exception handling. (divide by zero error, voter's age validity, student mark range validation)
11. Exploring Pygame tool.
12. Developing a game activity using Pygame like bouncing ball, car race etc.

TOTAL : 60 PERIODS

Chairman
BoS/CSE& IT

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Develop algorithmic solutions to simple computational problems

CO2 : Develop and execute simple Python programs.

CO3 : Implement programs in Python using conditionals and loops for solving problems.

CO4 : Deploy functions to decompose a Python program.

CO5 : Process compound data using Python data structures and Utilize Python packages in developing software applications.

TEXT BOOKS:

1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.

REFERENCE BOOKS:

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.
3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press, 2021.
4. Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.
5. Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018.

E-RESOURCES:

1. http://www.flowgorithm.org/
2. https://www.python.org/
3. https://nptel.ac.in/courses/106104074

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	-	-	-	-	-	2	2	3	3	3
CO2	3	3	3	3	2	-	-	-	-	-	2	-	3	3	
CO3	2	2	-	2	2	-	-	-	-	-	1	-	3	3	3
CO4	1	2	-	-	1	-	-	-	-	-	1	-	2	3	3
CO5	2	2	-	-	2	-	-	-	-	-	1	-	2	3	3
AVG	**2**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**3**	**3**	**3**

1 - low, 2 - medium, 3 - high, '-' - no correlation

Chairman
BoS/CSE& IT

23PCL11	PHYSICS AND CHEMISTRY LABORATORY (Common to B.E./B. Tech. all branches)	L	T	P	C
		0	0	4	2

PHYSICS LABORATORY
(Any Seven Experiments)

COURSE OBJECTIVES:

- Determination of the physical parameters such as young's modulus by Uniform bending method, Non-Uniform bending method, Simple harmonic oscillations of cantilever and rigidity modulus of wire
- To impart knowledge in the determination of the thermal conductivity of a bad conductor by Lee's Disc method and band gap of a semiconductor
- Determination of the wavelength of the laser using grating, numerical aperture and acceptance angle in an optical iber and width of the groove in an compact disc by using laser
- Determination of the velocity of sound and compressibility of liquids by using ultrasonic interferometer
- Knowledge on the frequency of alternating current using electrically vibrating tuning fork by using Melde's apparatus

LIST OF EXPERIMENTS

1. Determination of Young's modulus by Uniform bending method
2. Determination of Young's modulus by non-uniform bending method
3. Simple harmonic oscillations of cantilever
4. Determination of rigidity modulus of wire and moment of inertia of regular objects – Torsion pendulum
5. Determination of thermal conductivity of a bad conductor – Lee's Disc method
6. Determination of band gap of a semiconductor
7. Determination of the wavelength of the laser using grating
8. a) Determination of numerical aperture and acceptance angle in an optical iber
   b) Determination of width of the groove in an compact disc by using laser
9. Determination of the velocity of sound and compressibility of liquids by using ultrasonic interferometer
10. Determination of the frequency of alternating current using electrically vibrating tuning fork -Melde's apparatus

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Experiment and determine the physical characteristics of given solid materials using Young's modulus-Uniform bending method, non-uniform bending method, cantilever method and Torsion Pendulum.

CO2: Experiment and determine the thermal conductivity of a bad conductor using Lee's Disc method and band gap energy of a given semiconducting material using Zener diode.

CO3: Experiment and determine the optical property of light sources, acceptance angle of optical iber and width of the groove in an compact disc using Laser.

CO4: Experiment and determine the velocity of ultrasonic waves using ultrasonic interferometer.

CO5: Experiment and determine the frequency of alternating current using electrically vibrating tuning fork by using Melde's apparatus

Chairman
BoS / S&H

TEXT BOOKS:

1. Dr. P. Mani, Engineering Physics Practicals, Dhanam Publications (2022)

CO's – PO's MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1	-	-	-	-	-	-	-	-
CO2	3	3	1	1	-	-	-	-	-	-	-	-
CO3	3	3	1	1	-	-	-	-	-	-	-	-
CO4	3	3	1	1	-	-	-	-	-	-	-	-
CO5	3	3	1	1	-	-	-	-	-	-	-	-
AVG	3	3	1	1	-	-	-	-	-	-	-	-

CHEMISTRY LABORATORY

(Any Seven Experiments)

COURSE OBJECTIVES:

- To inculcate experimental skills to test basic understanding of water quality parameters, such as acidity, alkalinity.
- To acquire the knowledge in total hardness and dissolved oxygen and its impacts in industries through experiments
- To understand the impacts of chlorine in water sample through volumetric analysis.
- To induce the students to familiarize with electroanalytical techniques in the determination of impurities in aqueous solutions.
- To determine the amount of metal ions through spectroscopic techniques.

LIST OF EXPERIMENTS

1. Preparation of Na_2CO_3 as a primary standard and estimation of acidity of a water sample using the primary standard.
2. Determination of types and amount of alkalinity in a water sample
3. Determination of total, temporary & permanent hardness of water by EDTA method.
4. Determination of DO content of water sample by Winkler's method.
5. Determination of chloride content of water sample by Argentometric method.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Conductometric titration of barium chloride against sodium sulphate (precipitation titration).
9. Estimation of iron content of the given solution using potentiometer.
10. Estimation of sodium /potassium present in water using a lame photometer.

TOTAL: 30 PERIODS

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COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Analyse the quality of water samples with respect to their acidity and alkalinity of water samples

CO2: Examine the water quality parameters like total hardness and DO with volumetric analysis.

CO3: Learn the permissible limit of chlorine in the given water sample

CO4: Analyse the impurities in solution by electro analytical techniques quantitatively

CO5: Determine the amount of metal ions through spectroscopic techniques.

CO's – PO's MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	3	3	1	-	-	-	1
CO2	3	2	2	-	-	3	3	1	-	-	-	1
CO3	3	2	1	-	-	3	3	1	-	-	-	1
CO4	3	2	2	-	1	2	1	-	-	-	-	-
CO5	3	2	1	-	1	2	1	-	-	-	-	-
Avg.	3	2	1	-	1	3	2	1	-	-	-	1

TEXT BOOKS:

1. "Vogel's Textbook of Quantitative Chemical Analysis", (8th Edition, 2014)
2. J. Mendham, R. C. Denney, J.D. Barnes, M. Thomas and B. Sivasankar, "Vogel's Textbookof Quantitative Chemical Analysis", (2009)

Chairman
BoS / S&H

23ENL11	ENGLISH LABORATORY (Common to B.E./B.Tech. all Branches)	L T P C 0 0 2 1

COURSE OBJECTIVES:

- To improve the communicative competence of learners.
- To help learners use language effectively in academic /work contexts.
- To develop various listening strategies to comprehend various types of audio materials like lectures, discussions, videos etc.
- To build on students' English language skills by engaging them in listening, speaking and grammar learning activities those are relevant to authentic contexts.
- To use language ef iciently in expressing their opinions via various media.

UNIT-I INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION 6

Listening- Listening for General Information-Speci ic Details- Conversation: Introduction toClassmates - Audio / Video (Formal & Informal); Telephone Conversation; Listening to Voicemail & Messages; Listening and Filling a Form.
Speaking- Making Telephone Calls- Self Introduction; Introducing a Friend; - Politeness Strategies- Making Polite Requests, Making Polite Offers, Replying to Polite Requests and Offers- Understanding Basic Instructions (Filling out a Bank Application for Example).

UNIT-II NARRATION AND SUMMATION 6

Listening - Listening to Podcasts, Anecdotes / Stories / Event Narration; Documentaries and Interviews with Celebrities.
Speaking - Narrating Personal Experiences / Events-Talking about Current and Temporary Situations & Permanent and Regular Situations - Describing Experiences and Feelings- Engaging in Small Talk- Describing Requirements and Abilities.

UNIT-III DESCRIPTION OF A PROCESS / PRODUCT 6

Listening - Listen to Product and Process Descriptions; A Classroom Lecture; and Advertisements about Products.
Speaking - Picture Description- Describing Locations in Workplaces- Giving Instruction to Use the Product- Explaining Uses and Purposes- Presenting a Product- Describing Shapes and Sizes and Weights- Talking about Quantities (Large & Small)- Talking about Precautions.

UNIT-IV CLASSIFICATION AND RECOMMENDATIONS 6

Listening – Listening to Technology, Entertainment and Design (TED) Talks; Listening to Lectures - and Educational Videos.
Speaking – Small Talk; Discussing and Making Plans-Talking about Tasks-Talking about Progress- Talking about Positions and Directions of Movement- Talking about Travel Preparations- Talking about Transportation.

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UNIT-V **EXPRESSION** **6**

Listening - Listening to Debates/ Discussions; Different Viewpoints on an Issue; and Panel Discussions.
Speaking - Making Predictions- Talking about a Given Topic-Giving Opinions- Understandinga Website- Describing Processes.

TOTAL : 30 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able

CO1:	To listen to and understand general and complex academic information
CO2:	To listen to and understand different points of view in a discussion
CO3:	To speak luently and accurately in formal and informal communicative contexts
CO4:	To describe products and processes and explain their uses clearly as well as accurately
CO5:	To express their opinions effectively in both formal and informal discussions

E. RESOURCES:

- https://www.ted.com/about/programs-initiatives/ted-talks-education
- https://learnenglish.britishcouncil.org/

CO's & PO's MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	3	3	-	3
CO2	-	-	-	-	-	-	-	-	3	3	-	3
CO3	-	-	-	-	-	-	-	1	2	3	-	2
CO4	-	-	-	-	-	-	-	-	2	3	-	2
CO5	-	-	-	-	-	-	-	1	3	3	-	2
AVR	-	-	-	-	-	-	-	1	3	3	-	2

1 - low, 2 - medium, 3 - high, '-' - no correlation

Chairman
BoS / S&H

23ENT21	PROFESSIONAL ENGLISH – II (Common to B.E./B.Tech. all Branches)	L T P C 2 0 0 2

COURSE OBJECTIVES:

- To engage learners in meaningful language activities to improve their reading and writing skills.
- To learn various reading strategies and apply in comprehending documents in professional context.
- To help learners understand the purpose, audience, contexts of different types of writing.
- To develop analytical thinking skills for problem solving in communicative contexts.
- To demonstrate an understanding of job applications and interviews for internship and placements.

UNIT-I **MAKING COMPARISONS** 6

Reading - Reading Advertisements, User Manuals, Brochures Emails.

Writing - Professional Emails, Email Etiquette - Compare and Contrast Essay.
Grammar - Mixed Tenses, Prepositional Phrase.

UNIT-II **EXPRESSING CAUSAL RELATIONS IN SPEAKING AND WRITING** 6

Reading - Reading Longer Technical Texts– Cause and Effect Essays, and Letters / Emails of Complaint.
Writing - Writing Responses to Complaints.
Grammar - Active Passive Voice Transformations, In initive and Gerunds.

UNIT-III **PROBLEM SOLVING** 6

Reading - Case Studies, Excerpts from Literary Texts, News Reports etc.
Writing - Letter to the Editor, Checklists, Problem Solution Essay / Argumentative Essay.
Grammar - Error Correction; If Conditional Sentences.

UNIT-IV **CLASSIFICATION AND RECOMMENDATIONS** 6

Reading - Newspaper Articles.
Writing - Recommendations, Transcoding, Accident Report, Survey Report
Grammar - Reported Speech, Modals.
Vocabulary - Conjunctions- Use of Prepositions.

Chairman
BoS / S&H

UNIT-V **EXPRESSION** **6**

Reading - Company Pro iles, Statement of Purpose, (SOP), An Excerpt of Interview with Professionals.
Writing - Job / Internship Application – Cover Letter & Resume.
Grammar - Numerical Adjectives, Relative Clauses.

TOTAL : 30 PERIODS

COURSE OUTCOMES:

At the end of the Course the students will able to

CO1:	Compare and contrast products and ideas in technical texts.
CO2:	Identify and report cause and effects in events, industrial processes through technical texts
CO3:	Analyse problems in order to arrive at feasible solutions and communicate them in the written format
CO4:	Present their ideas and opinions in a planned and logical manner
CO5:	Draft effective resumes in the context of job search.

TEXT BOOKS:

1. Department of English, Anna University, "English for Engineers & Technologists" Orient Blackswan Private Ltd, 2020.
2. Dr.Veena Selvam, Dr.Sujatha Priyadarshini, & CO, Department of English, Anna University, "English for Science & Technology" Cambridge University Press, 2021.

REFERENCE BOOKS:

1. Raman, Meenakshi, Sharma & Sangeeta, "Professional English", Oxford University Press, New Delhi, 2019.
2. Dr. V. Chellammal, "Learning to Communicate", Allied Publishers, New Delhi, 2003
3. V.N. Arora and Laxmi Chandra, "Improve Your Writing", Oxford University Press, NewDelhi, 2001.

E. RESOURCES:

- https://learnenglish.britishcouncil.org/

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CO'S-PO'S MAPPING :

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	1	-	-	-	-	-	1	2	3	-	2
CO2	-	-	-	-	-	-	1	-	3	3	-	3
CO3	-	1	1	-	-	-	-	-	3	3	-	3
CO4	-	-	-	-	-	-	-	-	2	3	-	2
CO5	-	-	-	-	-	-	-	-	2	3	-	2
AVG	-	1	1	-	-	-	1	1	2	3	-	2

1. Low, 2- Medium, 3-High, "-" No Correlation

Chairman
BoS / S&H

23MAT21	NUMERICAL METHODS AND STATISTICS (Common to B.E./B.Tech. all Branches)	L T P C 3 1 0 4

COURSE OBJECTIVES:

- To introduce the basic concepts of solving algebraic and transcendental equations
- To introduce the numerical techniques of interpolation in various intervals and differentiation and integration in engineering and technology
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems
- To introduce the basic concepts of classifications of design of experiments which plays very important roles in the field of engineering and statistical quality control

UNIT-I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9+3

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting-Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel – Eigen values of a matrix by Power method and Jacobi's method for symmetric matrices.

UNIT-II INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION 9+3

Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Approximation of derivates using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson's 1/3 rules

UNIT-III NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS 9+3

Single step methods: Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order differential equations - Multi step methods: Milne's and Adams - Bash forth predictor corrector methods for solving first order differential equations.

UNIT-IV TESTING OF HYPOTHESIS 9+3

Sampling distributions - Tests for single mean, proportion and difference of means (Large andsmall samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit – Independence of attributes

UNIT-V DESIGN OF EXPERIMENTS 9+3

One way and two way classifications - Completely randomized design – Randomized block design – Latin square design - 2^2 factorial design.

TOTAL : 60 PERIODS

Chairman
BoS / S&H

COURSE OUTCOMES:

At the end of the Course the students will be able to

- **CO1 :** Apply the numerical techniques of interpolation in various intervals and differentiation and integration for engineering problems
- **CO2 :** Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations
- **CO3 :** Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications
- **CO4 :** Apply the concept of testing of hypothesis for small and large samples in real life problems
- **CO5 :** Apply the basic concepts of classifications of design of experiments in the field of agriculture

TEXT BOOKS:

1. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 9th Edition, 2023
2. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2019

REFERENCE BOOKS:

1. Gupta S.C. and Kapoor V. K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12th Edition, 2020
2. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016
3. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage
4. Learning, New Delhi, 8th Edition, 2014
5 Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", 9th Edition, Pearson Education, India, 2022

CO's – PO's MAPPING

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1	1	-	-	-	2	-	2	3
CO2	3	3	1	1	1	-	-	-	2	-	2	2
CO3	3	3	1	1	1	-	-	-	2	-	2	3
CO4	3	3	1	1	1	-	-	-	2	-	2	3
CO5	3	2	1	1	1	-	-	-	2	-	3	3
AVG	3	3	1	1	1	-	-	-	2	-	2	3

1- Low, 2- Medium , 3-High, "-" No Correlation

Chairman
BoS / S&H

23PHT21	PHYSICS FOR INFORMATION SCIENCE (for B.E. / B.TECH- CSE, IT and AIDS)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To make the students understand the importance in studying electrical properties ofmaterials
- To enable the students to gain knowledge in semiconductor physics
- To instill knowledge on magnetic properties of materials
- To establish a sound grasp of knowledge on different optical properties of materials, opticaldisplays and applications
- To inculcate an idea of signi icance of nano structures, quantum con inement, ensuingnano device applications and quantum computing.

UNIT-I **ELECTRICAL PROPERTIES OF MATERIALS** 9

Classical free electron theory - Expression for electrical conductivity – Thermal conductivity, expression - Wiedemann-Franz law – Success and failures - electrons in metals – Fermi- Dirac statistics – Density of energy states – Electron in periodic potential – Energy bands in solids.

UNIT-II **SEMICONDUCTOR PHYSICS** 9

Intrinsic Semiconductors – Energy band diagram – direct and indirect band gap semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors – variation of Fermi level with temperature and impurity concentration –Hall effect and devices – Ohmic contacts – Schottky diode.

UNIT-III **MAGNETIC PROPERTIES OF MATERIALS** 9

Magnetic dipole moment – atomic magnetic moments- magnetic permeability and susceptibility - Magnetic material classi ication: diamagnetism – paramagnetism – ferromagnetism – antiferromagnetism – ferrimagnetism –Domain Theory of ferromagnetism - Hard and soft magnetic materials – examples and uses – Magnetic principle in computer data storage – Magnetic hard disc (Giant Magneto Resistive sensor).

UNIT-IV **OPTICAL PROPERTIES OF MATERIALS** 9

Classi ication of optical materials – carrier generation and recombination processes - Absorption emission and scattering of light in metals, insulators and semiconductors (concepts only) - photo current in a P-N diode – solar cell - LED – Organic LED – Laser diodes – Optical data storage techniques.

Chairman
BoS / S&H

UNIT-V **NANODEVICES AND QUANTUM COMPUTING** **9**

Introduction - quantum con inement – quantum structures: quantum wells, wires and dots - band gap of nanomaterials. Single electron transistor - Quantum system for information processing - quantum states – classical bits – quantum bits – ,CNOT gate - quantum gates – advantage of quantum computing over classical computing.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the Course the students will be able to

- **CO1:** Gain knowledge on classical and quantum electron theories, and energy band structures
- **CO2:** Acquire knowledge on basics of semiconductor physics and its applications in variousdevices
- **CO3:** Get knowledge on magnetic properties of materials and their applications in data storage
- **CO4:** Have the necessary understanding on the functioning of optical materials for optoelectronics
- **CO5:** Understand the basics of quantum structures and their applications and basics of quantumcomputing

TEXT BOOKS:

1. S.O. Kasap, "Principles of Electronic Materials and Devices", McGraw-Hill Education (Indian Edition), 2020
2. Jasprit Singh, "Semiconductor Devices: Basic Principles", Wiley (Indian Edition), 2007
3. R.Murugesan, Kiruthiga Sivaprasath, "Modern Physics", S.Chand (Indian Edition), 2019

REFERENCE BOOKS:

1. Charles Kittel, "Introduction to Solid State Physics", Wiley India Edition, 2022
2. R.Balasubramaniam, Callister's, "Materials Science and Engineering", Wiley (IndianEdition), 2020
3. Parag K. Lala, "Quantum Computing: A Beginner's Introduction", McGraw-Hill Education (Indian Edition), 2020
4. B.Rogers, J.Adams and S.Pennathur, "Nanotechnology: Understanding Small Systems", CRC Press, 2015

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CO's –PO's MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	-	-	-	-	-	-	-	-	-
CO2	3	1	1	-	-	-	-	-	-	-	-	-
CO3	3	-	-	1	2	1	1	1	-	-	-	-
CO4	3	-	2	1	3	1	1	1	-	-	-	-
CO5	3	2	2	2	2	1	2	-	-	-	-	-
AVG	3	1	2	1	2	1	1	1	-	-	-	-

1- Low, 2- Medium , 3-High, "-" No Correlation

Chairman
BoS / S&H

		L	T	P	C
23EET22	**BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (For B.E./B.Tech- CIVIL, CSE, MECH, AI&DS, BME, IT, Pharm.Tech branches)**	3	0	0	3

COURSE OBJECTIVES:

- To learn the basic concepts of electric circuits and analysis.
- To analyze the magnetic circuits and domestic wiring.
- To understand the basics of working principles and application of electrical machines.
- To impart knowledge about analog devices and their characteristics.
- To educate on the fundamental concepts of digital electronics.

UNIT-I **ELECTRIC CIRCUITS** **10**

Basic components of electric circuits, Charge, Current, Voltage and Power, Voltage and current sources, Ohm's law, Kirchhoff's laws, Series and parallel connected independent sources, Resistors in series and parallel, Voltage division and current division rule, Mesh current and node voltage methods of analysis-DC Circuits.

UNIT-II **MAGNETIC CIRCUITS AND ELECTRICAL INSTALLATIONS** **10**

Magnetic circuits-definitions-MMF, flux, reluctance, Magnetic field intensity, Flux density, Fringing, Self and Mutual inductances-simple problems. Domestic wiring, Wires and Cables - types, Earthing, Protective devices, Switch fuse unit, Safety precautions and First Aid.

UNIT-III **ELECTRICAL MACHINES** **10**

Construction and working principle- DC generators, EMF equation, Types and applications. Working principle of DC motors, Types and applications. Construction, Working principle and applications of 1ϕ Transformer, Three phase alternator, Three phase induction motor and Synchronous motor.

UNIT-IV **ANALOG ELECTRONICS** **8**

Resistor, Inductor and Capacitor in electronic circuits, PN Junction diodes, Rectifier, Zener diode-Characteristics-Applications, Construction and characteristics of bipolar junction transistor-Biasing, JFET, MOSFET, IGBT, SCR, Amplifier –Applications.

UNIT-V **DIGITAL ELECTRONICS** **7**

Review of number systems, Binary codes, Error detection and correction codes, Combinational logic Circuits, Representation of logic functions-SOP and POS forms, K-map representations, Minimization using K maps - Simple Problems.

TOTAL: 45 PERIODS

Chairman
BoS / EEE

COURSE OUTCOME

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

CO1	Explain circuit's behavior using circuit laws and analyze the mesh analysis and nodal analysis.
CO2	Analyze the Magnetic circuits, earthing and wiring.
CO3	Understand the working principle and applications of electrical machines.
CO4	Aanalyze the characteristics of analog electronic devices.
CO5	Explain the basic concepts of digital electronics.

TEXT BOOKS:

1. D P Kothari and I.J Nagarath, "Basic Electrical and Electronics Engineering", McGraw Hill Education (India) Private Limited, Second Edition, 2020.
2. S.K. Bhattacharya, Basic Electrical Engineering, Pearson Education, 2019.
3. James A Svoboda, Richard C. Dorf, Dorf's Introduction to Electric Circuits, Wiley,2018.
4. A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2015.

REFERENCE BOOKS:

1. Muhammad H.Rashid, "Spice for Circuits and electronics", 4th Edition., Cengage India,2019.
2. Thomas L. Floyd, 'Electronic Devices', 10th Edition, Pearson Education, 2018.
3. John Bird, "Electrical Circuit theory and technology", Routledge; 2017.
4. Albert Malvino, David Bates, 'Electronic Principles, McGraw Hill Education; 7th edition, 2017.
5. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010.

E-RESOURCES:

1. NPTEL-Online Courses and Video lectures: https://nptel.ac.in/

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	-	-	-	-	1	-	-	3	2	1
CO2	3	3	2	2	-	-	-	-	-	1	-	-	3	3	2
CO3	3	3	3	3	-	-	-	-	-	1	-	-	3	3	3
CO4	3	3	3	3	-	-	-	-	-	1	-	-	3	3	3
CO5	3	3	3	2	-	-	-	-	-	1	-	-	3	3	3
AVG	3	3	2	2	-	-	-	-	-	1	-	-	3	3	2

1 - low, 2 - medium, 3 - high, '-' - no correlation

Chairman
BoS/EEE

		L	T	P	C
23MET21	**ENGINEERING GRAPHICS** (Common to: B.E./B.Tech. all Branches)	2	0	4	4

Course Objectives:

The main learning objective of this course is to prepare the students for:

- , Drawing engineering curves.
- Drawing projection of points, lines and plane surface.
- Drawingprojection of solids and freehand sketching.
- Drawing of sectioned solids and development of surfaces
- Drawing isometric and perspective projections of simple solids.

CONCEPTS AND CONVENTIONS (Not for Examination)

Importance of graphics in engineering applications - Use of drafting instruments - BIS conventions and specifications — Size, layout and folding of drawing sheets — Lettering and dimensioning.

UNIT-I PLANE CURVES **5+12**

Basic Geometrical constructions, Curves used in engineering practices: Conics — Construction of ellipse, parabola and hyperbola by eccentricity method — Construction of cycloid — construction of involutes of square and circle — Drawing of tangents and normal to the above curves.

UNIT-II PROJECTION OF POINTS, LINES AND PLANE SURFACE **6+12**

Principal Planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT-III PROJECTION OF SOLIDS AND FREEHAND SKETCHING **6+12**

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method. Orthographic projection- Freehand sketching of multiple views from pictorial views of objects.

UNIT-IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES **7+12**

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other — obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids — Prisms, pyramids cylinders and cones.

UNIT-V ISOMETRIC AND PERSPECTIVE PROJECTIONS **6+12**

Principles of isometric projection — isometric scale - Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.

TOTAL : 90 PERIODS

Chairman - BoS / Mech

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Construct the conic curves, involutes and cycloid

CO2: Solve practical problems involving projection of lines, Planes.

CO3: DrawProjection of solids and can draw freehand sketch.

CO4: Draw projection of sectioned solids and development of surfaces

CO5: Draw theisometric and perspective projections.

TEXT BOOKS:

1. K Venugopal, Engineering Drawing and Graphics, Sixth edition, New Age International, 2013.
2. Natrajan K.V., "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.

REFERENCE BOOKS:

1. BasantAgarwal and Agarwal C.M., "Engineering Drawing", McGraw Hill, 2nd Edit ion, 2019.
2. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Publications, Bangalore, 27th Edition, 2017.
3. Luzzader, Warren.J. and Duff, John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
4. Parthasarathy N. S. and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
5. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson Education India, 2nd Edition, 2009.

E-RESOURCES:

1. https://archive.nptel.ac.in/courses/112/102/112102304/
2. https://onlinecourses.nptel.ac.in/noc20_me79/preview
3. https://www.youtube.com/watch?v=ANEvQyt3PnU

CO's – PO's& PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	-	2	-	-	-	-	3	-	2	2	2	-
CO2	3	1	2	-	2	-	-	-	-	3	-	2	2	2	-
CO3	3	1	2	-	2	-	-	-	-	3	-	2	2	2	-
CO4	3	1	2	-	2	-	-	-	-	3	-	2	2	2	-
CO5	3	1	2	-	2	-	-	-	-	3	-	2	2	2	-
Avg	3	1	2	-	2	-	-	-	-	3	-	2	2	2	-

1 - low, 2 - medium, 3 - high, '-' - no correlation

Chairman
BoS / Mech

23CST21	PROGRAMMING IN C (for B.E. / B.Tech. - CSE, IT, AIDS, CS, AIML)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the constructs of C Language and to develop C Programs using basic programming constructs.
- To develop C programs using arrays and strings
- To develop modular applications in C using functions
- To develop applications in C using pointers and structures.
- To do input/output and file handling in C.

UNIT-I BASICS OF C PROGRAMMING 8

Introduction to programming paradigms – Applications of C Language - Structure of C program - C programming: Data Types - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions - Input/Output statements, Assignment statements – Decision making statements - Switch statement - Looping statements – Preprocessor directives - Compilation process

UNIT-II ARRAYS AND STRINGS 9

Introduction to Arrays: Declaration, Initialization – One dimensional array –Two dimensional arrays - String operations: length, compare, concatenate, copy – Selection sort, linear and binary search.

UNIT-III FUNCTIONS AND POINTERS 10

Modular programming - Function prototype, function definition, function call, Built-in functions (string functions, math functions) – Recursion, Binary Search using recursive functions –Pointers – Pointer operators – Pointer arithmetic – Arrays and pointers – Array of pointers – Parameter passing: Pass by value, Pass by reference.

UNIT-IV STRUCTURES AND UNION 10

Structure - Nested structures – Pointer and Structures – Array of structures – Self referential structures – Dynamic memory allocation - Singly linked list – typedef – Union - Storage classes and Visibility.

UNIT-V FILE PROCESSING 8

Files – Types of file processing: Sequential access, Random access – Sequential access file - Random access file - Command line arguments.

TOTAL : 45 PERIODS

Chairman
BoS/CSE& IT

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Demonstrate knowledge on C Programming constructs and to Develop simple applications in C using basic constructs

CO2 : Design and implement applications using arrays and strings

CO3 : Develop and implement modular applications in C using functions.

CO4 : Develop applications in C using structures and pointers.

CO5 : Design applications using sequential and random access file processing.

TEXT BOOKS:

1. ReemaThareja, "Programming in C", Oxford University Press, Second Edition, 2016.
2. Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2015.

REFERENCE BOOKS:

1. Paul Deitel and Harvey Deitel, "C How to Program with an Introduction to C++", Eighth edition, Pearson Education, 2018.
2. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.
3. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996.
4. Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", Second Edition, Oxford University Press, 2013.
5. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", 1st Edition, Pearson Education, 2013.

E-RESOURCES:

1. https://www.learn-c.org/

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	1	2	1	1	1	2	-	3	3	1	2	2
CO2	2	3	2	1	2	1	1	1	2	-	3	2	2	2	2
CO3	3	2	2	1	3	1	1	1	2	-	3	3	2	2	2
CO4	2	3	3	1	2	1	2	1	2	-	3	2	2	3	2
CO5	2	2	3	2	1	2	-	-	2	1	2	2	2	2	2
AVG	**2**	**2**	**2**	**1**	**2**	**1**	**1**	**1**	**2**	**-**	**3**	**2**	**2**	**2**	**2**

1 - low, 2 - medium, 3 - high, '-' - no correlation

Chairman
BoS/CSE& IT

23TAT21 **தமிழரும் தொழில்நுட்பமும்** L T P C 1 0 0 1

(B.E./B.Tech- அனைத்து பாடப்பிரிவுகளுக்கும் பொதுவானது)

பாடநெறி நோக்கங்கள்:

- நெசவு மற்றும் பானைத்தொழில்நுட்பத்தைப் புரிந்து கொள்ளுதல்
- சேர, சோழ, பல்லவ மற்றும் நாயக்கர்களின் வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பத்தை ஒப்பிடுதல்
- தமிழர்களின் பல்வேறு உற்பத்தி தொழில்நுட்பத்தைப் பற்றிய அறிவைப் பெறுதல்
- தமிழர்களின் வேளாண்மை மற்றும் கடல்சார் அறிவைப் பெற்றுக்கொள்ளுதல்
- அறிவியல் தமிழையும் அதன் இணையப்பயன்பாட்டையும் கற்றல்

அலகு - I நெசவு மற்றும் கட்டிடத் தொழில்நுட்பம் 3

சங்க காலத்தில் நெசவுத்தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்சங்க காலத்தில் நெசவுத்தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்

அலகு - II வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம் 3

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமானப்பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும் கோவில்களும் - சோழர் காலத்து பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சாரோசெனிக் கட்டிடக் கலை

அலகு - III உற்பத்தித் தொழில்நுட்பம் 3

கப்பல் காட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத்துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்

Chairman
BoS / S&H

அலகு - IV வேளாண்மை மற்றும் நீர்பாசனத் தொழில்நுட்பம் 3

அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்

அலகு - V அறிவியல் தமிழ் மற்றும் கணினித்தமிழ் 3

அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்

மொத்தம்: 15 பாடவேளைகள்

பாடநெறி முடிவுகள்:

இப்பாடத்தைப் படிப்பதின் முடிவில் மாணவர்கள்

CO1: நெசவு மற்றும் பானைத்தொழில்நுட்பத்தை பற்றிப் புரிந்துகொள்வார்கள்
CO2: வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பத்தில் தமிழர்களின் அறிவைப் பெறுவார்கள்
CO3: தமிழர்களின் உற்பத்தி தொழில்நுட்பத்தை கண்டறிவார்கள்
CO4: தமிழர்களின் வேளாண்மை மற்றும் கடல்சார் அறிவைக் குறித்து விவாதிப்பார்கள்.
CO5: பல்வேறு இணையப் பயன்பாடுகளில் அறிவியல் தமிழைப் பயன்படுத்திப்பார்ப்பார்கள்

மின் -ஆதாரங்கள்:

1. https://www.tamilvu.org/
2. https://sorkuvai.com/

CO's -PO's விவரணையாக்கம்:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-	1	1	1	1	1	-	1
CO2	2	-	-	-	-	2	2	2	2	2	-	2
CO3	2	-	-	-	-	2	2	2	2	2	-	2
CO4	1	-	-	-	-	1	1	1	1	1	-	1
CO5	2	-	-	-	-	2	2	2	2	2	-	2
AVG	2	-	-	-	-	2	2	2	2	2	-	2

Chairman
BoS / S&H

23TAT21	TAMILS AND TECHNOLOGY (Common to B.E./B. Tech. all branches)	L T P C 1 0 0 1

COURSE OBJECTIVES:

- To understand about weaving and ceramic technology of Tamils
- To compare the design and constructive technology of Cheras, Cholas, Pallavas and Nayakkars
- To gain knowledge in various manufacturing technology of Tamils
- To analyse the agriculture and ishery knowledge of Tamils
- To learn about scienti ic Tamil and its usage in online platforms

UNIT-I **WEAVING AND CERAMIC TECHNOLOGY** 3

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

UNIT-II **DESIGN AND CONSTRUCTION TECHNOLOGY** 3

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

UNIT-III **MANUFACTURING TECHNOLOGY** 3

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

UNIT-IV **AGRICULTURE AND IRRIGATION TECHNOLOGY** 3

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

UNIT-V **SCIENTIFIC TAMIL & TAMIL COMPUTING** 3

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

TOTAL: 15 PERIODS

Chairman
BoS / S&H

COURSE OUTCOMES:

At the end of the course the student will be able to

- **CO1:** Relate the weaving ceramic technology of Tamils
- **CO2:** Understand the knowledge of Tamils in design and construction technology
- **CO3:** Recognize the manufacturing technology knowledge of Tamils
- **CO4:** Criticize the agriculture and ishery knowledge of Tamils
- **CO5:** Apply scienti ic Tamil in Various online platforms

E- RESOURCES:

1. https://www.tamilvu.org/
2. https://sorkuvai.com/

CO's –PO's MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-	1	1	1	1	1	-	1
CO2	2	-	-	-	-	2	2	2	2	2	-	2
CO3	2	-	-	-	-	2	2	2	2	2	-	2
CO4	1	-	-	-	-	1	1	1	1	1	-	1
CO5	2	-	-	-	-	2	2	2	2	2	-	2
AVG	2	-	-	-	-	2	2	2	2	2	-	2

Chairman
BoS / S&H

23MEL21	ENGINEERING PRACTICES LABORATORY (Common to: B.E./B.Tech. all Branches)	L	T	P	C
		0	0	4	2

Course Objectives:

- Acquire skills in operating hand tools and instruments.Provide hands on training on common household plumbing workand wood work
- Provide hands on training on welding processes.
- Provide hands on training on various simple machining processes. Making a tray out of metal sheet using sheet metal work.
- Wiring various electrical joints in common household electrical wire network.
- Soldering and testing simple electronic circuits. Assembling and testing simple electronic components on PCB.

GROUP – A(CIVIL & MECHANICAL)

I) CIVIL ENGINEERING PRACTICES (12)

PLUMBING WORK:

Hands-on-exercise:

Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components - External thread cutting

WOOD WORK:

Hands-on-exercise:Sawing,PlaningandMaking joints

II) MECHANICAL ENGINEERING PRACTICES (18)

WELDING WORK:

Fabrication of Models with MS Plate using Arc Welding

BASIC MACHINING WORK:

a) Simple Turning
b) Drilling and Tapping Practice

SHEET METAL WORK:

Model making – Trays and funnels

ASSEMBLING AND DISMANTLING WORK:

Assembling a centrifugal pump

GROUP B (ELECTRICAL & ELECTRONICS)

III) ELECTRICAL ENGINEERING PRACTICES (15)

a) Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with lamp, fan and three pin socket
b) Staircase wiring
c) Fluorescent Lamp wiring with introduction to CFL and LED types.
d) Energy meter wiring and related calculations/ calibration
e) Study of Iron Box wiring and assembly
f) Study of Fan Regulator (Resistor type and Electronic type using Diac/Triac/quadrac)
g) Study of emergency lamp wiring/Water heater

Chairman
BoS / Mech

IV) ELECTRONIC ENGINEERING PRACTICES (15)

SOLDERING WORK:

Soldering simple electronic circuits and checking continuity

ELECTRONIC ASSEMBLY AND TESTING WORK:

Assembling and testing electronic components on a small PCB

ELECTRONIC EQUIPMENT STUDY:

a) Study elements of smart phone
b) Assembly and dismantle of LED TV
c) Assembly and dismantle of computer/ laptop

TOTAL : 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Make a wooden model using carpentry Process.

CO2: Make various shapes using welding processes.

CO3: Make various shapes using manufacturing processes like machining and sheet metal work.

CO4: Wires various electrical joints in common household electrical wire network.

CO5: Solder and test simple electronic circuits. Assemble and test simple electronic components on PCB.

REFERENCE:

1. Manual prepared by the faculty of Civil, Mechanical, Electrical and Electronics and Communication Engineering Department, SVHEC.

E-RESOURCES:

1. https://www.youtube.com/watch?v=GPnQjCrb83Y
2. https://www.youtube.com/watch?v=nJwdsMI3PcY

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	3	-	-	-	-	-	-	-	-	2	1	1
CO2	3	-	-	3	-	-	-	-	-	-	-	-	2	1	1
CO3	3	-	-	3	-	-	-	-	-	-	-	-	2	1	1
CO4	3	-	-	3	-	-	-	-	-	-	-	-	2	1	1
CO5	3	-	-	3	-	-	-	-	-	-	-	-	2	1	1
Avg	3	-	-	3	-	-	-	-	-	-	-	-	2	1	1

1 - low, 2 - medium, 3 - high, '-' - no correlation

Chairman
BoS / Mech

23CSL21	PROGRAMMING IN C LABORATORY (for B.E. / B.Tech. - CSE, IT, AIDS, CS, AIML)	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To familiarize with C programming constructs to develop programs in C using basic constructs.
- To develop programs in C using arrays.
- To develop applications in C using strings, pointers, functions.
- To develop applications in C using structures.
- To develop applications in C using file processing.

LIST OF EXPERIMENTS

Note: The lab instructor is expected to design problems based on the topics listed. The Examination shall not be restricted to the sample experiments designed.

1. I/O statements, operators, expressions
2. Decision-making constructs: if-else, goto, switch-case, break-continue
3. Loops: for, while, do-while
4. Arrays: 1D and 2D, Multi-dimensional arrays, traversal
5. Strings: operations
6. Functions: call, return, passing parameters by (value, reference), passing arrays to function.
7. Recursion
8. Pointers: Pointers to functions, Arrays, Strings, Pointers to Pointers, Array of Pointers
9. Structures: Nested Structures, Pointers to Structures, Arrays of Structures and Unions.
10. Files: reading and writing, File pointers, file operations, random access, processor directives.

TOTAL : 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Demonstrate knowledge on C Programming constructs and Develop programs in C using basic constructs

CO2 : Develop programs in C using arrays.

CO3 : Develop applications in C using strings, pointers, functions..

CO4 : Develop applications in C using structures..

CO5 : Develop applications in C using file processing.

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BoS/CSE& IT

TEXT BOOKS:

1. ReemaThareja, "Programming in C", Oxford University Press, Second Edition, 2016.
2. Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2015.

REFERENCE BOOKS:

1. Paul Deitel and Harvey Deitel, "C How to Program with an Introduction to C++", Eighth edition, Pearson Education, 2018.
2. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.
3. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996.
4. Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", Second Edition, Oxford University Press, 2013.
5. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", 1st Edition, Pearson Education, 2013.

E-RESOURCES:

1. https://www.learn-c.org/

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	2	1	1	-	-	2	1	2	2	2	3	2
CO2	2	2	2	1	1	2	-	-	2	-	2	2	2	2	2
CO3	2	2	2	2	1	2	-	-	3	-	3	3	3	2	2
CO4	2	2	3	2	3	2	-	-	3	-	3	3	3	3	2
CO5	2	2	3	2	1	2	-	-	2	1	2	2	2	2	2
AVG	**2**	**2**	**3**	**2**	**1**	**2**	**-**	**-**	**2**	**1**	**2**	**2**	**2**	**2**	**2**

1 - low, 2 - medium, 3 - high, '-' - no correlation

Chairman
BoS/CSE& IT

23ENL21	COMMUNICATION LABORATORY (Common to B.E./B.Tech. all Branches)	L T P C 0 0 4 2

COURSE OBJECTIVES:

- To identify varied group discussion skills and apply them to take part in effective discussions in a professional context.
- To analyse concepts and problems and make effective presentations explaining them clearly and precisely.
- To be able to communicate effectively through formal and informal writing.
- To be able to use appropriate language structures to write emails, reports and essays
- To give instructions and recommendations that are clear and relevant to the context

UNIT-I **MAKING COMPARISONS** **12**

Speaking - Role Play Exercises Based on Workplace Contexts- Talking about Competition- Discussing Progress toward Goals- Talking about Experiences- Talking about Events in Life-Discussing Past Events.
Writing - Writing Emails (Formal & Semi-Formal)

UNIT-II **EXPRESSING CAUSAL RELATIONS IN SPEAKING AND WRITING** **12**

Speaking - Discussing News Stories – Talking about Frequency- Talking about Travel Problems-Discussing Travel Procedures- Talking about Travel Problems- Making Arrangements-Describing Arrangements- Arrangements Discussing Plans and Decisions- Discussing Purposes and Reasons- Understanding Common Technology Terms.
Writing -Writing Different Types of Emails.

UNIT-III **PROBLEM SOLVING** **12**

Speaking - Discussing Predictions- Describing the Climate- Discussing Forecasts and Scenarios- Talking about Purchasing- Discussing Advantages and Disadvantages- Making Comparisons- Discussing Likes and Dislikes- Discussing Feelings about Experiences- Discussing Imaginary Scenarios.
Writing - Short Essays and Reports- Formal/Semi-Formal letters.

UNIT-IV **CLASSIFICATION AND RECOMMENDATIONS** **12**

Speaking - Discussing the Natural Environment- Describing Systems- Describing Position and Movement Explaining Rules (Example- Discussing Rental Arrangements)- Understanding Technical Instructions.

Writing - Writing Instructions -Writing a Short Article.

Chairman
BoS / S&H

UNIT-V **EXPRESSION** **12**

Reading - Describing Things Relatively-Describing Clothing-Discussing Safety Issues (Making Recommendations) Talking about Electrical Devices-Describing Controlling Actions.

Writing - Job Application (Cover Letter + Curriculum Vitae) – Writing Recommendations.

TOTAL : 60 PERIODS

COURSE OUTCOMES:

At the end of the Course the students will able to

- **CO1:** Speak effectively in group discussions held in a formal/semi formal contexts
- **CO2:** Discuss, analyse and present concepts and problems from various perspectives to arrive at suitable solutions
- **CO3:** Create emails, letters and effective job applications with resume.
- **CO4:** Write critical reports to convey data and information with clarity and precision
- **CO5:** Deliver suitable instructions and recommendations for safe execution of tasks

E-RESOURCES:

- https://www.englishclub.com/speaking/
- https://learnenglish.britishcouncil.org/

CO's-PO's MAPPING :

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	3	3	-	3
CO2	-	-	2	-	-	-	-	-	3	3	-	3
CO3	-	-	-	-	-	-	-	-	3	3	-	2
CO4	-	-	-	-	-	-	-	-	3	3	-	3
CO5	-	-	1	-	-	-	-	1	3	3	-	2
AVG	-	-	2	-	-	-	-	1	3	3	-	3

1- Low, 2- Medium, 3-High, "-" No Correlation

Chairman
BoS / S&H

23MDC21	YOGA FOR HUMAN EXCELLENCE (Common to B.E./B.Tech. all Branches)	L T P C 0 0 1 0

UNIT-I **SIMPLIFIED PHYSICAL EXERCISES** 3

Physical exercises: Hand exercises – Leg exercises. Breathing exercises: Eye exercises – Kapalabathi. Makarasana. Body massages: Acupressure – Relaxation.

UNIT-II **KAYA KALPA** 3

Kaya Kalpa Exercise – Aswini Mudra – Moola Bandha – Ojas Breath (Kayakalpa Exercise should be learnt directly from the World Community Service Centre.)

UNIT-III **MEDITATION** 3

Agna. Santhi : Clearence. Thuriya. Thuriyatheetham meditation

UNIT-IV **HUMAN RESOURCES DEVELOPMENT** 3

Eradication of worries – Bene its of Blessings – Greatness of Friendship – Neutralization of anger - Individual peace and world peace

UNIT-V **YOGASANAS** 3

Suriya Namaskar, Padmasana, Vajrasana, Sukasana, Chakrasana (side posture), Viruchasana, Bhujangasana, Yoga mudra, Ustrasana, Maha Mudra, Vakkarasana.

TOTAL : 15 PERIODS

TEXT BOOKS:

1. Yoga Practices – I: VISION, Vethathiri Publications.
2. Yogasana – Vethathiri Publications

REFERENCE BOOKS:

1. Simpli ied Physical Exercises – Vethathiri Publications.
2. Sound health through yoga – Dr. K. Chandrasekaran.

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BoS / S&H

23MAT31	DISCRETE MATHEMATICS	L	T	P	C
	(for B.E. / B.Tech - CSE, IT, AIDS, AIML & Cyber - Security)	3	1	0	4

COURSE OBJECTIVES:

- To extend student's logical and mathematical maturity and ability to deal with abstraction.
- To introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.
- To understand the basic concepts of combinatorics and graph theory.
- To familiarize the applications of algebraic structures.
- To understand the concepts and significance of lattices and Boolean algebra which are widely used in computer science and engineering.

UNIT-I **LOGIC AND PROOFS** **9+3**

Propositional logic –Propositional equivalences –Predicates and quantifiers – Nested quantifiers– Rules of inference - Introduction to proofs – Proof methods and strategy.

UNIT-II **COMBINATORICS** **9+3**

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

UNIT-III **GRAPHS** **9+3**

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

UNIT-IV **ALGEBRAIC STRUCTURES** **9+3**

Algebraic systems–Semi groups and monoids – Groups – Subgroups – Homomorphisms– Normal subgroup and cosets – Lagrange's theorem – Definitions and examples of Rings and Fields.

UNIT-V **LATTICES AND BOOLEAN ALGEBRA** **9+3**

Partial ordering- Posets - Lattices as posets – Properties of lattices – Lattices as algebraic systems – Sublattices – Direct product and homomorphism – Some special lattices-Boolean algebra-Sub Boolean Algebra - Boolean Homomorphism.

TOTAL : 60 PERIODS

Chairman
BoS / S&H

COURSE OUTCOMES:

At the end of the course, students would:	
CO1:	Have knowledge of the concepts needed to test the logic of a program.
CO2:	Apply Mathematical techniques to Prove Arguments/statements/theorems ; define pigeonhole principle and discuss its significance; solve problems using counting techniques and combinatorics
CO3:	Classify graphs by their characteristics, apply graph theory to solve problems in different areas of computer science
CO4:	Genaralize the concept of groups to subgroups, normal subgroups ,Quotient group, Cyclic group and permutation group, Lagrange's theorem, Rings and Fields
CO5:	understand the concept of partially ordered set and properties of partial ordered sets, lattice, semi lattice, distributive lattice, Boolean algebra and properties of Boolean algebra

TEXT BOOKS:

1. Rosen.K.H.,"DiscreteMathematicsanditsApplications",7th Edition, Tata Mcw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2017.
2. Tremblay. J.P. and Manohar. R, "Discrete Mathematical Structures with Applications to Computer Science", Tata Mc Graw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.

REFERENCE BOOKS:

1. Grimaldi.R.P."Discrete and Combinatorial Mathematics :An Applied Introduction , 5thEdition, Pearson Education Asia, Delhi, 2013.
2. Koshy.T."Discrete Mathematics with Applications", Elsevier Publications,2006.
3. Lipschutz. S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.

E-RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc23_cs109/preview
2. https://onlinecourses.nptel.ac.in/noc23_cs22/preview
3. https://nptel.ac.in/courses/106106183

CO's – PO's& PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	-	2	-	-	-	2	-	2	-	-	-
CO2	3	3	2	2	-	2	-	-	-	2	-	2	-	-	-
CO3	3	3	2	2	-	2	-	-	-	3	-	2	-	-	-
CO4	3	3	2	2	-	2	-	-	-	2	-	2	-	-	-
CO5	3	2	2	2	-	2	-	-	-	2	-	2	-	-	-
AVG	3	3	2	2	-	2	-	-	-	2	-	2	-	-	-

1 - low, 2 - medium, 3 - high, '-' - no correlation.

Chairman
BoS / S&H

23CST31	FOUNDATIONS OF DATA SCIENCE (for B.E./B.Tech – CSE, IT, AIDS , CS, AIML)	L 3	T 0	P 0	C 3

COURSE OBJECTIVES:

- To understand the data science fundamentals and process.
- To learn to describe the data for the data science process.
- To learn to describe the relationship between data.
- To utilize the Python libraries for Data Wrangling.
- To present and interpret data using visualization libraries in Python

UNIT-I INTRODUCTION 9

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

UNIT-II DESCRIBING DATA 9

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

UNIT-III DESCRIBING RELATIONSHIPS 9

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

UNIT-IV PYTHON LIBRARIES FOR DATA WRANGLING 9

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

UNIT-V DATA VISUALIZATION 9

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

TOTAL : 45 PERIODS

Chairman
BoS/CSE&IT

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Define the data science process

CO2 : Understand different types of data description for data science process

CO3 : Gain knowledge on relationships between data

CO4 : Use the Python Libraries for Data Wrangling

CO5 : Apply visualization Libraries in Python to interpret and explore data

TEXT BOOKS:

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016. (Unit I)
2. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017. (Units II and III)
3. Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016. (Units IV and V)

REFERENCE BOOKS:

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

E-RESOURCES:

1. https://nptel.ac.in/courses/106106179
2. https://nptel.ac.in/courses/106106212

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	2	-	-	-	1	1	1	2	2	2	2
CO2	2	1	-	1	1	-	-	-	2	1	1	2	2	3	1
CO3	2	2	1	2	2	1	1	-	1	2	1	3	2	2	3
CO4	1	2	2	1	2	-	-	-	1	1	2	2	3	3	2
CO5	2	2	1	2	2	-	-	-	1	1	1	2	2	2	2
AVG	**2**	**2**	**1**	**2**	**2**	**1**	**1**	**-**	**1**	**1**	**1**	**2**	**2**	**2**	**2**

1 - low, 2 - medium, 3 - high, '-' - no correlation

Chairman
BoS/CSE&IT

23ITT31	DATA STRUCTURES AND ALGORITHMS (for B.Tech. – IT, AIDS , CS, AIML)	L	T	P	C
		3	0	0	3

COURSEOBJECTIVES:

- To understand the concepts of ADTs
- To design linear data structures –lists, stacks, and queues
- To understand sorting, searching, and hashing algorithms
- To apply Tree structures using searching.
- To apply Graph structures to solve problems.

UNIT I ABSTRACT DATA TYPES **9**

Abstract Data Types(ADTs)–ADTs and classes–introduction to OOP–classes in Python– inheritance – namespaces – shallow and deep copying Introduction to analysis of algorithms –asymptotic notations– divide & conquer–recursion– analyzing recursive algorithms.

UNIT II LINEAR STRUCTURES **9**

List ADT–array-based implementations–linked list implementations–singly linked lists–circularly linked lists – doubly linked lists – Stack ADT – Queue ADT – double ended queues – applications

UNIT III SORTING AND SEARCHING **9**

Bubble sort – selection sort – insertion sort – merge sort – quick sort – analysis of sorting algorithms–linear search–binary search–hashing–hash functions–collision handling–load factors, rehashing, and efficiency

UNIT IV TREE STRUCTURES **9**

Tree ADT–Binary Tree ADT–tree traversals– binary search trees–AVL trees–heaps–multi- way search trees

UNIT V GRAPH STRUCTURES **9**

Graph ADT – representations of graph – graph traversals – DAG – topological ordering – greedy algorithms – dynamic programming – shortest paths – minimum spanning trees – introduction to complexity classes and intractability

TOTAL: 45PERIODS

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COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Explain abstract data types

CO2: Design, implement, and analyze linear data structures, such as lists, queues, and stacks, according to the needs of different applications

CO3: Design, implement, and analyze efficient tree structures to meet requirements such as searching, indexing, and sorting.

CO4: Implement Tree structures to solve the searching problems.

CO5: Model problems as graph problems and implement efficient graph algorithms to solve them.

TEXT BOOKS:

1. Michael T.Goodrich, Roberto Tamassia, and Michael H.Gold wasser ,"Data Structures & Algorithms in Python", An Indian Adaptation, John Wiley & Sons Inc., 2021

REFERENCE BOOKS:

1. Lee, KentD., Hubbard ,Steve ,"Data Structures and Algorithms with Python" Springer Edition 2015

2. Rance D.Necaise, "DataStructures and Algorithms Using Python",JohnWiley&Sons,2011

3. Aho, Hopcroft, and Ullman,"Data Structures and Algorithms", Pearson Education, 1983.

4. Thomas H.Cormen, Charles E.Leiserson, Ronald L.Rivest, and Clifford Stein, "Introduction to Algorithms", Second Edition, McGraw Hill, 2002.

5. Mark Allen Weiss,"Data Structures and Algorithm Analysis in C++",Fourth Edition, Pearson Education, 2014

E-RESOURCES:

1. http://www.flowgorithm.org/
2. https://www.python.org/
3. https://nptel.ac.in/courses/106104074

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CO's–PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	3	1	-	-	-	2	-	2	1	1	1	1
CO2	2	3	2	2	2	-	-	-	2	-	2	2	3	2	2
CO3	2	2	3	2	3	-	-	-	3	-	2	2	3	2	2
CO4	3	3	3	3	1	-	-	-	3	-	2	2	3	2	3
CO5	3	3	3	3	1	-	-	-	3	-	2	2	3	2	3
AVG	**2.2**	**2.6**	**2.6**	**2.6**	**1.6**	**-**	**-**	**-**	**3**	**-**	**2**	**2**	**3**	**2**	**2**

1- low,2 -medium,3- high,'-'- no correlation

23ADI31 **DATA EXPLORATION AND VISUALIZATION** (for B.Tech.- AIDS)

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

- To outline an overview of exploratory data analysis.
- To implement data visualization using Matplotlib.
- To perform univariate data exploration and analysis.
- To apply bivariate data exploration and analysis.
- To use Data exploration and visualization techniques for multivariate and time series data.

UNIT-I **EXPLORATORY DATA ANALYSIS** **9**

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 - Grouping Datasets - data aggregation – Pivot tables and cross-tabulations.

UNIT-II **VISUALIZING USING MATPLOTLIB** **9**

Importing Matplotlib – Simple line plots – Simple scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization –three dimensional plotting - Geographic Data with Base map - Visualization with Seaborn.

UNIT-III **UNIVARIATE ANALYSIS** **9**

Introduction to Single variable: Distributions and Variables - Numerical Summaries of Level and Spread - Scaling and Standardizing – Inequality - Smoothing Time Series.

UNIT-IV **BIVARIATE ANALYSIS** **9**

Relationships between Two Variables - Percentage Tables - Analyzing Contingency Tables - Handling Several Batches – Scatter plots and Resistant Lines – Transformations.

UNIT-V **MULTIVARIATE AND TIME SERIES ANALYSIS** **9**

Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tables and Beyond - Longitudinal Data – Fundamentals of TSA – Characteristics of time series data – Data Cleaning – Time-based indexing – Visualizing – Grouping – Resampling.

TOTAL : 45 PERIODS

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PRACTICAL EXERCISES:

1. Install the data Analysis and Visualization tool: R/ Python /Tableau Public/ Power BI.
2. Perform exploratory data analysis (EDA) on with datasets like email data set. Export all your emails as a dataset, import them inside a pandas data frame, visualize them and get different in sights from the data.
3. Working with Numpy arrays, Pandas data frames , Basic plots using Matplotlib.
4. Explore various variable and row filters in R for cleaning data. Apply various plot features in Ron sample data sets and visualize.
5. Perform Time Series Analysis and apply the various visualization techniques.
6. Perform Data Analysis and representation on a Map using various Map data sets with Mouse Rollover effect, user interaction, etc..
7. Build cartographic visualization for multiple datasets involving various countries of the world; states and districts in India etc.
8. Perform EDA on Wine Quality Data Set.
9. Use a case study on a data set and apply the various EDA and visualization techniques and present an analysis report.

TOTAL : 30 PERIODS
TOTAL : 75 (45+30) PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Understand the fundamentals of exploratory data analysis.

CO2 : Implement the data visualization using Matplotlib.

CO3 : Perform univariate data exploration and analysis.

CO4 : Apply bivariate data exploration and analysis.

CO5 : Use Data exploration and visualization techniques for multivariate and time series data.

TEXT BOOKS:

1. Suresh Kumar Mukhiya, Usman Ahmed, "Hands-On Exploratory Data Analysis with Python", Packt Publishing, 2020. (Unit 1)
2. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", Oreilly, 1st Edition, 2016. (Unit 2)
3. Catherine Marsh, Jane Elliott, "Exploring Data: An Introduction to Data Analysis for Social Scientists", Wiley Publications, 2nd Edition, 2008. (Unit 3,4,5)

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REFERENCE BOOKS:

1. Eric Pimpler, Data Visualization and Exploration with R, GeoSpatial Training service, 2017.
2. Claus O. Wilke, "Fundamentals of Data Visualization", O'reilly publications, 2019.
3. Matthew O. Ward, Georges Grinstein, Daniel Keim, "Interactive Data Visualization: Foundations, Techniques, and Applications", 2nd Edition, CRC press, 2015.

E-RESOURCES:

1. https://nptel.ac.in/courses/10610407

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	3	-	-	-	-	2	3	3	3	2	2	2
CO2	2	2	2	1	1	-	-	-	3	2	3	1	3	1	3
CO3	2	1	2	1	1	-	-	-	3	2	1	2	2	2	1
CO4	2	2	2	1	-	-	-	-	1	2	1	3	1	3	2
CO5	3	1	1	2	1	-	-	-	3	2	1	2	2	2	3
AVG	**2**	**1**	**2**	**2**	**1**	**-**	**-**	**-**	**2**	**2**	**2**	**2**	**2**	**2**	**2**

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23ECI32 **DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION** (for BE/B.Tech- CSE, AI&DS and IT)

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

- To analyze and design combinational circuits
- To analyze and design sequential circuits
- To understand the basic structure and operation of a digital computer.
- To study the design of data path unit, control unit for processor and to familiarize with the hazards.
- To understand the concept of various memories and I/O interfacing.

UNIT-I COMBINATIONAL LOGIC 9

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

UNIT-II SYNCHRONOUS SEQUENTIAL LOGIC 9

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

UNIT-III COMPUTER FUNDAMENTALS 9

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

UNIT-IV DATAPATH AND CONTROL DESIGN 9

Instruction Execution – Building a Data Path- ALU – Designing a Control Unit – Hardwired Control, Microprogrammed Control – Pipelining – Data Hazard – Control Hazards.

UNIT-V MEMORY AND I/O 9

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

TOTAL: 45 PERIODS

PRACTICAL EXERCISES:

1. Verification of Boolean theorems using logic gates.
2. Design and implementation of combinational circuits using gates for arbitrary functions.
3. Implementation of 4-bit binary adder/subtractor circuits.
4. Implementation of code converters
5. Implementation of BCD adder, encoder and decoder circuits

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6. Implementation of functions using Multiplexers.
7. Implementation of the synchronous counters
8. Implementation of a Universal Shift register.
9. Simulator based study of Computer Architecture

PRACTICAL: 30 PERIODS
TOTAL (45+30): 75 PERIODS

COURSE OUTCOMES:

At the end of the course, the students will be able to

CO1: Design various combinational digital circuits using logic gates.

CO2: Design sequential circuits and analyze the design procedures.

CO3: State the fundamentals of computer systems and analyze the execution of an instruction.

CO4: Analyze different types of control design and identify hazards.

CO5: Identify the characteristics of various memory systems and I/O communication.

TEXT BOOKS:

1.M. Morris Mano, Michael D. Ciletti, "Digital Design : With an Introduction to the Verilog HDL, VHDL, and System Verilog", Sixth Edition, Pearson Education, 2018.

2.David A. Patterson, John L. Hennessy, "Computer Organization and Design, The Hardware/Software Interface", Sixth Edition, Morgan Kaufmann/Elsevier, 2020.

REFERENCE BOOKS:

1.Carl Hamacher, ZvonkoVranesic, SafwatZaky, NaraigManjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw-Hill, 2012.

2. William Stallings, "Computer Organization and Architecture – Designing for Performance", Tenth Edition, Pearson Education, 2016.

3. M. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 2016.

E-RESOURCES:

1. NPTEL-Online Courses and Video lectures: https://nptel.ac.in/

CO's – PO's & PSO's MAPPING

CO/ PO/ PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	1	1	1	1	2	3	2	3	3
CO2	3	3	3	3	2	1	1	1	1	1	2	3	1	2	2
CO3	3	3	3	3	2	2	1	1	1	1	2	3	2	3	1
CO4	3	3	3	3	1	1	1	1	1	1	1	2	1	3	1
CO5	3	3	3	3	1	2	1	1	1	1	1	2	1	2	1
AVG	3	3	3	3	1.8	1.6	1	1	1	1	1.6	2.6	1.4	2.6	1.6

1 -low, 2-medium ,3-high, '-' -no correlation

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23EST31	ENTREPRENEURSHIP AND STARTUP (Common to: B.E / B.Tech. all Branches)	L 1	T 0	P 0	C 1

Course Objectives:

The main learning objective of this course is to prepare the students :

- To develop a knowledge on basic concepts of entrepreneurship.
- To know about business opportunities and project evaluation criteria.
- To explore the concept of startups, government schemes and other financial institutions support

UNIT-I ENTREPRENEURSHIP CONCEPTS 5

Entrepreneurship-Meaning-Origin-Functions-Factors Affecting Entrepreneurial Growth- - Role of Entrepreneurship in Economic Development- Skills required for an Entrepreneur - Barriers to Entrepreneurship - Stages in Entrepreneurial Process.

UNIT-II PROJECT FORMULATION AND IDENTIFICATION 5

Identification of business opportunities -Project formulation- Project Classification and Identification - Project Objectives - Technical Analysis, Financial Analysis – Environmental Appraisal of Project - EDP Phases - Project Report Preparation.

UNIT-III START UP OPPORTUNITIES AND FINANCE 5

The New Industrial Revolution- Business Start-up - Rise of the startup Economy- Government Initiatives - Government schemes and incentives - Institutional service to entrepreneur - Sources of Finance.

TOTAL : 15 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Enhanced the knowledge of entrepreneurship qualities and skills to startup a business.

CO2: Understand the project classification and prepare a feasibility report.

CO3: Provide vision for the own Start-up and its importance for economic development.

TEXT BOOKS:

1. Gupta C.B and Srinivasan N.P- Entrepreneurial development-Sultan Chand and Sons-Latest edtion.
2. Khanka S.S.-Entrepreneurial Development-S.Chand& Co, RamNagar, New Delhi, Latest edtion.

REFERENCE BOOKS:

1. Vasant Desai-Project Management and Entrepreneurship-Himalaya Publishing House,2023
2. P.Narayana Reddy – Entrepreneurship Text and Cases- cengage learning.2022
3. Prasanna Chandra- Projects planning, analysis, selection, implementation and review Tata McGraw-Hill Publishing Co, Latest edtion.
4. Donald F.Kuratko- Entrepreneurship theory, process & practice-9th Edition-Cengage Learning,2022.

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E-RESOURCES:

1. http://nptel.ac.in/courses/122106032/Pdf/7_2.pdf,"Business Plan",Dr.T. J.Kamalanabhan, Indian Institute of Technology Madras.
2. http://www.nptel.ac.in/syllabus/110104049/,"Entrepreneurial Finance", Dr. B.V. Phani, IIT Kanpur.
3. http:// nptel.ac.in/noc20_mg35/ Entrepreneurship and Start up

CO, PO & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	1	-	-	-	-	-	-	-	3	2	2
CO2	2	3	1	3	-	-	-	-	-	-	-	-	2	1	2
CO3	1	-	3	2	2	-	-	-	-	-	-	-	1	3	2
Avg	2	2	2	1.6	1	-	-	-	-	-	-	-	2	2	2

1-low, 2-medium, 3- high, '-'-no correction

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BoS / MBA

23CSL31	DATA SCIENCE LABORATORY (for B.E./B.Tech. – CSE, IT, and AIDS)	L	T	P	C
		0	0	4	2

COURSE OBJECTIVE

- To understand the python libraries for data science
- To understand the basic Statistical and Probability measures for data science.
- To learn descriptive analytics on the benchmark data sets.
- To apply correlation and regression analytics on standard data sets.
- To present and interpret data using visualization packages in Python

LIST OF EXPERIMENTS

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

List of Equipments:(30 Students per Batch)

Tools: Python, Numpy, Scipy, Matplotlib, Pandas, statmodels, seaborn, plotly, bokeh

Note: Example data sets like: UCI, Iris, Pima Indians Diabetes etc.

TOTAL : 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Make use of the python libraries for data science.
CO2 : Make use of the basic Statistical and Probability measures for data science.
CO3 : Perform descriptive analytics on the benchmark data sets.
CO4 : Perform correlation and regression analytics on standard data sets.
CO5 : Present and interpret data using visualization packages in Python.

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E-RESOURCES:

1. https://nptel.ac.in/courses/106106179
2. https://nptel.ac.in/courses/106106212

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	-	-	-	-	1	3	3	3	1	3	2
CO2	3	2	2	3	1	-	-	-	3	1	3	2	1	3	3
CO3	3	2	1	3	1	-	-	-	2	1	1	1	3	2	3
CO4	2	3	1	3	-	-	-	-	2	3	2	3	3	3	1
CO5	1	2	3	1	1	-	-	-	2	1	3	1	1	3	3
AVG	**2**	**2**	**2**	**2**	**1**	-	-	-	**2**	**2**	**2**	**2**	**2**	**3**	**2**

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23ITL31	**DATA STRUCTURES AND ALGORITHMS LABORATORY** (for B.Tech. – IT, AIDS , CS , AIML)	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To implement ADTs in Python
- To design and implement linear data structures –lists, stacks, and queues
- To implement sorting, searching and hashing algorithms
- To solve problems using tree structures with searching
- To apply Graph structures to solve problems

LIST OF EXPERIMENTS

1. Implement simple ADTs as Python classes
2. Implement recursive algorithms in Python
3. Implement List ADT using Python arrays
4. Linked list implementations of List
5. Implementation of Stack and Queue ADTs
6. Applications of List, Stack and Queue ADTs
7. Implementation of sorting and searching algorithms
8. Implementation of Hash tables
9. Tree representation and traversal algorithms
10. Implementation of Binary Search Trees
11. Implementation of Heaps
12. Graph representation and Traversal algorithms
13. Implementation of single source shortest path algorithm
14. Implementation of minimum spanning tree algorithms

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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At the end of the course the students will be able to

CO1: Implement ADTs as Python classes

CO2: Design, implement, and analyze linear data structures, such as lists, queues, and stacks, According to the needs of different applications

CO3: Design, implement, and analyze efficient tree structures to meet requirements such as searching, indexing, and sorting

CO4: Implement Tree structures to solve the searching problems.

CO5: Model problems as graph problems and implement efficient graph algorithms to solve them.

TEXT BOOKS:

1. Michael T.Goodrich, Roberto Tamassia, and Michael H.Goldwasser,"Data Structures & Algorithms in Python", John Wiley & Sons Inc., 2013

REFERENCE BOOKS:

1. Rance D.Necaise, "Data Structures and Algorithms Using Python",JohnWiley&Sons,2011

2. Aho,Hopcroft,andUllman,"DataStructuresandAlgorithms",PearsonEducation,1983.

3. ThomasH.Cormen,CharlesE.Leiserson,RonaldL.Rivest,andCliffordStein,"Introductionto Algorithms", Second Edition, McGraw Hill, 2002.

4. MarkAllen Weiss," Data Structures and Algorithm Analysis in C++",Fourth Edition, Pearson Education, 20145. Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018.

E-RESOURCES:

1. http://www.flowgorithm.org/
2. https://www.python.org/
3. https://nptel.ac.in/courses/106104074

CO's–PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	-	-	-	2	3	1	2	1	2	1
CO2	3	3	2	-	1	-	-	-	2	3	1	2	2	2	1
CO3	2	2	2	1	1	-	-	-	2	3	1	2	1	3	1
CO4	3	1	2	1	1	-	-	-	2	3	1	2	1	3	1
CO5	3	1	2	1	1	-	-	-	2	3	1	2	1	3	1
AVG	**2.8**	**1.8**	**1.8**	**0.8**	**1**				**2**	**3**	**1**	**2**	**1.2**	**2.6**	**1**

1- low, 2 -medium, 3- high, '-'- no correlation

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BoS/CSE& IT

23MAT42 **PROBABILITY AND LINEAR ALGEBRA**
(for B.Tech. AI&DS)

L	T	P	C
3	1	0	4

COURSE OBJECTIVES:

- To introduce the basic concepts of probability and random variables.
- To develop an understanding of distribution functions.
- To introduce the basic concepts of two dimensional random variables.
- To introduce the basic notions of vector spaces which will then be used to solve related problems
- To understand the concepts of vector space, linear Transformations, inner product spaces and orthogonalization

UNIT-I **PROBABILITY AND RANDOM VARIABLES** **9+3**

Axioms of probability – Conditional probability – Baye's theorem - Discrete and continuous random variables – Moments – Moment generating functions

UNIT-II **DISTRIBUTION FUNCTIONS** **9+3**

Discrete distributions - Binomial, Poisson and Geometric , Continuous distributions - Uniform, Exponential, Gamma and Normal distributions

UNIT-III **TWO-DIMENSIONAL RANDOM VARIABLES** **9+3**

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression.

UNIT-IV **VECTOR SPACES** **9+3**

Vector spaces – Subspaces – Linear combinations and linear system of equations – Linear independence and linear dependence – Bases and dimensions.

UNIT-V **LINEAR TRANSFORMATION AND INNER PRODUCT SPACES** **9+3**

Linear transformation - Null spaces and ranges - Dimension theorem – Matrix representation of a linear transformations - Inner product - Norms – Gram Schmidt orthogonalization process - Adjoint of linear operations – Least square approximation

TOTAL : 60 PERIODS

TEXT BOOKS:

1. Johnson. R.A., Miller. I and Freund. J., "Miller and Freund's Probability and Statistics forEngineers", Pearson Education, Asia, 9th Edition, 2016.
2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th Edition, 2007.

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3. Grewal.B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition,2018.

REFERENCE BOOKS:

1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences",Cengage Learning,New Delhi, 8th Edition, 2014.
2. Papoulis. A. and Unnikrishnapillai . S., "Probability, Random Variables and StochasticProcesses", McGraw Hill Education India, 4th Edition, New Delhi, 2010.
3. Ross . S.M., "Introduction to Probability and Statistics for Engineers and Scientists",5th Edition, Elsevier, 2014.
4. Spiegel. M.R., Schiller. J. and Srinivasan . R.A., "Schaum's Outline of Theory and Problems ofProbability and Statistics", Tata McGraw Hill Edition, 4th Edition, 2012.
5. Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons,10th Edition, New Delhi, 2016.

COURSE OUTCOME:

At the end of the Course the students will be able to

CO1: Understand the fundamental knowledge of the concepts of probability which can describe real life phenomenon

CO2: Understand the basic concepts standard distributions engineering problems

CO3: Understand the basic concepts of two dimensional random variables and apply in engineering problems

CO4: Explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts

CO5: Demonstrate accurate and efficient use of advanced algebraic techniques

CO's - PO's MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	-	-	-	-	2	-	-	1
CO2	3	3	3	-	-	-	-	-	2	-	-	1
CO3	3	3	2	-	-	-	-	-	2	-	-	1
CO4	3	3	2	-	-	-	-	-	2	-	-	1
CO5	3	3	3	-	-	-	-	-	2	-	-	1
AVG	3	3	3	-	-	-	-	-	2	-	-	1

1- Low, 2- Medium , 3-High, "-" No Correlation

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23ADT41	MACHINE LEARNING (for B.Tech –AIDS, AIML)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the basic concepts of machine learning.
- To understand and build supervised learning models.
- To understand and build unsupervised learning models.
- To evaluate the algorithms based on corresponding metrics identified.
- To apply Algorithms for Design and Analysis of Machine learning experiments.

UNIT I INTRODUCTION TO MACHINE LEARNING 8

Review of Linear Algebra for machine learning; Introduction and motivation for machine learning; Examples of machine learning applications, Vapnik- Chervonenkis (VC) dimension, Probably Approximately Correct (PAC) learning, Hypothesis spaces, Inductive bias, Generalization, Bias variance trade-off.

UNIT II SUPERVISED LEARNING 11

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

UNIT III ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING 9

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

UNIT IV NEURAL NETWORKS 9

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

UNIT V DESIGN AND ANALYSIS OF MACHINE LEARNING EXPERIMENTS 8

Guidelines for machine learning experiments, Cross Validation(CV) and re sampling–K-fold CV, bootstrapping, measuring classifier performance, assessing a single classification algorithm and comparing two classification algorithms – t test, McNemar's test, K-fold CV paired t test

TOTAL: 45PERIODS

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COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Explain the basic concepts of machine learning.

CO2: Construct supervised learning models.

CO3: Construct unsupervised learning algorithms.

CO4: Evaluate and compare different models

CO5: Implement the Algorithms for Machine Leaning experiments.

TEXT BOOKS:

1.Ethem Alpaydin,"Introduction to Machine Learning", MIT Press, Fourth Edition,2020.

2.Stephen Mars land, "Machine Learning: An Algorithmic Perspective, "Second Edition", CRC Press, 2014.

REFERENCE BOOKS:

1. ChristopherM.Bishop,"PatternRecognitionandMachineLearning",Springer,2006.

2. TomMitchell,"MachineLearning",McGrawHill,3rdEdition, 1997.

3. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, "Foundations of Machine Learning", Second Edition, MIT Press, 2012, 2018.

4. IanGoodfellow,YoshuaBengio,AaronCourville,"DeepLearning",MITPress, 2016

5. Sebastain Raschka, Vahid Mirjalili,"Python Machine Learning", Packt publishing,3rd Edition, 2019.

E-RESOURCES:

https://nptel.ac.in/courses/106106139

https://nptel.ac.in/courses/106106202

CO's – PO's & PSO's MAPPING

	PO's												PSO's		
CO's	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	1	2	1	-	-	-	-	3	3	2	2	2	2	1
CO2	1	3	3	1	2	-	-	-	2	2	2	1	3	1	1
CO3	2	1	3	3	2	-	-	-	1	1	1	1	1	2	1
CO4	2	3	3	2	1	-	-	-	3	2	3	2	1	2	1
CO5	1	1	3	3	1	-	-	-	3	1	1	3	3	3	2
AVG	2	2	3	2	2	-	-	-	2	2	2	2	2	2	1

1- low, 2 –**medium, 3- high,'-'- no correlation**

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23ADT42	DATABASE DESIGN AND MANAGEMENT (for B.Tech. -AIDS , AIML)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce database development life cycle and conceptual modeling
- To learn SQL for data definition, manipulation and querying a database
- To learn relational database design using conceptual mapping and normalization
- To learn transaction concepts and serializability of schedules
- To learn data model and querying in object-relational and No-SQL databases

UNIT-I **CONCEPTUAL DATA MODELING** **8**

Database environment – Database system development lifecycle – Requirements collection – Database design -- Entity-Relationship model – Enhanced-ER model – UML class diagrams.

UNIT-II **RELATIONAL MODEL AND SQL** **10**

Relational model concepts -- Integrity constraints -- SQL Data manipulation – SQL Data definition – Views -- SQL programming.

UNIT-III **RELATIONAL DATABASE DESIGN AND NORMALIZATION** **10**

ER and EER-to-Relational mapping – Update anomalies – Functional dependencies – Inference rules – Minimal cover – Properties of relational decomposition – Normalization (upto BCNF).

UNIT-IV **TRANSACTION MANAGEMENT** **8**

Transaction concepts – properties – Schedules – Serializability – Concurrency Control – Two-phase locking techniques.

UNIT-V **OBJECT RELATIONAL AND NO-SQL DATABASES** **9**

Mapping EER to ODB schema – Object identifier – reference types – row types – UDTs – Subtypes and super types – user-defined routines – Collection types – Object Query Language; No-SQL: CAP theorem – Document-based: Mongo DB data model and CRUD operations; Column-based: Hbase data model and CRUD operations.

TOTAL : 45 PERIODS

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COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Understand the database development life cycle and apply conceptual modeling.

CO2 : Apply SQL and programming in SQL to create, manipulate and query the database

CO3 : Apply the conceptual-to-relational mapping and normalization to design relational database

CO4 : Determine the serializability of any non-serial schedule using concurrency techniques

CO5 : Apply the data model and querying in Object-relational and No-SQL databases.

TEXT BOOKS:

1. Thomas M. Connolly, Carolyn E. Begg, Database Systems – A Practical Approach to Design, Implementation, and Management, Sixth Edition, Global Edition, Pearson Education, 2015.
2. Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems, 7th Edition, Pearson, 2017.

REFERENCE BOOKS:

1. Toby Teorey, Sam Lightstone, Tom Nadeau, H. V. Jagadish, "DATABASE MODELING AND DESIGN - Logical Design", Fifth Edition, Morgan Kaufmann Publishers, 2011.
2. Carlos Coronel, Steven Morris, and Peter Rob, Database Systems: Design,Implementation, and Management, Ninth Edition, Cengage learning, 2012
3. Abraham Silberschatz, Henry F Korth, S Sudharshan, "Database System Concepts", 6th Edition, Tata Mc Graw Hill, 2011.
4. Hector Garcia-Molina, Jeffrey D Ullman, Jennifer Widom, "Database Systems:TheComplete Book", 2nd edition, Pearson.

E-RESOURCES:

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

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	3	-	-	-	-	3	1	2	1	2	3	3
CO2	2	3	1	3	1	-	-	-	1	2	2	1	3	3	3
CO3	2	2	2	1	1	-	-	-	2	3	1	2	1	1	2
CO4	2	2	3	1	-	-	-	-	1	2	1	2	2	2	2
CO5	3	1	3	2	1	-	-	-	1	3	1	1	2	1	1
AVG	**2**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**2**	**2**	**1**	**1**	**2**	**2**	**2**

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23ADT43	ARTIFICIAL INTELLIGENCE (for B.Tech –AIDS , AIML)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Learn the basic AI approaches
- Develop problem solving agents
- Perform logical and probabilistic reasoning

UNIT-I **INTELLIGENTAGENTS** **9**

Introduction to AI–Agents and Environments–concept to frationality –nature of environments – structure of agents. Problem solving agents – search algorithms – uninformed search strategies.

UNIT-II **PROBLEMSOLVING** **9**

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

UNIT-III **GAMEPLAYINGANDCSP** **9**

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

UNIT-IV **LOGICALREASONING** **9**

Knowledge-based agents – propositional logic – propositional theorem proving – propositional model checking – agents based on propositional logic. First-order logic – syntax and semantics –knowledge representation and engineering – inferences in first-order logic – forward chaining – backward chaining – resolution.

UNIT-V **PROBABILISTICREASONING** **9**

Acting under uncertainty –Bayesian inference –naïve Bayes models. Probabilistic reasoning – Bayesian networks–exact inference in BN–approximate inference in BN–causal networks.

TOTAL:45PERIODS

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COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Explain intelligent agent frameworks

CO2: Apply problem solving techniques

CO3: Apply game playing and CSP techniques

CO4: Perform logical reasoning

CO5: Perform probabilistic reasoning under uncertainty

TEXT BOOKS:

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

REFERENCE BOOKS:

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

E-RESOURCES:

1. https://nptel.ac.in/courses/106102220
2. https://nptel.ac.in/courses/106105077

CO's–PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	3	-	-	-	-	2	3	3	1	2	1	1
CO2	2	2	1	1	1	-	-	-	2	2	3	1	3	2	2
CO3	2	1	2	1	-	-	-	-	2	1	1	3	1	2	1
CO4	2	1	2	2	-	-	-	-	2	1	2	2	1	3	3
CO5	3	2	2	1	1	-	-	-	3	2	1	2	2	2	1
AVG	**2**	**1**	**2**	**2**	**1**	-	-	-	**2**	**2**	**2**	**2**	**2**	**2**	**2**

1- low,2- medium,3- high,'-'- no correlation

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23CSI41	OPERATING SYSTEMS (for B.E./B.Tech. –CSE, IT , AIDS , AIML)	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- To understand the basics and functions of operating systems.
- To understand Processes and Threads
- To analyze Scheduling algorithms and process synchronization.
- To understand the concept of Deadlocks.
- To analyze various memory management schemes.
- To be familiar with I/O management and File systems.
- To be familiar with the basics of virtual machines and Mobile OS like iOS and Android

UNIT-I **INTRODUCTION** **9**

Computer System - Elements and organization; Operating System Overview - Objectives and Functions- Evolution of Operating System; Operating System Structures – Operating System Services - User Operating System Interface - System Calls – System Programs - Design and Implementation - Structuring methods.

UNIT-II **PROCESS MANAGEMENT** **9**

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

UNIT-III **MEMORY MANAGEMENT** **9**

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

UNIT-IV **STORAGE MANAGEMENT** **9**

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

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UNIT-V VIRTUAL MACHINES AND MOBILE OS **9**

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

TOTAL: 45PERIODS

PRACTICAL EXERCISES:

1. Installation of Operating system : Windows/ Linux
2. Illustrate UNIX commands and Shell Programming
3. Process Management using System Calls : Fork, Exec, Getpid, Exit, Wait, Close
4. Write C programs to implement the various CPU Scheduling Algorithms
5. Illustrate the inter process communication strategy
6. Implement mutual exclusion by Semaphores
7. Write a C program to avoid Deadlock using Banker's Algorithm
8. Write a C program to Implement Deadlock Detection Algorithm
9. Write C program to implement Threading
10. Implement the paging Technique using C program
11. Write C programs to implement the following Memory Allocation Methods
    a. First Fit b. Worst Fit c. Best Fit
12. Write C programs to implement the various Page Replacement Algorithms
13. Write C programs to Implement the various File Organization Techniques
14. Implement the following File Allocation Strategies using C programs
    a. Sequential b. Indexed c. Linked
15. Write C programs for the implementation of various disk scheduling algorithms

TOTAL : 30 PERIODS

TOTAL : 75 (45+30) PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Analyze various scheduling algorithms and process synchronization.

CO2: Explain deadlock, prevention and avoidance algorithms.

CO3: Compare and contrast various memory management schemes.

CO4: Explain the functionality of file systems I/O systems, and Virtualization

CO5: Compare iOS and Android Operating Systems.

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TEXT BOOKS:

1 Abaham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9thEdition, John Wiley and Sons Inc., 2018.

2. Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 4th Edition, New Delhi, 2016.

REFERENCE BOOKS:

1. Ramaz Elmasri, A. Gil Carrick, David Levine, "Operating Systems – A Spiral Approach", TataMcGraw Hill Edition, 2010.
2. William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, PrenticeHall, 2018.
3. Achyut S.Godbole, Atul Kahate, "Operating Systems", McGraw Hill Education, 2016 Programming", BCS Learning &Development., 2017

E-RESOURCES:

https://nptel.ac.in/courses/106108101

https://nptel.ac.in/courses/106106144

CO's – PO's & PSO's MAPPING

	PO's												PSO's		
CO's	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	1	1	1	-	-	-	-	1	1	1	2	2	1	2
CO2	2	3	1	3	1	-	-	-	3	2	2	3	3	3	1
CO3	2	2	3	3	2	-	-	-	3	1	1	2	1	1	1
CO4	2	2	1	2	1	-	-	-	1	3	2	1	1	1	2
CO5	2	3	3	2	1	-	-	-	3	1	2	1	3	1	2
AVG	**2**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**2**	**2**	**2**	**2**	**2**	**1**	**2**

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CYT41 ENVIRONMENTAL SCIENCES AND SUSTAINABILITY L T P C
(Common to B.E./B.Tech. all Branches)
2 0 0 2

COURSE OBJECTIVES:

- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.
- To facilitate the understanding of global and Indian scenario of renewable and nonrenewable resources, causes of their degradation and measures to preserve them.
- To familiarize the concept of sustainable development goals and sustainable practices
- To imbibe awareness on population issues and manmade activities

UNIT-I ENVIRONMENT AND BIODIVERSITY 6

Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Types of biodiversity – values of biodiversity, India as a mega-diversity nation – threats to biodiversity – conservation of biodiversity.
Activity: Documentation of ecosystems/Biodiversity within Campus.

UNIT-II ENVIRONMENTAL POLLUTION 6

Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system (OHASMS). Environmental protection, Environmental protection acts.
Activity: Documentation of pollution issues in Erode district.

UNIT-III RENEWABLE SOURCES OF ENERGY 6

Energy management and conservation - New Energy Sources: Need and different types of new energy sources. Concept, origin and applications of - Hydrogen energy, Ocean energy, Tidal energy and geothermal energy conversion.
Activity: Documentation of available renewable resources in Erode district.

UNIT-IV SUSTAINABILITY AND MANAGEMENT 6

Development, GDP, Sustainability- concept, needs and challenges - Sustainable Development Goals - Concept of Carbon Credit, Carbon Footprint. Circular economy, ISO 14000 Series, Material Life Cycle Assessment, Environmental Impact Assessment. Green Engineering.
Activity: Documentation of sustainable goals of Tamilnadu. **Case Study:** E-Waste Management

UNIT-V HUMAN POPULATION AND DISASTER MANAGEMENT 6

Population growth, Population explosion— Family Welfare Program – Environment and human health. Human rights – HIV/AIDS – Women and Child Welfare – Role of Information Technology in environment and human health – Disaster management: Floods, earthquake, cyclone and landslides.
Activity: Documentation of women development schemes in Tamilnadu.

TOTAL HOURS 30

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COURSE OUTCOMES:

At the end of the course the students will be able to

- **CO1 :** To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.
- **CO2 :** To identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.
- **CO3 :** To identify and apply the understanding of renewable and non-renewable resources
- **CO4 :** To recognize the different goals of sustainable development and sustainability practices and apply them for future development.
- **CO5 :** To aware the population issues and to handle the disaster issues

TEXT BOOKS:

1. Dr. A.Ravikrishnan "Environmental Sciences and Sustainability", 2nd Edition, Sri Krishna Hitech Publishing Company Pvt. Ltd, 2022.

2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2010.

3. Gilbert M.Masters & Wendell P Ela, 'Introduction to Environmental Engineering and Science', 3rd edition, Prentice – Hall of India Pvt. Ltd, New Delhi, 2008.

REFERENCE BOOKS:

1. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT. LTD, New Delhi, 2009.

2. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2022.

3. Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2023.

ONLINE SOURCES:

Unit 1: https://www.youtube.com/watch?v=Ar04qG1P8Es (IIT ROORKEE NPTEL) & https://www.youtube.com/watch?v=SHxAOoxhKTA (IIT KANPUR NPTEL)
Unit 2: https://www.youtube.com/watch?v=I7Z34WU257U (IIT ROORKEE NPTEL)
Unit 3: https://www.youtube.com/watch?v=1kUE0BZtTRc (NATIONAL GEOGRAPHIC)
Unit 4: https://www.youtube.com/watch?v=Crd3CFq5B4s (IITM NPTEL)
Unit 5: https://www.youtube.com/watch?v=sMqtwbKc8EA (FINANCIAL TIMES)

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CO's & PO's MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	-	-	2	3	-	-	-	-	2
CO2	3	2	-	-	-	3	3	-	-	-	-	2
CO3	3	-	1	-	-	2	2	-	-	-	-	2
CO4	3	2	1	1	-	2	2	-	-	-	-	2
CO5	3	2	1	-	-	2	2	-	-	-	-	1

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23ADL41	MACHINE LEARNING LABORATORY (for B.Tech. –AIDS , AIML)	L	T	P	C
		0	0	3	1.5

COURSE OBJECTIVES:

- To understand the data sets and apply suitable algorithms for selecting the appropriate features for analysis.
- To learn to implement supervised machine learning algorithms on standard datasets and evaluate the performance.
- To experiment the unsupervised machine learning algorithms on standard datasets and evaluate the performance.
- To build the graph based learning models for standard data sets.
- To compare the performance of different ML algorithms and select the suitable one based on the application

LIST OF EXPERIMENTS

1. For a given set of training data examples stored in a .CSV file, implement and demonstrate the **Candidate-Elimination algorithm** to output a description of the set of all hypotheses consistent with the training examples.
2. Write a program to demonstrate the working of the decision tree based **ID3 algorithm**. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
3. Build an Artificial Neural Network by implementing the **Back propagation algorithm** and test the same using appropriate data sets.
4. Write a program to implement the **naïve Bayesian classifier** for a sample training data set stored as a .CSV file and compute the accuracy with a few test data sets.
5. Implement **naïve Bayesian Classifier** model to classify a set of documents and measure the accuracy, precision, and recall.
6. Write a program to construct a **Bayesian network to** diagnose CORONA infection using standard WHO Data Set.
7. Apply **EM algorithm** to cluster a set of data stored in a .CSV file. Use the same data set for clustering using the k-Means **algorithm**. Compare the results of these two algorithms.
8. Write a program to implement ***k*-Nearest Neighbour algorithm** to classify the iris data set. Print both correct and wrong predictions.
9. Implement the non-parametric **Locally Weighted Regression algorithm** in order to fit data points. Select an appropriate data set for your experiment and draw graphs.

TOTAL : 45 PERIODS

List of Equipments:(30 Students per Batch)
The programs can be implemented in either Python or R.

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COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Apply suitable algorithms for selecting the appropriate features for analysis.

CO2 : Implement supervised machine learning algorithms on standard datasets and evaluate the performance.

CO3 : Apply unsupervised machine learning algorithms on standard datasets and evaluate the performance..

CO4 : Build the graph based learning models for standard data sets

CO5 : Assess and compare the performance of different ML algorithms and select the suitable one based on the application.

E-RESOURCES:

https://nptel.ac.in/courses/106106139

https://nptel.ac.in/courses/106106202

CO's – PO's & PSO's MAPPING

	PO's												PSO's		
CO's	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	2	2	1	-	-	-	-	1	2	3	3	3	2	1
CO2	2	1	1	3	2	-	-	-	3	2	3	2	3	1	1
CO3	2	2	1	1	2	-	-	-	1	1	1	1	2	3	3
CO4	2	2	3	3	2	-	-	-	1	2	1	1	1	2	2
CO5	2	2	3	1	2	-	-	-	3	1	1	1	2	1	2
AVG	**2**	**2**	**2**	**2**	**2**	-	-	-	**2**	**2**	**2**	**2**	**2**	**2**	**2**

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23ADL42	DATABASE DESIGN AND MANAGEMENT LABORATORY (for B.Tech. –AIDS , AIML)	L	T	P	C
		0	0	3	1.5

COURSE OBJECTIVES:

- To understand the database development life cycle
- To learn database design using conceptual modeling, Normalization
- To implement database using Data definition, Querying using SQL manipulation and SQL programming
- To implement database applications using IDE/RAD tools
- To learn querying Object-relational databases

LISTOF EXPERIMENTS

Note: The examples suggested in each experiment are only indicative. The lab instructor is expected to design other problems on similar lines. The Examination shall not be restricted to the sample experiments listed here.

1. Database Development Lifecycle:
   Problem definition and Requirement analysis
   Scope and Constraints
2. Database design using Conceptual modeling (ER-EER) – top-down approach
   MappingconceptualtorelationaldatabaseandvalidateusingNormalization
3. Implement the database using SQL Data definition with constraints, Views
4. Query the database using SQL Manipulation
5. Querying/ Managing the database using SQL
   Programming Stored Procedures/Functions
   Constraints and security using Triggers
6. Database design using Normalization–bottom-up approach
7. Develop database applications using IDE/RAD tools(Eg., Net Beans,Visual Studio)
8. Database design using EER-to-ODB mapping/UML class diagrams
9. Object features of SQL-UDTs and sub-types, Tables using UDTs, Inheritance ,Method definition
10. Querying the Object-relational database using Objet Query language

TOTAL: 45 PERIODS

HARDWARE:

- Standalone Desktops

SOFTWARE:

- Postgre SQL
-

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COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Understand the database development lifecycle
CO2: Design relational database using conceptual-to-relational mapping, Normalization
CO3: Apply SQL for creation, manipulation and retrieval of data
CO4: Develop a database applications for real-time problems
CO5: Design and query object-relational databases.

E-RESOURCES:

1. http://www.flowgorithm.org/
2. https://www.python.org/
3. https://nptel.ac.in/courses/106104074

CO's–PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	3	-	-	-	-	1	1	1	3	2	2	1
CO2	2	2	1	3	1	-	-	-	3	2	3	1	1	1	2
CO3	2	1	3	1	-	-	-	-	3	3	1	1	2	1	1
CO4	2	2	3	1	-	-	-	-	2	3	2	1	2	1	2
CO5	3	3	1	3	1	-	-	-	1	3	2	3	3	3	2
AVG	**2**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**2**	**2**	**2**	**2**	**2**	**2**	**2**

1- low,2 -medium,3- high,'-'- no correlation

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23ADL43	**ARTIFICIAL INTELLIGENCE LABORATORY** (for B.Tech. –AIDS , AIML)	L	T	P	C
		0	0	3	1.5

COURSE OBJECTIVES:

- To design and implement search strategies
- To implement game playing techniques
- To implement CSP techniques
- To develop systems with logical reasoning
- To develop systems with probabilistic reasoning

LIST OF EXPERIMENTS

1. Implement basic search strategies – 8-Puzzle, 8 - Queens problem, Cryptarithmetic.
2. Implement A* and memory bounded A* algorithms
3. Implement Mini max algorithm for game playing (Alpha-Beta pruning)
4. Solve constraint satisfaction problems
5. Implement propositional model checking algorithms
6. Implement forward chaining, backward chaining, and resolution strategies
7. Build naïve Bayes models
8. Implement Bayesian networks and perform inferences
9. Mini-Project

TOTAL : 45 PERIODS

COURSE OUTCOMES: At the end of the course the students will be able to

CO1 : Design and implement search strategies

CO2 : Implement game playing and CSP techniques

CO3 : Develop logical reasoning systems

CO4 : Develop probabilistic reasoning systems

CO5 : Process compound data using Python data structures and Utilize Python packages in developing software applications.

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E-RESOURCES:

1. https://nptel.ac.in/courses/106102220
2. https://nptel.ac.in/courses/106105077

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	3	3	-	-	-	-	1	1	2	1	3	2	1
CO2	1	2	3	3	2	-	-	-	3	2	3	3	3	3	2
CO3	3	1	3	3	1	-	-	-	1	3	1	2	1	1	3
CO4	2	1	1	1	1	-	-	-	2	3	1	2	2	2	1
CO5	3	1	1	1	1	-	-	-	1	3	3	3	3	3	2
AVG	**2**	**1**	**2**	**2**	**1**	**-**	**-**	**-**	**2**	**2**	**2**	**2**	**2**	**2**	**2**

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23MDC41	SOFT AND ANALYTICAL SKILLS - I	L	T	P	C
		1	0	0	0

COURSE OBJECTIVES:

- ☐ To make the students aware of critical thinking.
- ☐ To understand the significance of emotional intelligence in self-growth.
- ☐ Basic Knowledge about the Arithmetic Ability.
- ☐ To solve the problems in Business Computations.
- ☐ Understand the basics of Data Interpretation

UNIT-I **CRITICAL THINKING** **3**

Active Listening –Observation –Curiosity –Introspection –Analytical Thinking –Open-mindedness – Creative Thinking.

UNIT-II **EMOTIONAL INTELLIGENCE** **3**

Transactional analysis – Empathy – Sympathy - Conflict management.

UNIT-III **ARITHMETIC ABILITY** **3**

Vedic Maths - Algebraic operations BODMAS, Fractions, Divisibility rules, LCM & GCD (HCF).

UNIT-IV **BUSINESS COMPUTATIONS** **3**

Time & Distance, Partnership, simple & compound interest.

UNIT-V **DATA INTERPRETATION** **3**

Line Graphs - Venn diagrams - Mixed Graphs.

TOTAL : 15PERIODS

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COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Analyse and evaluate arguments and identify most common fallacies.

CO2 : Discover personal competence and techniques of building emotional intelligence.

CO3 : Enhance the Aptitude Round Clearing ability in interview process.

CO4 : Infer the concepts of Business Computations.

CO5 : Interrupt the data.

TEXT BOOKS:

1. Quantitative Aptitude for Competitive Examination by R.S. Agrawal, S.Chand Publications.
2. Soft Skills: an Integrated Approach to Maximise Personality, Gajendra S. Chauhan, Sangeeta Sharma, Wiley India.

REFERENCE BOOKS:

1. Analytical skills by Showick Thorpe, published by S Chand And Company Limited, Ramnagar, New Delhi-110055.
2. Quantitative Aptitude and Reasoning by R V Praveen, PHI publishers.
3. Quantitative Aptitude for Competitive Examination by AbhijitGuha, Tata Mc Graw Hill Publications.
4. Personality Development and Soft Skills, Barun K. Mitra, Oxford Press
5. Communication Skills for Engineers and Scientists , Sharma, Sangeeta & Binod Mishra., PHI India. (2 nd edition).

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SHREE VENKATESHWARA HI-TECH ENGINEERING COLLEGE
(Autonomous)
Gobichettipalayam, Erode -638455

Regulation 2023 (UG)
Curriculum and Syllabus
B.Tech. – Artificial Intelligence and Data Science
SEMESTER V

S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
Theory											
1.	23ADT51	Deep Learning	PC	3	0	0	3	3	40	60	100
2.	23CST52	Distributed Computing	PC	3	0	0	3	3	40	60	100
3.	23CSI51	Computer Networks	PC	3	0	2	5	4	50	50	100
4.	23CSE18	Big Data Analytics	PC	2	0	2	4	3	50	50	100
5.		Professional Elective I*	PE	-	-	-		3	-	-	100
6.		Professional Elective II*	PE	-	-	-		3	-	-	100
Practicals											
7.	23ADL51	Deep Learning Laboratory	PC	0	0	3	3	1.5	60	40	100
Mandatory Courses											
8.	23MDC51	Mandatory Course – III Soft and Analytical Skills-II	MC	1	0	0	1	0	-	-	-
9.		Mandatory Course – IV&	MC	3	0	0	3	0	100	-	100
		Total		-	-	-	-	**20.5**			

*** Professional Elective – I & II shall be chosen from the list of Professional electives (Verticals) offered by same Programme**

& Mandatory Course-IV is a Non-credit Course (Student shall select one course from the list given under Mandatory Course-IV)

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23ADT51 **DEEP LEARNING** (for B.Tech – AIDS)

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand and need and principles of deep neural networks
- To understand CNN and RNN architectures of deep neural networks
- To comprehend advanced deep learning models
- To learn the evaluation metrics for deep learning models

UNIT-I **DEEP NETWORKS BASICS** **9**

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

UNIT-II **CONVOLUTIONAL NEURAL NETWORKS** **9**

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

UNIT-III **RECURRENT NEURAL NETWORKS** **10**

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

UNIT-IV **MODEL EVALUATION** **8**

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

UNIT-V **AUTOENCODERS AND GENERATIVE MODELS** **9**

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

TOTAL : 45 PERIODS

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COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Explain the basics in deep neural networks

CO2 : Apply Convolution Neural Network for image processing

CO3 : Apply Recurrent Neural Network and its variants for text analysis

CO4 : Apply model evaluation for various applications

CO5 : Apply auto en coders and generative models for suitable applications.

TEXT BOOKS:

1 Ian Goodfellow, Yoshua Bengio, Aaron Courville, ``Deep Learning'', MIT Press, 2016.

2. Andrew Glassner, "Deep Learning: A Visual Approach", No Starch Press, 2021.

REFERENCE BOOKS:

1. Salman Khan, Hossein Rahmani, Syed Afaq Ali Shah, Mohammed Bennamoun, ``A Guide to Convolutional Neural Networks for Computer Vision'', Synthesis Lectures on Computer Vision, Morgan & Claypool publishers, 2018.

2. Yoav Goldberg, ``Neural Network Methods for Natural Language Processing'', Synthesis Lectures on Human Language Technologies, Morgan & Claypool publishers, 2017.

3. Francois Chollet, ``Deep Learning with Python'', Manning Publications Co, 2018.

4.Charu C. Aggarwal, ``Neural Networks and Deep Learning: A Textbook'', Springer International Publishing, 2018.

5.Josh Patterson, Adam Gibson, ``Deep Learning: A Practitioner's Approach'', O'Reilly Media, 2017.

E-RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc20_cs62
2. https://onlinecourses.nptel.ac.in/noc21_cs93

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3	1	-	-	-	2	3	1	2	3	3	3
CO2	2	2	2	3	3	-	-	-	1	2	2	3	1	1	3
CO3	3	3	3	3	3	-	-	-	2	1	1	2	2	1	3
CO4	3	3	1	1	1	-	-	-	1	3	1	3	2	1	1
CO5	3	2	2	2	3	-	-	-	2	3	2	2	2	3	3
AVG	2.8	2.4	2	2.4	2.2	-	-	-	1.6	2.4	1.4	2.4	2	1.8	2.6

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CST52 **DISTRIBUTED COMPUTING** (for B.E/B.Tech-CSE,IT , AIDS , CS, AIML)

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To introduce the computation and communication models of distributed systems
- To illustrate the issues of synchronization and collection of information in distributed systems
- To describe distributed mutual exclusion and distributed deadlock detection techniques
- To elucidate agreement protocols and fault tolerance mechanisms in distributed systems
- To explain the cloud computing models and the underlying concepts

UNIT-I **INTRODUCTION** **8**

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

UNITII **LOGICALTIMEAND GLOBAL STATE** **10**

Logical Time: Physical Clock Synchronization: NTP A Framework for a System of Logical Clocks Scalar Time – Vector Time; Message Ordering and Group Communication: Message Ordering Paradigms – Asynchronous Execution with Synchronous Communication – Synchronous Program Order on Asynchronous System – Group Communication – Causal Order – Total Order; Global State and Snapshot Recording Algorithms: Introduction–System Model and Definitions–Snapshot Algorithms for FIFO Channels.

UNITIII **DISTRIBUTED MUTEX ANDDEADLOCK** **10**

Distributed Mutual exclusion Algorithms: Introduction–Preliminaries–Lamport's algorithm–Ricart - Agrawala's Algorithm––Token-Based Algorithms–Suzuki-Kasami's Broadcast Algorithm; Deadlock Detection in Distributed Systems: Introduction – System Model – Preliminaries – Models of Deadlocks– Chandy-Misra-Haas Algorithm for the AND model and OR Model.

UNITIV **CONSENSUSAND RECOVERY** **10**

Consensus and Agreement Algorithms: Problem Definition–Overview of Results–Agreement in a Failure-Free System(Synchronous and Asynchronous) – Agreement in Synchronous Systems with Failures; Check pointing and Rollback Recovery: Introduction–Background and Definitions–Issues in Failure Recovery–Checkpoint-based Recovery–Coordinated Check pointing Algorithm-Algorithm for Asynchronous Check pointing and Recovery

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UNITV **CLOUD COMPUTING** **7**

Definition of Cloud Computing – Characteristics of Cloud – Cloud Deployment Models – Cloud Service Models – Driving Factors and Challenges of Cloud – Virtualization – Load Balancing – Scalability and Elasticity – Replication – Monitoring – Cloud Services and Platforms: Compute Services – Storage Services– Application Services

TOTAL:45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Explain the foundations of distributed systems(K2).

CO2 : Solve synchronization and state consistency problems(K3)

CO3 : Use resource sharing techniques in distributed systems(K3)

CO4 : Apply working model of consensus and reliability of distributed systems(K3)

CO5 : Explain the fundamentals of cloud computing(K2)

TEXT BOOKS:

1.Kshem kalyani AjayD ,Mukesh Singhal, "Distributed Computing: Principles, Algorithms and Systems",Cambridge Press,2011.

2.Mukesh Singhal ,Niranjan G Shivaratri,"Advanced Concepts in Operating systems ",Mc-Graw Hill Publishers,1994.

REFERENCE BOOKS:

1.George Coulouris,Jean Dollimore,Time Kindberg, "Distributed Systems Concepts and Design",Fifth Edition,Pearson Education,2012.

2.Pradeep L Sinha,"Distributed Operating Systems: Concepts and Design", Prentice Hall of India, 2007.

3.Tanenbaum AS ,VanSteenM, "Distributed Systems: Principles and Paradigms", Pearson Education, 2007.

4.LiuML,"Distributed Computing: Principles and Applications",PearsonEducation,2004.

5.NancyALynch,"Distributed Algorithms",MorganKaufmanPublishers,2003.

6.Arsh deep Bagga,Vijay Madisetti, "Cloud Computing: A Hands-On Approach",Universities Press,2014

E-RESOURCES:

https://nptel.ac.in/courses/106106107

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CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
CO1	2	2	3	3	1	-	-	-	2	1	3	3	2	1	1
CO2	1	3	2	1	2	-	-	-	2	2	2	2	1	3	2
CO3	2	2	1	3	3	-	-	-	3	2	1	1	1	2	1
CO4	1	2	2	3	1	-	-	-	3	3	2	1	3	1	1
CO5	3	3	1	2	3	-	-	-	3	3	3	1	3	2	3
AVG	1.8	2.4	1.8	2.4	2	-	-	-	2.6	2.2	2.2	1.6	2	1.8	1.6

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSI51	COMPUTER NETWORKS (for BE/B.Tech. -CSE , IT , AIDS, CS)	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES:

- To understand the concept of layering in networks.
- To know the functions of protocols of each layer of TCP/IP protocol suite.
- To visualize the end-to-end flow of information.
- To learn the functions of network layer and the various routing protocols
- To familiarize the functions and protocols of the Transport layer

UNIT-I **INTRODUCTION AND APPLICATION LAYER** **10**

Data Communication - Networks – Network Types – Protocol Layering – TCP/IP Protocol suite – OSI Model – Introduction to Sockets - Application Layer protocols: HTTP – FTP – Email protocols (SMTP - POP3 - IMAP - MIME) – DNS – SNMP

UNIT-II **TRANSPORT LAYER** **9**

Introduction - Transport-Layer Protocols: UDP – TCP: Connection Management – Flow control - Congestion Control - Congestion avoidance (DECbit, RED) – SCTP – Quality of Service

UNIT-III **NETWORK LAYER** **7**

Switching : Packet Switching - Internet protocol - IPV4 – IP Addressing – Subnetting - IPV6, ARP, RARP, ICMP, DHCP

UNIT-IV **ROUTING** **7**

Routing and protocols: Unicast routing - Distance Vector Routing - RIP - Link State Routing – OSPF – Path-vector routing - BGP - Multicast Routing: DVMRP – PIM.

UNIT-V **DATA LINK AND PHYSICAL LAYERS** **12**

Data Link Layer – Framing – Flow control – Error control – Data-Link Layer Protocols HDLC – PPP -Media Access Control – Ethernet Basics – CSMA/CD – Virtual LAN – Wireless LAN (802.11) - Physical Layer: Data and Signals - Performance – Transmission media- Switching – Circuit Switching.

45 PERIODS

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PRACTICAL EXERCISES: **30 PERIODS**

1. Learn to use commands like tcp dump, netstat, if config, ns lookup and trace route. Capture ping and trace route PDUs using a network protocol analyzer and examine.
2. Write a HTTP web client program to download a web page using TCP sockets.
3. Applications using TCP sockets like: a) Echo client and echo server b) Chat
4. Simulation of DNS using UDP sockets.
5. Use a tool like Wireshark to capture packets and examine the packets
6. Write a code simulating ARP /RARP protocols.
7. Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.
8. Study of TCP/UDP performance using Simulation tool.
9. Simulation of Distance Vector/ Link State Routing algorithm.
10. Simulation of an error correction code (like CRC)

COURSE OUTCOMES:

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

CO 1: Explain the basic layers and its functions in computer networks.

CO 2: Understand the basics of how data flows from one node to another.

CO 3: Analyze routing algorithms.

CO 4: Describe protocols for various functions in the network.

CO 5: Analyze the working of various application layer protocols.

TOTAL: 75 (45+30) PERIODS

TEXT BOOKS:

1. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Eighth Edition, Pearson Education, 2021.

2. Behrouz A. Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, Sixth Edition TMH, 2022.

REFERENCES

1. Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.

2. William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education,2013

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3. Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.
4. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", McGraw Hill, 2012.

E-RESOURCES

https://onlinecourses.nptel.ac.in/noc22_cs19/preview

https://www.udemy.com/topic/computer-network/

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	2	-	-		-	-	-	-	-	-	-	3	-	-
CO2	-	1	-	-	2	-	-	-	-	-	-	2	-	2	-
CO3	-	2	-	-	3	-	-	-	-	-	-	-	-	3	-
CO4	-		-	1	2	-	-	-	-	3	-	-	-	-	-
CO5	-	3	2	-	-	-	-	-	-	-	-	-	-	-	3
AVG	-	1	-	-	1	-	-	-	-	1	-	-	-	1	1

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE18	BIG DATA ANALYTICS	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To understand big data.
- To learn and use NoSQL big data management.
- To learn map reduce analytics using Hadoop and related tools.
- To work with map reduce applications
- To understand the usage of Hadoop related tools for Big Data Analytics

UNIT-I **UNDERSTANDING BIG DATA** **5**

Introduction to big data – convergence of key trends – unstructured data – industry examples of big data – web analytics – big data applications– big data technologies – introduction to Hadoop – open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics.

UNIT-II **NOSQL DATA MANAGEMENT** **7**

Introduction to NoSQL – aggregate data models – key-value and document data models – relationships – graph databases – schemaless databases – materialized views – distribution models – master-slave replication – consistency - Cassandra – Cassandra data model – Cassandra examples – Cassandra clients.

UNIT-III **BASICS OF HADOOP** **6**

Data format – analyzing data with Hadoop – scaling out – Hadoop streaming – Hadoop pipes – design of Hadoop distributed file system (HDFS) – HDFS concepts – Java interface – data flow – Hadoop I/O – data integrity – compression – serialization – Avro – file-based data structures - Cassandra – Hadoop integration.

UNIT-IV **MAP REDUCE APPLICATIONS** **6**

Map Reduce workflows – unit tests with MR Unit – test data and local tests – anatomy of Map Reduce job run – classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution – Map Reduce types – input formats – output formats.

UNIT-V **HADOOP RELATED TOOLS** **6**

Hbase – data model and implementations – Hbase clients – Hbase examples – praxis.Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts.
Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries.

TOTAL : 30 PERIODS

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LIST OF EXPERIMENTS **30 PERIODS**

1. Downloading and installing Hadoop; Understanding different Hadoop modes. Startup scripts, Configuration files.
2. Hadoop Implementation of file management tasks, such as Adding files and directories, retrieving files and Deleting files
3. Implement of Matrix Multiplication with Hadoop Map Reduce.
4. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.
5. Installation of Hive along with practice examples.
6. Installation of HBase, Installing thrift along with Practice examples
7. Practice importing and exporting data from various databases.

Software Requirements:
Cassandra, Hadoop, Java, Pig, Hive and HBase.

COURSE OUTCOMES:
At the end of the course the students will be able to

CO1 : Describe big data and use cases from selected business domains.

CO2 : Explain NoSQL big data management.

CO3 : Install, configure, and run Hadoop and HDFS.

CO4 : Perform map-reduce analytics using Hadoop.

CO5 : Use Hadoop-related tools such as HBase, Cassandra, Pig, and Hive for big data analytics.

TOTAL: 60(30+30) PERIODS

TEXT BOOKS:

1. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
2. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
3. Sadalage, Pramod J. "NoSQL distilled", 2013.

REFERENCE BOOKS:

1 E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
2.Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
3.Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.
4. Alan Gates, "Programming Pig", O'Reilley, 2011.

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E-RESOURCES:

https://onlinecourses.nptel.ac.in/noc25_cs131/preview

https://onlinecourses.swayam2.ac.in/nou25_ma07/preview

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	-	2	2	3	1	1	3	3
CO2	3	3	2	3	2	-	-	-	2	2	3	3	2	3	2
CO3	3	3	3	2	3	-	-	-	2	2	1	2	2	3	3
CO4	2	3	3	3	3	-	-	-	2	2	3	2	3	3	2
CO5	3	3	3	3	3	-	-	-	3	1	3	2	3	2	3
AVG	2.8	3	2.8	2.8	2.8	-	-	-	2.2	1.8	2.6	2	2.2	2.8	2.6

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23ADL51	**DEEP LEARNING LABORATORY** (for B.Tech – AIDS)	L	T	P	C
		0	0	3	1.5

COURSE OBJECTIVES:

- To understand the tools and techniques to implement deep neural networks
- To apply different deep learning architectures for solving problems
- To implement generative models for suitable applications
- To learn to build and validate different models

LIST OF EXPERIMENTS

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

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Apply deep neural network for simple problems (K3)
CO2 : Apply Convolution Neural Network for image processing (K3)
CO3 : Apply Recurrent Neural Network and its variants for text analysis (K3)
CO4 : Apply generative models for data augmentation (K3)
CO5 : Process compound data using Python data structures and Utilize Python packages in developing software applications.

E-RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc20_cs62
2. https://onlinecourses.nptel.ac.in/noc21_cs93

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	-	-	-	3	2	3	2	3	3	2
CO2	1	3	2	2	2	-	-	-	3	2	2	2	1	3	1
CO3	3	2	1	2	1	-	-	-	2	3	1	1	2	3	3
CO4	3	3	1	2	1	-	-	-	1	3	2	2	3	2	2
CO5	3	3	3	3	2	-	-	-	1	2	3	1	3	3	2
AVG	2.6	2.6	1.6	2	1.4	-	-	-	2	2.4	2.2	1.6	2.4	2.8	2

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23MDC51	SOFT SKILLS AND ANALYTICAL SKILLS - II	L	T	P	C
		1	0	0	0

COURSE OBJECTIVES:

- ☐ To enhance the collaboration and cooperation between individuals towards a common goal.
- ☐ To provide a critical perspective on the socialization of men and women.
- ☐ Basic Knowledge about the Verbal Reasoning.
- ☐ To solve the problems in Quantitative Aptitude.
- ☐ Understand the basics of Data Interpretation

UNIT-I **TEAM SKILLS** 3

Trust and collaboration - Team building – Shouldering responsibilities

UNIT-II **GENDER SENSITIZATION** 3

Media and the Social Context - Social Networks - Gender Sensitization

UNIT-III **VERBAL REASONING** 3

Verbal Reasoning: Syllogism, Blood relationship

UNIT-IV **QUANTITATIVE APTITUDE** 3

Ratio and proportion, Problems on ages, Partnership.

UNIT-V **DATA INTERPRETATION** 3

Tabulation – Profit & loss, Percentage.

TOTAL : 15 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Share and exchange knowledge and ideas, clarify doubts, and arrive at a collective decision or understanding.

CO2 : Meet the needs of an increasingly ethnically and gender-diverse workplace.

CO3 : Enhance the Aptitude Round Clearing ability in interview process

CO4 : Solve problems pertaining to quantitative ability.

CO5 : Interrupt the data.

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TEXT BOOKS:

1. Quantitative Aptitude for Competitive Examination by R.S. Agrawal, S.Chand Publications.
2. Soft Skills: an Integrated Approach to Maximise Personality, Gajendra S. Chauhan, Sangeeta Sharma, Wiley India

REFERENCE BOOKS:

1. Analytical skills by Showick Thorpe, published by S Chand And Company Limited, Ramnagar, New Delhi-110055
2. Quantitative Aptitude and Reasoning by R V Praveen, PHI publishers.
3. Quantitative Aptitude for Competitive Examination by AbhijitGuha, Tata Mc Graw Hill Publications.
4. Personality Development and Soft Skills, Barun K. Mitra, Oxford Press
5. Cornerstone: Developing Soft Skills, Sherfield, Pearson India

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SHREE VENKATESHWARA HI-TECH ENGINEERING COLLEGE
(Autonomous)
Gobichettipalayam, Erode -638455

Regulation 2023 (UG)
Curriculum and Syllabus
B.Tech. – Artificial Intelligence and Data Science
SEMESTER VI

S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
Theory											
1.	23ECI62	Embedded Systems and IoT	PC	3	0	2	5	4	50	50	100
2.	23ADT61	Data and Information Security	PC	3	0	0	3	3	40	60	100
3.		Professional Elective III*	PE	-	-	-	-	3	-	-	100
4.		Professional Elective IV*	PE	-	-	-	-	3	-	-	100
5.		Professional Elective V*	PE	-	-	-	-	3	-	-	100
6.		Professional Elective VI*	PE	-	-	-	-	3	-	-	100
7.		Open Elective – I**	OE	-	-	-	-	3	-	-	100
Mandatory											
8.	23MCT61	Mandatory Course-V&	MC	3	0	0	3	0	100	-	100
			Total	-	-	-	-	22			

*** Professional Elective – III to VI shall be chosen from the list of Professional electives (Verticals) offered by same Programme**

**** Open Elective – I shall be chosen from the list of open electives offered by other Programmes**

& Mandatory Course-V is a Non-credit Course (Student shall select one course from the list of given under Mandatory Course-V)

@ The students individually undergo training in reputed Firms/Research Institute/ Laboratories for the specified duration (04 weeks) during VI semester summer vacation. After completion of training, a detailed report should be submitted within ten days from the commencement of VII semester.

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23ECI62 **EMBEDDED SYSTEMS AND IoT** L T P C
(for B.E./B.Tech - AIDS, AIML, CSE, CS, & IT) 3 0 2 4

COURSE OBJECTIVES:

- To learn the internal architecture and programming of embedded processors.
- To understand interfacing of I/O devices with embedded processors.
- To explore the evolution and fundamentals of the Internet of Things (IoT).
- To build small, low-cost embedded and IoT systems using Open platforms.
- To apply IoT concepts to solve real-world problems and scenarios.

UNIT-I 8051 MICROCONTROLLER 9

8051 Microcontroller, Architecture, Instruction Set and Programming, Programming Parallel Ports, Timers and Serial Port, Interrupt Handling.

UNIT-II EMBEDDED C PROGRAMMING 9

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

UNIT-III IoT DEVICES 9

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

UNIT-IV IoT COMMUNICATION AND OPEN PLATFORMS 9

IoT Communication Models and APIs, IoT Communication Protocols -HTTP, MQTT, XMPP-Bluetooth, WiFi, ZigBee, GPS, GSM modules, Open Platform - Raspberry Pi, Architecture, Programming, Interfacing, Accessing GPIO Pins, Sending and Receiving Signals Using GPIO Pins, Connecting to the Cloud.

UNIT-V APPLICATIONS DEVELOPMENT 9

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

THEORY:45 PERIODS

PRACTICAL EXERCISES:

1. Write 8051 Assembly Language experiments using simulator.
2. Test data transfer between registers and memory.
3. Perform ALU operations.
4. Write Basic and arithmetic Programs Using Embedded C.
5. Introduction to Arduino platform and programming
6. Explore different communication methods with IoT devices (Zigbee, GSM, Bluetooth)
7. Introduction to Raspberry PI platform and python programming
8. Interfacing sensors with Raspberry PI
9. Communicate between Arduino and Raspberry PI using any wireless medium

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10. Setup a cloud platform to log the data
11. Log Data using Raspberry PI and upload to the cloud platform
12. Design an IOT based system

PRACTICAL: 30 PERIODS
TOTAL (45+30): 75 PERIODS

COURSE OUTCOMES:

CO1: Learn the basics of the 8051 microcontroller and how to program it.
CO2: Write programs in Embedded C and understand how to manage tasks in embedded systems.
CO3: Understand IoT devices and learn how to program Arduino with sensors and actuators.
CO4: Learn about IoT communication methods and how to use Raspberry Pi for IoT projects.
CO5: Build simple IoT applications like home automation and smart farming.

TEXTBOOKS

1. Rolando Herrero, "Fundamentals of IoT Communication Technologies", Springer, First Edition, 2021.
2. Muhammed Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, "The 8051 Microcontroller and Embedded Systems", Pearson Education, Second Edition, 2014.

REFERENCES

1. Samuel Greengard, "The Internet of Things", First Edition, The MIT Press, 2021.
2. Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", CISCO Press, 2017.
3. Michael Barr, "Embedded C Coding Standard", Create Space Independent Publishing Platform; BARR-C: 2018 edition, 2018.
4. Marilyn Wolf, "Computers as Components: Principles of Embedded Computing System Design", Fourth Edition, Morgan Kaufmann, 2016.

E-RESOURCES:

1. https://emteria.com/blog/iot-embedded-system
2. https://bluefruit.co.uk/quality/your-guide-iot-and-embedded-systems/
3. https://www.emertxe.com/embedded-systems/

CO's – PO's & PSO's MAPPING

CO/ PO/ PSO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	3	2	2	3	1	1	0	1	1	0	2	3	1	1
CO 2	3	3	3	2	3	0	0	0	1	2	0	3	3	1	2
CO 3	2	3	3	2	3	0	0	0	2	2	0	2	2	3	3
CO 4	3	2	3	3	3	0	0	0	2	3	0	2	1	3	3
CO 5	3	3	3	3	3	1	1	0	3	3	1	3	3	3	3
AVG	3	3	3	3	3	1	1	0	2	2	1	2	2	2	2

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23ADT61 **DATA AND INFORMATION SECURITY** (for B.Tech-AIDS)

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To understand the basics of Information Security
- To know the legal, ethical and professional issues in Information Security
- To equip the students' knowledge on digital signature, email security and web security

UNIT-I **INTRODUCTION** **8**

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

UNIT-II **SECURITY INVESTIGATION** **8**

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

UNIT-III **DIGITAL SIGNATURE AND AUTHENTICATION** **9**

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

UNIT-IV **E-MAIL AND IP SECURITY** **10**

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

UNIT-V **WEB SECURITY** **10**

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

TOTAL : 45 PERIODS

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COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Understand the basics of data and information security.

CO2 : Understand the legal, ethical and professional issues in information security.

CO3 : Understand the various authentication schemes to simulate different applications.

CO4 : Understand various security practices and system security standards.

CO5 : Understand the Web security protocols for E-Commerce applications.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Harold F. Tipton, Micki Krause Nozaki,, "Information Security Management Handbook, Volume 6, 6th Edition, 2016.
2. Stuart McClure, Joel Scrambray, George Kurtz, "Hacking Exposed", McGraw- Hill, Seventh Edition, 2012.
3. Matt Bishop, "Computer Security Art and Science, Addison Wesley Reprint Edition, 2015.
4. Behrouz A Forouzan, Debdeep Mukhopadhyay, Cryptography And network security, 3rd Edition, . McGraw-Hill Education, 2015.

E-RESOURCES:

https://www.fortinet.com/resources/cyberglossary/data-security

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	1	-	-	-	-	1	3	1	2	3	1	1
CO2	1	3	3	3	2	-	-	-	1	2	2	2	1	2	2
CO3	2	3	3	3	1	-	-	-	1	3	1	2	1	2	1
CO4	3	3	1	1	1	-	-	-	3	1	1	3	2	3	3
CO5	3	2	2	3	2	-	-	-	1	2	1	2	2	2	1
AVG	2.4	2.6	2.4	2.2	1.5	-	-	-	1.4	2.2	1.2	2.2	1.8	2	1.6

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23EC015	PRINCIPLES OF COMMUNICATION ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the basic concepts of modulation and its necessity in communication systems.
- To explore amplitude and angle modulation techniques along with their comparison.
- To understand the process of sampling, quantization and pulse code modulation.
- To analyze various digital modulation schemes and their spectrum analysis.
- To learn the fundamentals of antenna design and wave propagation mechanisms.

UNIT-I AMPLITUDE MODULATION 9

Introduction to Modulation: Definition- Need for modulation- types of modulation - Frequency spectrum - Amplitude modulation: Definition - Simple signal diagram for amplitude modulation, Expression for amplitude modulation, expression for modulation.

UNIT-II ANGLE MODULATION 9

Basic definitions of Frequency modulation and Phase modulation-Simple signal diagram-Relation between FM and PM, FM Transmitter: Types of transmitters: Direct FM transmitter, Indirect FM transmitter - FM Receiver: stereophonic FM receiver-AFC.

UNIT-III SAMPLING AND QUANTIZATION 9

Introduction, The Quantization Random Process, Quantization Noise, Pulse-Code Modulation: Sampling, Quantization, Encoding, Regeneration, Decoding, Filtering, Multiplexing; Delta Modulation.

UNIT-IV DIGITAL MODULATION SCHEME 9

Geometric Representation of signals - Generation, detection, PCM, BPSK, BFSK, & QPSK - QAM - Carrier Synchronization - Structure of Non-coherent Receivers Synchronization and Carrier Recovery for Digital modulation, Spectrum Analysis.

UNIT-V ANTENNA AND WAVE PROPAGATION 9

Antennas: Definition-types of antenna: Mono pole and dipole antenna, directional Dipole arrays, Yagi antenna, parabolic antenna- Antenna parameters: directive gain, directivity, radiation pattern and polarization-applications.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the students will be able to

- **CO1:** Comprehend knowledge in amplitude modulation techniques
- **CO2:** Illustrate different angle modulation schemes with generation and detection methods
- **CO3:** Interpret knowledge in sampling and quantization
- **CO4:** Evaluate the digital modulation techniques
- **CO5:** Design different types of Antenna

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TEXT BOOKS:

1. Simon R. Saunders , Alejandro A. Aragon-Zavala, "Antennas and Propagation for Wireless Communication Systems", 3rd Edition, Wiley,2024.
2. Ifiok Otung, Communication Engineering Principles, 2nd Edition, Wiley, 2021.
3. M.L. Anand, Principles of Communication Engineering, 1st Edition, CRC Press, 2021.

REFERENCE BOOKS:

1. M. A. Bhagyaveni , R. Kalidoss , K. S. Vishvaksenan , "Introduction to Analog and Digital Communication, River Publishers, 1st Edition,2024.
2. Louis E. Frenzel, Principles of Electronic Communication Systems, 5th Edition, McGraw Hill, 2022.

E-RESOURCES:

1. https://elearn.nptel.ac.in/shop/nptel/principles-of-communication-systems-i/?v=c86ee0d9d7ed.
2. https://library.nitrkl.ac.in/libguide/subjects/guide.php?subject=EC

CO's – PO's & PSO's MAPPING

CO/PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	0	0	0	0	0	1	0	0	1	2	3	2	3
CO2	3	3	2	0	0	0	0	1	0	0	1	2	2	2	1
CO3	2	2	3	1	0	0	0	0	0	0	1	2	2	2	1
CO4	3	3	3	2	1	0	0	0	0	0	1	2	2	2	1
CO5	2	2	2	2	0	0	0	1	0	0	1	2	1	1	1
AVG	3	2	2	1	0	0	0	1	0	0	1	2	2	2	1

1 - low, 2 - medium, 3 - high, '-' - no correlation

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PROFESSIONAL ELECTIVE COURSES: VERTICALS

VERTICAL 1: AIDS I											
S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
1.	23CSE71	Knowledge Engineering	PE	2	0	2	4	3	50	50	100
2.	23CSE12	Recommender Systems	PE	2	0	2	4	3	50	50	100
3.	23CSE72	Soft Computing	PE	2	0	2	4	3	50	50	100
4.	23CSE14	Text and Speech Analysis	PE	2	0	2	4	3	50	50	100
5.	23CSE15	Business Analytics	PE	2	0	2	4	3	50	50	100
6.	23CSE16	Image and Video Analytics	PE	2	0	2	4	3	50	50	100
7.	23CSE17	Computer Vision	PE	2	0	2	4	3	50	50	100
8.	23CSE11	Exploratory Data Analysis	PE	2	0	2	4	3	50	50	100

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23CSE71	KNOWLEDGE ENGINEERING (for B.E/B.Tech-CSE and IT)	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To understand the basics of Knowledge Engineering.
- To discuss methodologies and modeling for Agent Design and Development.
- To design and develop ontologies.
- To apply reasoning with ontologies and rules.
- To understand learning and rule learning.

UNIT-I **REASONING UNDER UNCERTAINTY** 6

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-II **METHODOLOGY AND MODELING** 6

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-III **ONTOLOGIES – DESIGN AND DEVELOPMENT** 6

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-IV **REASONIING WITH ONTOLOGIES AND RULES** 6

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-V **LEARNING AND RULE LEARNING** 6

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.

30 PERIODS

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PRACTICAL EXERCISES **30 PERIODS**

1. Perform operations with Evidence Based Reasoning.
2. Perform Evidence based Analysis.
3. Perform operations on Probability Based Reasoning.
4. Perform Believability Analysis.
5. Implement Rule Learning and refinement.
6. Perform analysis based on learned patterns.
7. Construction of Ontology for a given domain.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Understand the basics of Knowledge Engineering.

CO2 : Apply methodologies and modelling for Agent Design and Development.

CO3 : Design and develop onto logies.

CO4 : Apply reasoning with ontologies and rules.

CO5 : Understand learning and rule learning.

TOTAL : 60 PERIODS

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Ronald J. Brachman, Hector J. Levesque: Knowledge Representation and Reasoning, Morgan Kaufmann, 2004.

2.Ela Kumar, Knowledge Engineering, I K International Publisher House, 2018.

3.John F. Sowa: Knowledge Representation: Logical, Philosophical, and Computational Foundations, Brooks/Cole, Thomson Learning, 2000.

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1	1	1	-	-	1	2	1	2	1	1	1
CO2	3	2	3	2	2	-	-	-	2	1	2	1	3	3	1
CO3	2	2	3	2	2	-	-	-	3	2	2	2	3	2	3
CO4	2	2	3	1	1	-	-	-	2	2	2	2	2	1	1
CO5	2	2	2	1	1	-	-	-	2	1	1	1	2	1	1
AVG	2.4	1.8	2.4	1.4	1.4	0.2	0	0	2	1.6	1.6	1.6	2.2	1.6	1.4

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE12 **RECOMMENDER SYSTEMS** **L T P C**

(for B.E/B.Tech-CSE, IT and AIDS) 2 0 2 3

COURSE OBJECTIVES:

- 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.

UNIT-I **INTRODUCTION** **6**

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)

Suggested Activities:

- Practical learning–Implement Data similarity measures.
- External Learning–Singular Value Decomposition(SVD)applications

Suggested Evaluation Methods:

- Quizon Recommender systems.
- Quiz of python tools available for implementing Recommender systems

UNIT-II **CONTENT-BASED RECOMMENDATION SYSTEMS** **6**

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

Suggested Activities:

- Assignment on content-based recommendation systems .
- Assignment of learning user profiles

Suggested Evaluation Methods:

- Quizon similarity-based retrieval.
- Quiz of content-based filtering

UNIT-III **COLLABORATIVE FILTERING** **6**

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

Suggested Activities:

- Practical learning–Implement collaborative filtering concepts
- Assignment of security aspects of recommender systems.

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Suggested Evaluation Methods:

- Quizon collaborative filtering
- Seminar on security measures of recommender systems

UNIT-IV **ATTACK-RESIST ANTRECOMMENDER SYSTEMS** **6**

Introduction–Types of Attacks–Detecting attacks on recommender systems–Individual attack–Group attack – Strategies for robust recommender design - Robust recommendation algorithms

Suggested Activities:

- Group Discussion on attacks and their mitigation
- Study of the impact of group attacks
- External Learning–Use of CAPTCHAs

Suggested Evaluation Methods:

- Quizon attacks on recommender systems
- Seminar on preventing attacks using the CAPTCHAs

UNIT-V **EVALUATING RECOMMENDER SYSTEMS** **6**

EvaluatingParadigms–UserStudies–OnlineandOfflineevaluation–Goalsof evaluation design – Design Issues – Accuracy metrics – Limitations of Evaluation measures

30PERIODS

PRACTICAL EXERCISES **30PERIODS**

1. Implement Data similarity measures using Python
2. Implement dimension reduction techniques for recommender systems
3. Implement user profile learning
4. Implement content-based recommendation systems
5. Implement collaborative filter techniques
6. Create an attack for tampering with recommender systems
7. Implement accuracy metrics like Receiver Operated Characteristic curves

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Understand the basic concepts of recommender systems

CO2 : Implement machine-learning and data-mining algorithms in recommender systems datasets

CO3 : Implementation of Collaborative Filtering in carrying out performance evaluation of recommender systems based on various metrics..

CO4 : Design and implement a simple recommender system.

CO5 : Learn about advanced topics of recommender systems.

CO6 : Learn about advanced topics of recommender systems applications

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TEXT BOOKS:

1. CharuC.Aggarwal, Recommender Systems: The Textbook,Springer,2016.
2. Dietmar Jannach, Markus Zanker, Alexander Felfernig and Gerhard Friedrich , Recommender Systems: An Introduction, Cambridge University Press (2011), 1st ed.
3.Francesco Ricci,LiorRokach, Bracha Shapira, Recommender Sytems Handbook, 1sted, Springer (2011),
4.Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, Mining of massive datasets, 3rd edition, Cambridge University Press, 2020.

E-RESOURCES:

1. https://www.tensorflow.org/resources/recommendation-systems
2. https://github.com/RudrenduPaul/Python-Ecommerce-recommendation-system-using-machine-learning

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	1	-	-	-	1	-	-	1	-	-	-
CO2	1	2	-	-	1	-	-	-	-	-	-	1	-	-	-
CO3	2	3	1	-	1	-	-	-	2	-	-	-	-	-	-
CO4	3	2	2	2	1	-	-	-	2	-	-	2	-	-	-
CO5	1	1	-	2	1	-	-	-	-	-	-	1	-	-	-
AVG	2	2	1	1	1	-	-	-	-	-	-	1	-	-	-

1 - low, 2 - medium, 3 - high, '-' - no correlation

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		L	T	P	C
23CSE72	SOFT COMPUTING	2	0	2	3
	(for B.E/B.Tech-CSE and IT)				

COURSE OBJECTIVES:

- To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on humanexperience.
- To provide the mathematical background for carrying out the optimization associated withneural network learning
- To learn various evolutionary Algorithms.
- To become familiar with neural networks that can learn from available examples andgeneralize to form appropriate rules for inference systems.
- To introduce case studies utilizing the above and illustrate the Intelligent behavior ofprograms based on soft computing

UNIT-I INTRODUCTION TO SOFT COMPUTING AND FUZZY LOGIC 6

Introduction - Fuzzy Logic - Fuzzy Sets, Fuzzy Membership Functions, Operations on Fuzzy Sets, Fuzzy Relations, Operations on Fuzzy Relations, Fuzzy Rules and Fuzzy Reasoning, FuzzyInference Systems.

UNIT-II NEURAL NETWORKS 6

Supervised Learning Neural Networks – Perceptrons – Back propagation -Multilayer Perceptrons – Unsupervised Learning Neural Networks – Kohonen Self-Organizing Networks.

UNIT-III GENETIC ALGORITHMS 6

Chromosome Encoding Schemes -Population initialization and selection methods - Evaluation function - Genetic operators- Cross over – Mutation - Fitness Function – Maximizing function.

UNIT-IV NEURO FUZZY MODELING 6

ANFIS architecture – hybrid learning – ANFIS as universal approximator – Coactive Neuro fuzzy modeling – Framework – Neuron functions for adaptive networks – Neuro fuzzy spectrum - Analysis of Adaptive Learning Capability.

UNIT-V APPLICATIONS 6

Modeling a two input sine function - Printed Character Recognition – Fuzzy filtered neural networks – Plasma Spectrum Analysis – Hand written neural recognition - Soft Computing for Color Recipe Prediction.

30 PERIODS

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PRACTICAL EXERCISES: **30 PERIODS**

1. Implementation of fuzzy control/ inference system
2. Programming exercise on classification with a discrete perceptron
3. Implementation of XOR with back propagation algorithm
4. Implementation of self organizing maps for a specific application
5. Programming exercises on maximizing a function using Genetic algorithm
6. Implementation of two input sine function
7. Implementation of three input non linear function

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Understand the fundamentals of fuzzy logic operators and inference mechanisms.

CO2: Understand neural network architecture for AI applications such as classification andclustering.

CO3: Learn the functionality of Genetic Algorithms in Optimization problems.

CO4: Use hybrid techniques involving Neural networks and Fuzzy logic

CO5: Apply soft computing techniques in real world applications

TOTAL : 60 PERIODS

TEXT BOOKS:

1. SaJANG, J.-S. R., SUN, C.-T., & MIZUTANI, E. (1997). Neuro-fuzzy and soft computing: A computational approach to learning and machine intelligence. Upper Saddle River, NJ, Prentice Hall,1997
2. Himanshu Singh, Yunis Ahmad Lone, Deep Neuro-Fuzzy Systems with Python
3. With Case Studies and Applications from the Industry, Apress, 2020

REFERENCE BOOKS:

1. Roj Kaushikand Sunita Tiwari, Soft Computing-Fundamentals Techniques and Applications, 1st Edition, McGraw Hill, 2018.
2. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003.
3. Samir Roy, Udit Chakraborthy, Introduction to Soft Computing, Neuro Fuzzy and Genetic Algorithms, Pearson Education, 2013.
4. S.N. Sivanandam, S.N. Deepa, Principles of Soft Computing, Third Edition, Wiley India Pvt Ltd, 2019.
5. R.Eberhart, P.Simpson and R.Dobbins, "Computational Intelligence - PC Tools", AP Professional, Boston, 1996

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CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	3	-	-	-	3	1	3	2	3	1	2
CO2	2	3	3	2	3	-	-	-	3	2	3	2	2	1	3
CO3	1	3	2	2	1	-	-	-	3	1	1	2	1	3	2
CO4	1	2	1	3	2	-	-	-	3	3	1	1	2	1	1
CO5	2	3	1	2	1	-	-	-	3	3	3	2	1	2	3
AVG	1.8	2.6	2	2.4	2	-	-	-	3	2	2.2	1.8	1.8	1.6	2.2

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE14	TEXT AND SPEECH ANALYSIS (for B.E/B.Tech-CSE ,IT and AIDS)	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- Understand natural language processing basics
- Apply classification algorithms to text documents
- Build question-answering and dialogue systems
- Develop a speech recognition system
- Develop a speech synthesizer

UNIT-I **NATURAL LANGUAGE BASICS** **6**

Foundationsofnaturallanguageprocessing–LanguageSyntaxandStructure-TextPreprocessing andWrangling–Texttokenization–Stemming–Lemmatization–Removingstop-words–Feature EngineeringforTextrepresentation–BagofWordsmodel-BagofN-Gramsmodel–TF-IDFmodel

Suggested Activities

- Flipped classroom on NLP
- Implementation of Text Preprocessing using NLTK
- Implementation of TF-IDF models

Suggested Evaluation Methods

- Quizon NLP Basics
- Demonstration of Programs

UNIT-II **TEXT CLASSIFICATION** **6**

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

Suggested Activities

- Flipped classroom on Feature extraction of documents
- Implementation of SVM models for text classification
- External learning:Text summarization and Topic models

Suggested Evaluation Methods

- Assignment on above topics
- Quiz on RNN,Transformers
- Implementing NLP with RNN and Transformers

UNIT-III **QUESTION ANSWERING AND DIALOGUE SYSTEMS** **6**

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

Suggested Activities:

- Flipped classroom on language models for QA
- Developing a knowledge-based question-answering system

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- Classic QAmodel development

Suggested Evaluation Methods

- Assignment on the above topics
- Quizon knowledge-based question answering system
- Development of simple chatbots

UNIT-IV **TEXT-TO-SPEECHSYNTHESIS** **6**

Overview. Text normalization. Letter-to-sound. Prosody, Evaluation. Signal processing - Concatenative and parametric approaches, Wave Net and other deep learning-based TTS systems

Suggested Activities:

- Flipped classroom on Speech signal processing
- Exploring Text normalization
- Data collection
- Implementation of TTS systems

Suggested Evaluation Methods

- Assignment on the above topics
- Quizon wavenet,deep learning-based TTS systems
- Finding accuracy with different TTS systems

UNIT-V **AUTOMATIC SPEECH RECOGNITION** **6**

Speech recognition:Acoustic modelling-Feature Extraction-HMM,HMM-DNN systems

Suggested Activities:

- Flipped classroom on Speech recognition.
- Exploring Feature extraction

Suggested Evaluation Methods

- Assignment on the above topics
- Quizon acoustic modelling

30 PERIODS

PRACTICALEXERCISES **30 PERIODS**

1. Create Regular expressions in Python for detecting word patterns and tokenizing text
2. Getting started with Pythonand NLTK-Searching Text,Counting Vocabulary,Frequency Distribution, Collocations, Bigrams
3. Accessing Text Corpora using NLTK in Python
4. Write a function that finds the 50 most frequently occurring words of atext that arenot stop words.
5. ImplementtheWord2Vecmodel
6. Use a transformer for implementing classification
7. Design a chatbot with a simple dialog system
8. Convert text to speech and find accuracy
9. Design a speech recognition system and find the error rate

TOTAL:60PERIODS

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COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Explain existing and emerging deep learning architectures for text and speech processing.

CO2 : ApplydeeplearningtechniquesforNLPtasks,languagemodellingandmachinetranslation

CO3 : Explain co reference and coherence for text processing.

CO4 : Build question-answering systems,chat bot sand dialogue systems

CO5 : Applydeeplearningmodelsforbuildingspeechrecognitionandtext-to-speechsystems

TEXT BOOKS:

1.Daniel Jurafsky and James H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", Third Edition, 2022

REFERENCE BOOKS:

1.Dipanjan Sarkar, "Text Analytics with Python: A Practical Real-World approach to Gaining Actionable insights from your data", APress,2018.

2.Tanveer Siddiqui, Tiwary U S, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.

3.LawrenceRabiner,Biing-HwangJuang,B.Yegnanarayana,"FundamentalsofSpeech Recognition" 1st Edition, Pearson, 2009.

4.Steven Bird, Ewan Klein, and Edward Loper, "Natural language processing with Python", O'REILLY.

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	1	3	-	-	-	1	2	1	2	1	1	1
CO2	3	1	2	1	3	-	-	-	2	2	1	3	3	2	1
CO3	2	2	1	3	1	-	-	-	3	3	1	2	3	3	1
CO4	2	1	1	1	2	-	-	-	2	1	2	2	3	1	1
CO5	1	3	2	2	1	-	-	-	3	2	1	1	2	3	1
AVG	2.2	1.8	1.8	1.6	2	-	-	-	2.2	2	1.2	2	2.4	2	1

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE15	BUSINESS ANALYTICS (for B.E/B.Tech-CSE, IT and AIDS)	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To understand the Analytics Life Cycle.
- To comprehend the process of acquiring Business Intelligence
- To understand various types of analytics for Business Forecasting
- To model the supply chain management for Analytics.
- To apply analytics for different functions of a business

UNIT-I **INTRODUCTION TO BUSINESS ANALYTICS** **6**

Analytics and Data Science – Analytics Life Cycle – Types of Analytics – Business Problem Definition – Data Collection – Data Preparation – Hypothesis Generation – Modeling – Validation and Evaluation – Interpretation – Deployment and Iteration

UNIT-II **BUSINESS IN TELLIGENCE** **6**

DataWarehouses and DataMart-Knowledge Management–Types of Decisions-DecisionMaking Process - Decision Support Systems – Business Intelligence –OLAP – Analytic functions

UNIT-III **BUSINESS FORECASTING** **6**

Introduction to Business Forecasting and Predictive analytics-Logic and DataDriven Models–Data Mining and Predictive Analysis Modelling –Machine Learning for Predictive analytics

UNIT-IV **HR & SUPPLYCHAIN ANALYTICS** **6**

Human Resources–Planning and Recruitment–Training and Development-Supply chain network -Planning Demand,Inventory and Supply–Logistics–Analytics applications in HR&Supply Chain -Applying HR Analytics to make a prediction of the demand for hourly employees for a year

UNIT-V **MARKETING & SALES ANALYTICS** **10**

Marketing Strategy, Marketing Mix, Customer Behaviour –selling Process – Sales Planning – Analytics applications in Marketing and Sales -predictive analytics for customers' behaviour in marketing and sales

30PERIODS

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LISTOF EXPERIMENTS: **30PERIODS**

Use MS-Excel and Power-BIto perform the following experiments using a Business dataset, and make presentations.

Students may be encouraged to bring their own real-timesocially relevant dataset.

ICycle–MSExcel

1. Explore the features of Ms-Excel.
2. (i)Get the input from user and perform numerical operations(MAX,MIN,AVG,SUM, SQRT, ROUND)

ii)Perform data import/export operations for different file formats.

3. Perform statistical operations-Mean,Median,Mode and Standarddeviation,Variance, Skewness, Kurtosis
4. Perform Z-test,T-test&ANOVA
5. Perform data pre-processing operations i)Handling Missing dataii)Normalization
6. Perform dimensionality reduction operation using PCA,KPCA&SVD
7. Perform bivariate and multivariate analysis on the dataset.
8. Apply and explore various plotting functions on the data set.

IICycle–PowerBIDesktop

9. Explore the features of Power BIDesktop
10. Prepare & Load data
11. Develop the datamodel
12. Perform DAX calculations
13. Design a report
14. Create a dashboard and perform data analysis
15. Presentation of a case study

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Explain there world business problems and model with analytical solutions...

CO2 : Identify the business processes for extracting Business Intelligence

CO3 : Apply predictive analytics for business fore-casting.

CO4 : Apply analytics for supplychain and logistics management

CO5 : Useanalyticsformarketingandsales.

TOTAL : 60 PERIODS

TEXT BOOKS:

1. R.EvansJames,BusinessAnalytics,2ndEdition,Pearson, 2017

2.RNPrasad,SeemaAcharya, Fundamentals of Business Analytics,2ndEdition,Wiley, 2016

3.PhilipKotler and KevinKeller,MarketingManagement,15thedition,PHI,2016

4.VSPRAO,Human Resource Management,3rdEdition,ExcelBooks,2010.

5.MahadevanB,"OperationsManagement-TheoryandPractice",3rdEdition, PearsonEducation,2018.

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CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	1	1	-	-	-	1	2	1	1	3	2	1
CO2	3	3	3	2	3	-	-	-	1	2	2	2	3	1	2
CO3	2	2	3	3	2	-	-	-	3	1	1	3	3	1	2
CO4	2	1	1	2	2	-	-	-	3	3	2	1	1	3	1
CO5	2	3	2	3	2	-	-	-	3	3	1	3	3	1	1
AVG	2.2	2.2	2.4	2.2	2	-	-	-	2.2	2.2	1.4	2	2.6	1.6	1.4

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE16	IMAGE AND VIDEO ANALYTICS (for B.E/B.Tech-CSE, IT and AIDS)	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To 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.
- To understand the various Object recognition mechanisms.
- To elaborate on the video analytics techniques

UNIT-I **INTRODUCTION** **6**

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

UNIT-II **IMAGE PRE-PROCESSING** **6**

Localpre-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.

UNIT-III **OBJECT DETECTION USING MACHINE LEARNING** **6**

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

UNIT-IV **FACE RECOGNITION AND GESTURE RECOGNITION** **6**

Face Recognition-Introduction-Applications of Face Recognition-Process of Face Recognition-DeepFace solution by Facebook-FaceNet for Face Recognition- Implementation using FaceNet-Gesture Recognition

UNIT-V **VIDEO ANALYTICS** **6**

VideoProcessing–usecasesofvideoanalytics-VanishingGradientandexplodinggradientproblem-RestNet architecture-RestNet and skip connections-Inception Network-GoogleNet architecture-Improvement in Inception v2-Video analytics-RestNet and Inception v3

30PERIODS

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LISTOF EXERCISES **30 PERIODS**

1. Write a program that computes theT-pyramid of an image.
2. Write a programthatderivesthequadtreerepresentationofanimageusingthehomogeneity criterion of equal intensity
3. Developprogramsforthefollowinggeometrictransforms:(a)Rotation(b)Changeofscale
4. (c)Skewing(d)Affinetransformcalculatedfromthreepairsofcorrespondingpoints(e) Bilinear transform calculated from four pairs of corresponding points.
5. Develop a program to implement Object Detection and Recognition
6. Develop a program for motion analysis using moving edges,and apply it to your image sequences.
7. Develop a program for Facial Detection and Recognition
8. Write a program for event detection in video surveillance system

TOTAL:60PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Understand the basics of image processing techniques for computer vision and video analysis.

CO2 : Explain the techniques used for image pre-processing

CO3 : Develop various object detection techniques.

CO4 : Understand the various face recognition mechanisms.

CO5 : Elaborate on deeplearning-based video analytics.

TEXT BOOKS:

1.MilanSonka,VaclavHlavac,RogerBoyle,"ImageProcessing,Analysis,andMachine Vision", 4nd edition, Thomson Learning, 2013.

2.VaibhavVerdhan,(2021,Computer Vision Using DeepLearning Neural Network Architectures with Python and Keras,Apress 2021(UNIT-III,IV and V)

REFERENCE BOOKS:

1. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer Verlag London

2.Limited,2011.

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	2	2	-	-	-	3	3	2	1	2	1	3
CO2	2	2	3	3	3	-	-	-	3	2	1	1	2	2	1
CO3	1	2	2	2	3	-	-	-	1	2	1	2	1	1	3
CO4	1	2	3	2	3	-	-	-	2	2	2	3	2	2	2
CO5	3	2	1	3	2	-	-	-	2	1	1	3	3	2	1
AVG	2	1.8	2.2	2.4	2.6	-	-	-	2.2	2	1.4	2	2	1.6	2

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE17	COMPUTER VISION (for B.E/B.Tech-CSE, IT and AIDS)	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To understand the fundamental concepts related to Image formation and processing.
- To learn feature detection, matching and detection
- To become familiar with feature based alignment and motion estimation
- To develop skills on 3D reconstruction
- To understand image based rendering and recognition

UNIT-I INTRODUCTION TO IMAGEFORMATION AND PROCESSING 6

Computer Vision - Geometric primitives and transformations - Photometric image formation - The digitalcamera-Pointoperators-Linearfiltering-Moreneighborhoodoperators-Fouriertransforms -Pyramids and wavelets-Geometric transformations-Global optimization

UNIT-II FEATURE DETECTION,MATCHING AND SEGMENTATION 6

Points and patches- Edges-Lines-Segmentation-Active contours-Split and merge-Mean shift and mode finding - Normalized cuts - Graph cuts and energy-based methods

UNIT-III FEATURE-BASED ALIGNMENT & MOTION ESTIMATION 6

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

UNIT-IV 3D RECONSTRUCTION 6

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

UNIT-V IMAGE-BASED RENDERING AND RECOGNITION 6

View interpolation Layered depth images - Light fields and Lumi graphs - Environment mattes - Video-based rendering-Object detection - Face recognition - Instance recognition - Category recognition - Context and scene understanding- Recognition databases and test sets

30 PERIODS

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PRACTICAL EXERCISES: **30 PERIODS**

LABORATORY EXPERIMENTS:

Software needed:

Open CV computer vision Library for Open CV in Python / PyCharmor C++ / Visual Studio or or equivalent

- Open CV Installation and working with Python
- Basic Image Processing-loading images,Cropping,Resizing,Thresholding,Contour analysis, Bolb detection
- Image Annotation–Drawing lines,text circle,rectangle, ellipse on images
- Image Enhancement -Understanding Color spaces,color space conversion, Histogram equialization, Convolution, Image smoothing, Gradients, Edge Detection
- Image Features and Image Alignment – Image transforms – Fourier, Hough, Extract ORB Image features, Feature matching, cloning,Feature matching based image alignment
- Image segmentation using Graphcut/Grabcut
- Camera Calibration with circular grid
- Pose Estimation
- 3D Reconstruction–Creating Depth map from stereo images
- Object Detection and Tracking using Kalman Filter, Cam shift

TOTAL:60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : To understand basic knowledge, theories and methods in image processing and computer vision..

CO2 : To implement basic and some advanced image processing techniques in Open CV.

CO3 : To apply 2D a feature-based based image alignment, segmentation and motion estimations

CO4 : To apply 3D image reconstruction techniques

CO5 : To design and develop innovative image processing and computer vision applications.

TEXT BOOKS:

1.Richard Szeliski,"Computer Vision:Algorithms and Applications",Springer-Texts in Computer Science, Second Edition, 2022.

2.Computer Vision:A Modern Approach,D.A.Forsyth,J.Ponce,Pearson Education,Second Edition, 2015

REFERENCE BOOKS:

1.Richard Hartley and Andrew Zisserman,Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.

2 .Christopher M.Bishop;Pattern Recognition and Machine Learning,Springer,2006

3.E.R.Davies,Computer and Machine Vision,FourthEdition,AcademicPress,2012

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CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1	1	-	-	-	2	1	3	2	2	1	1
CO2	3	3	3	2	3	-	1	-	2	1	2	2	3	1	2
CO3	3	3	2	2	3	-	-	-	1	1	2	2	3	2	2
CO4	2	3	3	2	3	-	-	-	2	1	2	3	2	2	3
CO5	2	3	3	2	2	2	-	-	3	1	2	3	3	3	3
AVG	2.6	2.6	2.4	1.8	2.4	0.4	0.25	0	2	1	2.2	2.4	2.6	1.8	2.2

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE11	EXPLORATORY DATA ANALYSIS (for B.E/B.Tech-CSE and IT)	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To outline an exploratory data analysis.
- To implement visualization using Matplotlib.
- To perform univariate data exploration and analysis.
- To apply bivariate data exploration and analysis.
- To use Data exploration and visualization techniques for multivariate and time series data

UNIT -I INTRODUCTION EXPLORATORY DATA ANALYSIS 6

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.

UNIT- II DATA MANIPULATION USING PYTHON 6

Data Manipulation using Pandas – Pandas Objects – Data Indexing and Selection – Operating on Data – Handling Missing Data – Hierarchical Indexing – Combining datasets – Merge and Join – Aggregation and grouping – Pivot Tables – Vectorized String Operations

UNIT-III DESCRIPTIVE ANALYSIS 6

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

UNIT-IV PAIRED-VARIABLE ANALYSIS 6

Relationships between Two Variables - Percentage Tables - Analyzing Contingency Tables - Handling Several Batches - Scatter plots and Resistant Lines.

UNITV MULTIVARIATE STATISTICAL ANALYSIS 6

Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tables and Beyond–Fundamentals of TSA–Characteristics of time series data–Data Cleaning–Time-based indexing – Visualizing – Re sampling.

Total : 30PERIODS

PRACTICAL EXERCISES:

1. Install the data Analysis and Visualization tool: R/Python/Tableau Public/Power BI.
2. Perform exploratory data analysis (EDA) with datasets like email data set. Export all your emails as a dataset, import the minsideap and as dataframe, visualize them and get different insights from the data.
3. Explore various variable and row filters in R for cleaning data. Apply various plot features in

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R on sample data sets and visualize.

4. Perform Time Series Analysis and apply the various visualization techniques.
5. Perform Data Analysis and representation on a Map using various Map datasets with Mouse Rollover effect, user interaction, etc..
6. Build cartographic visualization for multiple data sets involving various countries of the world states and districts in India etc.
7. Perform EDA on Wine Quality Data Set.
8. Use a case study on a dataset and apply the various EDA and visualization techniques and present an analysis report.

TOTAL : 30 PERIODS
TOTAL:60(30+30) PERIODS

COURSE OUTCOMES:

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

CO1: Understand the fundamentals of exploratory data analysis.
CO2: Implement the data visualization using Matplotlib.
CO3: Perform univariate data exploration and analysis.
CO4: Apply bi variate data exploration and analysis.
CO5: Use Data exploration and visualization techniques for multivariate and time series data.

TEXT BOOKS:

1. Suresh Kumar Mukhiya, Usman Ahmed," Hands-On Exploratory Data Analysis with Python", Packt Publishing, 2020.(Unit 1)
2. Jake Vander Plas, "Python Data Science Handbook : Essential Tools for Working with Data", First Edition, O Reilly, 2017. (Unit 2)
3. Catherine Marsh, Jane Elliott, "Exploring Data: An Introduction to Data Analysis for Social Scientists", Wiley Publications, 2nd Edition, 2008. (Unit 3,4,5)

REFERENCES:

1. Eric Pimpler, Data Visualization and Exploration with R, GeoSpatialTrainingservice,2017.
2. Claus O.Wilke,"Fundamentals of Data Visualization", O'reilly publications,2019.
3. Matthew O.Ward, Georges Grinstein, Daniel Keim ,"Interactive Data Visualization: Foundations, Techniques, and Applications", 2nd Edition, CRC press, 2015.

E-RESOURCES:

1. https://nptel.ac.in/courses/10610407

CO's – PO's & PSO's MAPPING

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	3	3	3	-	-	-	2	2	3	2	3	3	2
2	2	2	2	3	3	-	-	-	3	2	2	2	1	2	3
3	2	3	2	2	3	-	-	-	2	2	2	1	2	3	1
4	2	2	2	2	3	-	-	-	3	2	2	1	2	2	2
5	2	2	3	2	1	-	-	-	1	2	2	1	2	2	3
AVg	2.2	2.2	2.4	2.4	2.6	-	-	-	2.2	2	2.2	1.4	2	2.4	2.2

1-low,2-medium,3-high,'-'-no correlation

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VERTICAL 2: FULL STACK DEVELOPMENT for IT											
S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
1.	23CSE31	Cloud Computing	PE	2	0	2	4	3	50	50	100
2.	23CSE22	App Development	PE	2	0	2	4	3	50	50	100
3.	23CSE23	Cloud Services Management	PE	2	0	2	4	3	50	50	100
4.	23CSE24	UI and UX Design	PE	2	0	2	4	3	50	50	100
5.	23CSE25	Software Testing and Automation	PE	2	0	2	4	3	50	50	100
6.	23CSE26	Web Application Security	PE	2	0	2	4	3	50	50	100
7.	23CSE27	DevOps	PE	2	0	2	4	3	50	50	100
8.	23CSE28	Principles of Programming Languages	PE	3	0	0	3	3	40	60	100

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23CSE31	CLOUD COMPUTING (for B.E/B.Tech-CSE, IT and AIDS)	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To understand the principles of cloud architecture, models and infrastructure.
- To understand the concepts of virtualization and virtual machines.
- To gain knowledge about virtualization Infrastructure.
- To explore and experiment with various Cloud deployment environments.
- To learn about the security issues in the cloud environment.

UNIT-I CLOUD ARCHITECTURE MODELS AND INFRASTRUCTURE 6

Cloud Architecture: System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture – Cloud deployment models – Cloud service models; Cloud Infrastructure: Architectural Design of Compute and Storage Clouds – Design Challenges.

UNIT-II VIRTUALIZATION BASICS 6

Virtual Machine Basics – Taxonomy of Virtual Machines – Hypervisor – Key Concepts – Virtualization structure – Implementation levels of virtualization – Virtualization Types: Full Virtualization – Para Virtualization – Hardware Virtualization – Virtualization of CPU, Memory and I/O devices.

UNIT-III VIRTUALIZATION INFRASTRUCTURE AND DOCKER 7

Desktop Virtualization – Network Virtualization – Storage Virtualization – System-level of Operating Virtualization – Application Virtualization – Virtual clusters and Resource Management – Containers vs. Virtual Machines – Introduction to Docker – Docker Components – Docker Container – Docker Images and Repositories.

UNIT-IV CLOUD DEPLOYMENT ENVIRONMENT 6

Google App Engine – Amazon AWS – Microsoft Azure; Cloud Software Environments – Eucalyptus – OpenStack.

UNIT-V CLOUD SECURITY 5

Virtualization System-Specific Attacks: Guest hopping – VM migration attack – hyperjacking. Data Security and Storage; Identity and Access Management (IAM) - IAM Challenges - IAM Architecture and Practice.

30 PERIODS

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PRACTICAL EXERCISES: **30 PERIODS**

1. Install Virtualbox/VMware/ Equivalent open source cloud Workstation with different flavours of Linux or Windows OS on top of windows 8 and above.
2. Install a C compiler in the virtual machine created using a virtual box and execute Simple Programs
3. Install Google App Engine. Create a hello world app and other simple web applications using python/java.
4. Use the GAE launcher to launch the web applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Install Hadoop single node cluster and run simple applications like wordcount.
8. Creating and Executing Your First Container Using Docker.
9. Run a Container from Docker Hub

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Understand the design challenges in the cloud.
CO2: Apply the concept of virtualization and its types.
CO3: Experiment with virtualization of hardware resources and Docker.
CO4: Develop and deploy services on the cloud and set up a cloud environment..
CO5: Explain security challenges in the cloud environment.

TOTAL : 60 PERIODS

TEXT BOOKS:

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. James Turnbull, "The Docker Book", O'Reilly Publishers, 2014.
3. Krutz, R. L., Vines, R. D, "Cloud security. A Comprehensive Guide to Secure CloudComputing", Wiley Publishing, 2010.

REFERENCE BOOKS:

1. James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.
2. Tim Mather, Subra Kumaraswamy, and Shahed Latif, "Cloud Security and Privacy: anenterprise perspective on risks and compliance", O'Reilly Media, Inc., 2009.

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CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	-	-	-	2	3	1	3	2	1	3
CO2	3	1	2	2	1	-	-	-	1	2	1	3	2	2	1
CO3	2	3	2	3	1	-	-	-	3	1	1	3	1	1	1
CO4	1	2	3	3	3	-	-	-	3	3	1	2	1	3	3
CO5	2	3	3	1	3	-	-	-	2	2	1	2	2	2	3
AVG	2.2	2.2	2.2	2	1.8	-	-	-	2.2	2.2	1	2.6	1.6	1.8	2.2

1 - low, 2 - medium, 3 - high, '-' - no correlation

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		L	T	P	C
23CSE22	APP DEVELOPMENT (for B.E/B.Tech-CSE, IT and AIDS)	2	0	2	3

COURSE OBJECTIVES:

- To learn development of native applications with basic GUI Components
- To develop cross-platform applications with event handling
- To develop applications with location and data storage capabilities
- To develop web applications with database access

UNIT-I FUNDAMENTALS OF MOBILE & WEB APPLICATION DEVELOPMENT 6

Basics of Web and Mobile application development, Native App, Hybrid App, Cross-platform App,What is Progressive Web App, Responsive Web design.

UNIT-II NATIVE APP DEVELOPMENT USING JAVA 6

Native Web App, Benefits of Native App, Scenarios to create Native App, Tools for creating Native App, Cons of Native App, Popular Native App Dev elopment Frameworks, Java & Kotlin for Android, Swift & Objective-C for iOS, Basics of React Native, Native Components, JSX, State, Props.

UNIT-III HYBRID APP DEVELOPMENT 6

Hybrid Web App, Benefits of Hybrid App, Criteria for creating Native App, Tools for creating Hybrid App, Cons of Hybrid App, Popular Hybrid App Development Frameworks, Ionic, Apache Cordova.

UNIT-IV CROSS-PLATFORM APP DEVELOPMENT USING REACT-NATIVE 6

What is Cross-platform App, Benefits of Cross-platform App, Criteria for creating Cross-platform App, Tools for creating Cross-platform App, Cons of Cross-platform App, Popular Cross-platform App Development Frameworks, Flutter, Xamarin, React-Native, Basics of React Native, Native Components, JSX, State, Props.

UNIT-V NON-FUNCTIONAL CHARACTERISTICS OF APP FRAMEWORKS 6

Comparison of different Ap p frameworks, Build Performance, App Performance, Debugging capabilities, Time to Market, Maintainability, Ease of Development, UI/UX, Reusability

30 PERIODS

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PRACTICAL EXERCISES: **30 PERIODS**

1. Using react native, build a cross platform application for a BMI calculator.
2. Build a cross platform application for a simple expense manager which allows entering expenses and income on each day and displays category wise weekly income and expense.
3. Develop a cross platform application to convert units from imperial system to metric system (km to miles, kg to pounds etc.,)
4. Design and develop a cross platform application for day to day task (to-do) management.
5. Design an android application using Cordova for a user login screen with username, password, reset button and a submit button. Also, include header image and a label. Use layout managers.
6. Design and develop an android application using Apache Cordova to find and display the current location of the user.
7. Write programs using Java to create Android application having Databases
   - For a simple library application.
   - For displaying books available, books lend, book reservation. Assume that student information is available in a database which has been stored in a database server.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Develop Native applications with GUI Components.

CO2: Develop hybrid applications with basic event handling.

CO3: Implement cross-platform applications with location and data storage capabilities.

CO4: Implement cross platform applications with basic GUI and event handling.

CO5: Develop web applications with cloud database access.

TOTAL : 60 PERIODS

TEXT BOOKS:

1. Head First Android Development, Dawn Griffiths, O'Reilly, 1st edition.
2. Apache Cordova in Action, Raymond K. Camden, Manning. 2015.
3. Full Stack React Native: Create beautiful mobile apps with JavaScript and React Native, Anthony Accomazzo, Houssein Djirdeh, Sophia Shoemaker, Devin Abbott, FullStack publishing.

REFERENCE BOOKS:

1. Android Programming for Beginners, John Horton, Packt Publishing, 2nd Edition.
2. Native Mobile Development by Shaun Lewis, Mike Dunn.
3. Building Cross-Platform Mobile and Web Apps for Engineers and Scientists: An Active Learning Approach, Pawan Lingras, Matt Triff, Rucha Lingras.
4. Apache Cordova 4 Programming, John M Wargo, 2015.
5. React Native Cookbook, Daniel Ward, Packt Publishing, 2nd Edition.

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CO's – PO's & PSO's MAPPING

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CO2	2	1	3	2	2	-	-	-	3	2	2	3	3	2	1
CO3	2	2	2	1	2	-	-	-	1	1	1	1	1	1	2
CO4	1	3	1	1	3	-	-	-	1	1	3	2	1	3	1
CO5	1	1	3	1	3	-	-	-	1	1	2	1	3	2	1
AVG	1.6	1.8	2	1.4	2.6	-	-	-	1.4	1.2	2	1.6	2	2.2	1.6

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE23 **CLOUD SERVICES MANAGEMENT**

L	T	P	C
2	0	2	3

COURSE OBJECTIVES:

- Introduce Cloud Service Management terminology, definition & concepts
- Compare and contrast cloud service management with traditional IT service management
- Identify strategies to reduce risk and eliminate issues associated with adoption of cloudservices
- Select appropriate structures for designing, deploying and running cloud-based services ina business environment
- Illustrate the benefits and drive the adoption of cloud-based services to solve real worldproblems

UNIT-I **CLOUD SERVICE MANAGEMENT FUNDAMENTALS** **6**

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-II **CLOUD SERVICES STRATEGY** **6**

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-III **CLOUD SERVICE MANAGEMENT** **6**

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

UNIT-IV **CLOUD SERVICE ECONOMICS** **6**

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-V **CLOUD SERVICE GOVERNANCE & VALUE** **6**

IT Governance Definition, Cloud Governance Definition, Cloud Governance Framework, Cloud Governance Structure, Cloud Governance Considerations, Cloud

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Service Model Risk Matrix, Understanding Value of Cloud Services, Measuring the value of Cloud Services, Balanced Scorecard, Total Cost of Ownership

TOTAL : 30 PERIODS

PRACTICAL EXERCISES: **30 PERIODS**

1. Create a Cloud Organization in AWS/Google Cloud/or any equivalent Open Source cloud softwares like Openstack, Eucalyptus, Open Nebula with Role-based access control.
2. Create a Cost-model for a web application using various services and do Cost-benefitanalysis
3. Create alerts for usage of Cloud resources.
4. Create Billing alerts for your Cloud Organization.
5. Compare Cloud cost for a simple web application across AWS, Azure and GCP andsuggest the best one.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Exhibit cloud-design skills to build and automate business solutions using cloud technologies.

CO2: Possess Strong theoretical foundation leading to excellence and excitement towards adoption of cloud-based services.

CO3: Solve the real world problems using Cloud services and technologies.

CO4: Understand the economic principles of cloud computing.

CO5: Implement effective governance policies and frameworks that ensure compliance, risk management, and measurable business value from cloud services.

TEXT BOOKS:

1. Cloud Service Management and Governance: Smart Service Management in Cloud Era byEnamul Haque, Enel Publications.
2. Cloud Computing: Concepts, Technology & Architecture by Thomas Erl, Ricardo Puttini,Zaigham Mohammad 2013.
3. Cloud Computing Design Patterns by Thomas Erl, Robert Cope, Amin Naserpour.

REFERENCES:

1. Economics of Cloud Computing by Praveen Ayyappa, LAP Lambert Academic Publishing.
2. Mastering Cloud Computing Foundations and Applications Programming Rajkumar Buyya,Christian Vechhiola, S. Thamarai Selvi.

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CO's – PO's & PSO's MAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	-	1	-	-	-	-	2	1	-	-	-
CO2	3	2	2	2	1	1	-	-	-	-	2	1	-	-	-
CO3	3	2	2	2	1	1	-	-	-	-	2	1	-	-	-
CO4	3	2	2	2	1	1	-	-	-	-	2	1	-	-	-
CO5	3	2	2	2	1	1	-	-	-	-	2	1	-	-	-
AVG	**3**	**2**	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**2**	**1**	**-**	**-**	**-**

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE24	UI AND UX DESIGN	L	T	P	C
	(for B.E/B.Tech-CSE, IT and AIDS)	2	0	2	3

COURSE OBJECTIVES:

- To provide a sound knowledge in UI & UX
- To understand the need for UI and UX
- To understand the various Research Methods used in Design
- To explore the various Tools used in UI & UX
- Creating a wireframe and prototype

UNIT-I **FOUNDATIONS OF DESIGN** **6**

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

UNIT-II **FOUNDATIONS OF UI DESIGN** **6**

Visual and UI Principles - UI Elements and Patterns - Interaction Behaviors and Principles – Branding - Style Guides

UNIT-III **FOUNDATIONS OF UX DESIGN** **6**

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

UNIT-IV **WIREFRAMING, PROTOTYPING AND TESTING** **6**

Sketching Principles - Sketching Red Routes - Responsive Design – Wire framing - Creating Wire flows - Building a Prototype - Building High-Fidelity Mockups - Designing Efficiently with Tools - Interaction Patterns - Conducting Usability Tests - Other Evaluative User Research Methods - Synthesizing Test Findings - Prototype Iteration

UNIT-V **RESEARCH, DESIGNING, IDEATING, & INFORMATION ARCHITECTURE** **6**

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

30 PERIODS

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PRACTICAL EXERCISES: **30 PERIODS**

1. Designing a Responsive layout for an societal application
2. Exploring various UI Interaction Patterns
3. Developing an interface with proper UI Style Guides
4. Developing Wire flow diagram for application using open source software
5. Exploring various open source collaborative interface Platform
6. Hands on Design Thinking Process for a new product
7. Brainstorming feature for proposed product
8. Defining the Look and Feel of the new Project
9. Create a Sample Pattern Library for that product (Mood board, Fonts, Colors based on UI principles)
10. Identify a customer problem to solve
11. Conduct end-to-end user research - User research, creating personas, Ideation process (User stories, Scenarios), Flow diagrams, Flow Mapping

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Build UI for user Applications.

CO2: Evaluate UX design of any product or application.

CO3: Demonstrate UX Skills in product development.

CO4: Implement Sketching principles.

CO5: Create Wireframe and Prototype.

TOTAL: 60 (30+30) PERIODS

TEXT BOOKS:

1. Joel Marsh, "UX for Beginners", O'Reilly , 2022.
2. Jon Yablonski, "Laws of UX using Psychology to Design Better Product & Services" O'Reilly 2021.

REFERENCE BOOKS:

1. Jenifer Tidwell, Charles Brewer, Aynne Valencia, "Designing Interface" 3 rd Edition , O'Reilly 2020.
2. Steve Schoger, Adam Wathan "Refactoring UI", 2018.
3. Steve Krug, "Don't Make Me Think, Revisited: A Commonsense Approach to Web & Mobile", Third Edition, 2015.

E-RESOURCES :

https://www.nngroup.com/articles/

https://www.interaction-design.org/literature

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CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	3	1	-	-	-	3	3	2	1	3	3	1
CO2	2	3	1	3	2	-	-	-	1	2	2	2	1	2	2
CO3	1	3	3	2	2	-	-	-	2	3	1	2	1	3	3
CO4	1	2	3	3	1	-	-	-	3	2	1	3	3	3	3
CO5	1	2	3	2	1	-	-	-	2	1	1	1	3	2	2
AVG	1.6	2.2	2.2	2.6	1.4	-	-	-	2.2	2.2	1.4	1.8	2.2	2.6	2.2

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE25	SOFTWARE TESTING AND AUTOMATION (for B.E/B.Tech-CSE, IT and AIDS)	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES

- To understand the basics of software testing
- To learn how to do the testing and planning effectively
- To build test cases and execute them
- To focus on wide aspects of testing and understanding multiple facets of testing
- To get an insight about test automation and the tools used for test automation

UNIT I FOUNDATIONS OF SOFTWARE TESTING 6

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 II TEST PLANNING 6

The Goal of Test Planning, High Level Expectations, Inter group Responsibilities, Test Phases, Test Strategy, Resource Requirements, Tester Assignments, Test Schedule, Test Cases, Bug Reporting, Metrics and Statistics.

UNIT III TEST DESIGN AND EXECUTION 6

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 IV ADVANCED TESTING CONCEPTS 6

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 V TEST AUTOMATION AND TOOLS 6

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.

30 PERIODS

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PRACTICAL EXERCISES: **30 PERIODS**

1. Develop the test plan for testing an e-commerce web/mobile application (www.amazon.in).
2. Design the test cases for testing the e-commerce application
3. Test the e-commerce application and report the defects in it.
4. Develop the test plan and design the test cases for an inventory control system.
5. Execute the test cases against a client server or desktop application and identify the defects.
6. Test the performance of the e-commerce application.
7. Automate the testing of e-commerce applications using Selenium.
8. Integrate TestNG with the above test automation.
9. Mini Project:
   a) Build a data-driven framework using Selenium and TestNG
   b) Build Page object Model using Selenium and TestNG
   c) Build BDD framework with Selenium, TestNG and Cucumber

COURSE OUTCOMES:

Upon completion of this course, the 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 : Carryout advanced types of testing

CO5: Automate the software testing using Selenium and TestNG

TEXT BOOKS:

1. YogeshSingh,"SoftwareTesting",CambridgeUniversityPress,2012
2. Unmesh Gundecha, Satya Avasarala, "Selenium WebDriver 3 Practical Guide"- SecondEdition 2018

REFERENCE BOOKS:

1. GlenfordJ. Myers, Corey Sandler, Tom Badgett, The Art of Software Testing, 3rdEdition, 2012, John Wiley & Sons, Inc.
2. Ron Patton, Software testing, 2ndEdition,2006,Sams Publishing.
3. PaulC. Jorgensen, Software Testing: A Craftsman's Approach, FourthEdition,2014,Taylor & Francis Group.
4. CarlCocchiaro, Selenium Framework Design in Data-Driven Testing, 2018, Packt Publishing.
5. Elfriede Dustin, Thom Garrett,BernieGaurf, Implementing Automated Software Testing, 2009, Pearson Education, Inc.
6. Satya Avasarala, Selenium Web Driver PracticalGuide,2014, Packt Publishing.
7. Varun Menon, TestNg Beginner's Guide,2013,Packt Publishing.

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CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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CO2	2	3	1	1	1	-	-	-	2	2	1	2	1	2	3
CO3	2	2	1	3	1	-	-	-	1	3	1	2	2	3	2
CO4	2	1	3	2	1	-	-	-	1	1	1	2	3	1	2
CO5	2	2	1	3	1	-	-	-	1	3	2	1	2	1	3
AVG	2.2	2.2	1.6	2	1.2	-	-	-	1.2	2	1.6	1.8	2.2	1.8	2.6

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE26	WEB APPLICATION SECURITY (for B.E/B.Tech-CSE, IT and AIDS)	L T P C 2 0 2 3

COURSE OBJECTIVES:

- To understand the fundamentals of web application security
- To focus on wide aspects of secure development and deployment of web applications
- To learn how to build secure APIs
- To learn the basics of vulnerability assessment and penetration testing
- To get an insight about Hacking techniques and Tools

UNIT-I FUNDAMENTALS OF WEB APPLICATION SECURITY 6

The history of Software Security-Recognizing Web Application Security Threats, Web Application Security, Authentication and Authorization, Secure Socket layer, Transport layer Security, Session Management-Input Validation

UNIT-II SECURE DEVELOPMENT AND DEPLOYMENT 5

Web Applications Security - Security Testing, Security Incident Response Planning,The Microsoft Security Development Lifecycle (SDL), OWASP Comprehensive Lightweight Application Security Process (CLASP), The Software Assurance Maturity Model (SAMM)

UNIT-III SECURE API DEVELOPMENT 6

API Security- Session Cookies, Token Based Authentication, Securing Natter APIs: Addressing threats with Security Controls, Rate Limiting for Availability, Encryption, Audit logging, Securing service-to-service APIs: API Keys , OAuth2, Securing Microservice APIs: Service Mesh, Locking Down Network Connections, Securing Incoming Requests.

UNIT-IV VULNERABILITY ASSESSMENT AND PENETRATION TESTING 6

Vulnerability Assessment Lifecycle, Vulnerability Assessment Tools: Cloud-based vulnerability scanners, Host-based vulnerability scanners, Network-based vulnerability scanners, Database-based vulnerability scanners, Types of Penetration Tests: External Testing, Web Application Testing, Internal Penetration Testing, SSID or Wireless Testing, Mobile Application Testing.

UNIT-V HACKING TECHNIQUES AND TOOLS 7

Social Engineering, Injection, Cross-Site Scripting(XSS), Broken Authentication and Session Management, Cross-Site Request Forgery, Security Misconfiguration, Insecure Cryptographic Storage, Failure to Restrict URL Access, Tools: Comodo, OpenVAS, Nexpose, Nikto, Burp Suite, etc

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30 PERIODS

PRACTICAL EXERCISES: **30 PERIODS**

1. Install wireshark and explore the various protocols
   a. Analyze the difference between HTTP vs HTTPS
   b. Analyze the various security mechanisms embedded with different protocols.
2. Identify the vulnerabilities using OWASP ZAP tool
3. Create simple REST API using python for following operation
   a. GET
   b. PUSH
   c. POST
   d. DELETE
4. Install Burp Suite to do following vulnerabilities:
   a. SQL injection
   b. cross-site scripting (XSS)
5. Attack the website using Social Engineering method

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Understanding the basic concepts of web application security and the need for it.

CO2: Be acquainted with the process for secure development and deployment of web applications.

CO3: Acquire the skill to design and develop Secure Web Applications that use Secure APIs.

CO4: Be able to get the importance of carrying out vulnerability assessment and penetrationtesting

CO5: Acquire the skill to think like a hacker and to use hackers tool sets

TOTAL : 60 PERIODS

TEXT BOOKS:

1. Andrew Hoffman, Web Application Security: Exploitation and Countermeasures for Modern Web Applications, First Edition, 2020, O'Reilly Media, Inc.
2. Bryan Sullivan, Vincent Liu, Web Application Security: A Beginners Guide, 2012, The McGraw-Hill Companies.
3. Neil Madden, API Security in Action, 2020, Manning Publications Co., NY, USA.

REFERENCE BOOKS:

1. Michael Cross, Developer's Guide to Web Application Security, 2007, Syngress Publishing, Inc.
2. Ravi Das and Greg Johnson, Testing and Securing Web Applications, 2021, Taylor & Francis Group, LLC.
3. Prabath Siriwardena, Advanced API Security, 2020, Apress Media LLC, USA.
4. Malcom McDonald, Web Security for Developers, 2020, No Starch Press, Inc.

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5. Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, Gideon Lenkey, and Terron Williams Grey Hat Hacking: The Ethical Hacker's Handbook, Third Edition, 2011, The McGraw-Hill Companies.3. Steve Krug, "Don't Make Me Think, Revisited: A Commonsense Approach to Web & Mobile", Third Edition, 2015.

4. https://www.nngroup.com/articles/

5. https://www.interaction-design.org/literature

CO's – PO's & PSO's MAPPING

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CO3	1	1	1	2	3	-	-	-	-	-	-	1	-	-	-
CO4	1	2	1	1	2	-	-	-	-	-	-	-	-	-	-
CO5	1	2	2	2	2	-	-	-	-	-	-	1	-	-	-
AVG	1.2	1.6	1.6	1.4	2.6	-	-	-	-	-	-	0.6	-	-	-

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23CSE27	DEVOPS (for B.E/B.Tech-CSE, IT and AIDS)	L T P C 2 0 2 3

COURSE OBJECTIVES:

- To introduce DevOps terminology, definition & concepts
- To understand the different Version control tools like Git, Mercuria
- To understand the concepts of Continuous Integration/ Continuous Testing/ Continuous Deployment)
- To understand Configuration management using Ansible
- Illustrate the benefits and drive the adoption of cloud-based Devops tools to solve realworld problems

UNIT-I **INTRODUCTION TO DEVOPS** **6**

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

UNIT-II **COMPILE AND BUILD USING MAVEN & GRADLE** **6**

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-III **CONTINUOUS INTEGRATION USING JENKINS** **6**

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-IV **CONFIGURATION MANAGEMENT USING ANSIBLE** **6**

Ansible Introduction, Installation, Ansible master/slave configuration, YAML basics, Ansible modules, Ansible Inventory files, Ansible playbooks, Ansible Roles, adhoc commands in ansible

UNIT-V **BUILDING DEVOPS PIPELINES USING AZURE** **6**

Create Github Account, Create Repository, Create Azure Organization, Create a new pipeline, Build a sample code, Modify azure-pipelines.yaml file

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30 PERIODS

PRACTICAL EXERCISES: **30 PERIODS**

1. Create Maven Build pipeline in Azure
2. Run regression tests using Maven Build pipeline in Azure
3. Install Jenkins in Cloud
4. Create CI pipeline using Jenkins
5. Create a CD pipeline in Jenkins and deploy in Cloud
6. Create an Ansible playbook for a simple web application infrastructure
7. Build a simple application using Gradle
8. Install Ansible and configure ansible roles and to write playbooks

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Understand different actions performed through Version control tools like Git.

CO2: Perform Continuous Integration and Continuous Testing and Continuous Deployment using Jenkins by building and automating test cases using Maven & Gradle.

CO3: Ability to Perform Automated Continuous Deployment.

CO4: Ability to do configuration management using Ansible.

CO5: Understand to leverage Cloud-based DevOps tools using Azure DevOps.

TOTAL : 60 PERIODS

TEXT BOOKS:

1. Roberto Vormittag, "A Practical Guide to Git and GitHub for Windows Users: From Beginner to Expert in Easy Step-By-Step Exercises", Second Edition, Kindle Edition, 2016.
2. Jason Cannon, "Linux for Beginners: An Introduction to the Linux Operating System and Command Line", Kindle Edition, 20143. Neil Madden, API Security in Action, 2020, Manning Publications Co., NY, USA.

REFERENCE BOOKS:

1. Hands-On Azure Devops: Cicd Implementation For Mobile, Hybrid, And Web Applications Using Azure Devops And Microsoft Azure: CICD Implementation for ... DevOps and Microsoft Azure (English Edition) Paperback – 1 January 2020 by Mitesh Soni.
2. Jeff Geerling, "Ansible for DevOps: Server and configuration management for humans", First Edition, 2015.
3. David Johnson, "Ansible for DevOps: Everything You Need to Know to Use Ansible for DevOps", Second Edition, 2016.

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5. Mariot Tsitoara, "Ansible 6. Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the New Developer", Second Edition, 2019.
6. https://www.jenkins.io/user-handbook.pdf
7. https://maven.apache.org/guides/getting-started/

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	-	-	-	-	-	-	-	2	2	2
CO2	3	3	3	2	3	-	-	-	-	-	-	-	2	2	2
CO3	3	3	3	2	3	-	-	-	-	-	-	-	2	2	2
CO4	3	3	3	2	3	-	-	-	-	-	-	-	2	2	2
CO5	3	3	3	2	3	-	-	-	-	-	-	-	2	2	2
AVG	3	3	3	2	3	-	-	-	-	-	-	-	2	2	2

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE28	PRINCIPLES OF PROGRAMMING LANGUAGES (for B.E/B.Tech-CSE, IT and AIDS)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand and describe syntax and semantics of programming languages.
- To understand data, data types, and basic statements.
- To understand call-return architecture and ways of implementing them.
- To understand object-orientation, concurrency, and event handling in programming languages.
- To develop programs in non-procedural programming paradigms.

UNIT-I **SYNTAX AND SEMANTICS** **9**

Evolution of programming languages – describing syntax – context-free grammars – attribute grammars – describing semantics – lexical analysis – parsing – recursive-descent – bottom up parsing

UNIT-II **DATA, DATA TYPES, AND BASIC STATEMENTS** **9**

Names – variables – binding – type checking – scope – scope rules – lifetime and garbage collection – primitive data types – strings – array types – associative arrays – record types – union types – pointers and references – Arithmetic expressions – overloaded operators – type conversions – relational and boolean expressions – assignment statements – mixed mode assignments – control structures – selection – iterations – branching – guarded statements

UNIT-III **SUBPROGRAMS AND IMPLEMENTATIONS** **9**

Subprograms – design issues – local referencing – parameter passing – overloaded methods – generic methods – design issues for functions – semantics of call and return – implementing simple subprograms – stack and dynamic local variables – nested subprograms – blocks – dynamic scoping

UNIT-IV **OBJECT-ORIENTATION, CONCURRENCY, AND EVENT HANDLING** **9**

Object-orientation – design issues for OOP languages – implementation of object-oriented constructs – concurrency – semaphores – monitors – message passing – threads – statement level concurrency – exception handling – event handling

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UNIT-V **FUNCTIONAL AND LOGIC PROGRAMMING LANGUAGES** **9**

Introduction to lambda calculus – fundamentals of functional programming languages – Programming with Scheme – Programming with ML – Introduction to logic and logic programming – Programming with Prolog – multi-paradigm languages

TOTAL:45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Describe syntax and semantics of programming languages.

CO2: Explain data, data types, and basic statements of programming languages.

CO3: Design and implement subprogram constructs.

CO4: Apply object-oriented, concurrency, and event handling programming constructs andDevelop programs in Scheme, ML, and Prolog.

CO5: Understand and adopt new programming languages.

TEXT BOOKS:

1. Robert W. Sebesta, "Concepts of Programming Languages", Twelfth Edition (Global Edition), Pearson, 2022.
2. Michael L. Scott, "Programming Language Pragmatics", Fourth Edition, Elsevier, 2018.
3. R. Kent Dybvig, "The Scheme programming language", Fourth Edition, Prentice Hall, 2011.
4. Jeffrey D. Ullman, "Elements of ML programming", Second Edition, Pearson, 1997.
5. W. F. Clocksin and C. S. Mellish, "Programming in Prolog: Using the ISO Standard", Fifth Edition, Springer, 2003.

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	2	1	-	-	-	-	-	-	3	2	3	-
CO2	3	3	3	2	2	-	-	-	-	-	-	3	2	3	-
CO3	3	3	3	2	2	-	-	-	-	-	-	3	2	3	-
CO4	3	3	3	3	2	2	-	-	-	-	-	-	3	2	-
CO5	3	3	3	3	3	3	2	2	1	3	1	3	3	3	-
AVG	1.6	2.2	2.2	2.6	1.4	-	-	-	2.2	2.2	1.4	1.8	2.2	2.6	2.2

1 - low, 2 - medium, 3 - high, '-' - no correlation

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VERTICAL 3: CLOUD COMPUTING AND DATA CENTER TECHNOLOGIES											
S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
1.	23CSE31	Cloud Computing	PE	2	0	2	4	3	50	50	100
2.	23CSE32	Virtualization	PE	2	0	2	4	3	50	50	100
3.	23CSE23	Cloud Services Management	PE	2	0	2	4	3	50	50	100
4.	23CSE34	Data Warehousing	PE	2	0	2	4	3	50	50	100
5.	23CSE35	Storage Technologies	PE	3	0	0	3	3	40	60	100
6.	23CSE36	Software Defined Networks	PE	2	0	2	4	3	50	50	100
7.	23CSE37	Stream Processing	PE	2	0	2	4	3	50	50	100
8.	23CSE38	Security and Privacy in Cloud	PE	2	0	2	4	3	50	50	100

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23CSE31	CLOUD COMPUTING (for B.E/B.Tech-CSE, IT and AIDS)	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To understand the principles of cloud architecture, models and infrastructure.
- To understand the concepts of virtualization and virtual machines.
- To gain knowledge about virtualization Infrastructure.
- To explore and experiment with various Cloud deployment environments.
- To learn about the security issues in the cloud environment.

UNIT-I CLOUD ARCHITECTURE MODELS AND INFRASTRUCTURE 6

Cloud Architecture: System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture – Cloud deployment models – Cloud service models; Cloud Infrastructure: Architectural Design of Compute and Storage Clouds – Design Challenges.

UNIT-II VIRTUALIZATION BASICS 6

Virtual Machine Basics – Taxonomy of Virtual Machines – Hypervisor – Key Concepts – Virtualization structure – Implementation levels of virtualization – Virtualization Types: Full Virtualization – Para Virtualization – Hardware Virtualization – Virtualization of CPU, Memory and I/O devices.

UNIT-III VIRTUALIZATION INFRASTRUCTURE AND DOCKER 7

Desktop Virtualization – Network Virtualization – Storage Virtualization – System-level of Operating Virtualization – Application Virtualization – Virtual clusters and Resource Management – Containers vs. Virtual Machines – Introduction to Docker – Docker Components – Docker Container – Docker Images and Repositories.

UNIT-IV CLOUD DEPLOYMENT ENVIRONMENT 6

Google App Engine – Amazon AWS – Microsoft Azure; Cloud Software Environments – Eucalyptus – OpenStack.

UNIT-V CLOUD SECURITY 5

Virtualization System-Specific Attacks: Guest hopping – VM migration attack – hyperjacking. Data Security and Storage; Identity and Access Management (IAM) - IAM Challenges - IAM Architecture and Practice.

30 PERIODS

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PRACTICAL EXERCISES: **30 PERIODS**

1. Install Virtualbox/VMware/ Equivalent open source cloud Workstation with different flavours of Linux or Windows OS on top of windows 8 and above.
2. Install a C compiler in the virtual machine created using a virtual box and execute Simple Programs
3. Install Google App Engine. Create a hello world app and other simple web applications using python/java.
4. Use the GAE launcher to launch the web applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Install Hadoop single node cluster and run simple applications like wordcount.
8. Creating and Executing Your First Container Using Docker.
9. Run a Container from Docker Hub

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Understand the design challenges in the cloud.
CO2: Apply the concept of virtualization and its types.
CO3: Experiment with virtualization of hardware resources and Docker.
CO4: Develop and deploy services on the cloud and set up a cloud environment..
CO5: Explain security challenges in the cloud environment.

TOTAL : 60 PERIODS

TEXT BOOKS:

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. James Turnbull, "The Docker Book", O'Reilly Publishers, 2014.
3. Krutz, R. L., Vines, R. D, "Cloud security. A Comprehensive Guide to Secure CloudComputing", Wiley Publishing, 2010.

REFERENCE BOOKS:

1. James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.
2. Tim Mather, Subra Kumaraswamy, and Shahed Latif, "Cloud Security and Privacy: anenterprise perspective on risks and compliance", O'Reilly Media, Inc., 2009.

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CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	-	-	-	2	3	1	3	2	1	3
CO2	3	1	2	2	1	-	-	-	1	2	1	3	2	2	1
CO3	2	3	2	3	1	-	-	-	3	1	1	3	1	1	1
CO4	1	2	3	3	3	-	-	-	3	3	1	2	1	3	3
CO5	2	3	3	1	3	-	-	-	2	2	1	2	2	2	3
AVG	2.2	2.2	2.2	2	1.8	-	-	-	2.2	2.2	1	2.6	1.6	1.8	2.2

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE32	VIRTUALIZATION	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To Learn the basics and types of Virtualization
- To understand the Hypervisors and its types
- To Explore the Virtualization Solutions
- To Experiment the virtualization platforms

UNIT-I INTRODUCTION TO VIRTUALIZATION 7

Virtualization and cloud computing - Need of virtualization – cost, administration, fast deployment, reduce infrastructure cost – limitations- Types of hardware virtualization: Full virtualization - partial virtualization - Para virtualization-Types of Hypervisors

UNIT-II SERVER AND DESKTOP VIRTUALIZATION 6

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-III NETWORK VIRTUALIZATION 6

Introduction to Network Virtualization-Advantages- Functions-Tools for Network Virtualization- VLAN-WAN Architecture-WAN Virtualization

UNIT-IV STORAGE VIRTUALIZATION 5

Control Flow - Indenting - if Statement - while Loop - break and continue - for Loop - String - Lists - Tuples - Sets - Dictionaries

UNIT-V VIRTUALIZATION TOOLS 6

VMware-Amazon AWS-Microsoft HyperV- Oracle VM Virtual Box - IBM Power VM- Google Virtualization- Case study.

TOTAL : 30 PERIODS

PRACTICAL EXERCISES: 30 PERIODS

1. Create type 2 virtualization in VMWARE or any equivalent Open Source Tool. Allocate memoryand storage space as per requirement. Install Guest OS on that VMWARE.
2.
   a. Shrink and extend virtual disk
   b. Create, Manage, Configure and schedule snapshots

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c. Create Spanned, Mirrored and Striped volume

d. Create RAID 5 volume

3.

a. Desktop Virtualization using VNC

b. Desktop Virtualization using Chrome Remote Desktop

4. Create type 2 virtualization on ESXI 6.5 server

5. Create a VLAN in CISCO packet tracer

6. Install KVM in Linux

7. Create Nested Virtual Machine (VM under another VM)

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Analyze the virtualization concepts and Hypervisor

CO2: Apply the Virtualization for real-world applications

CO3: Install & Configure the different VM platforms

CO4: Experiment with the VM with various software

CO5: Apply virtualization tools for scenarios like testing, development, server consolidation, and network simulation.

TEXT BOOKS:

1. Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter,TATA McGraw- Hill , New Delhi – 2010
2. Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg,Andrzej Goscinski, John Wiley & Sons, Inc. 2011
3. David Marshall, Wade A. Reynolds, Advanced Server Virtualization: VMware and MicrosoftPlatform in the Virtual Data Center, Auerbach
4. Chris Wolf, Erick M. Halter, "Virtualization: From the Desktop to the Enterprise", APress,2005.
5. James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.
6. David Marshall, Wade A. Reynolds, "Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center", Auerbach Publications, 2006.

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CO's – PO's & PSO's MAPPING

CO's	PO's												PSO's		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS O1	PS O2	PS O3
CO1	1	3	1	3	2	-	-	-	1	1	3	1	2	3	2
CO2	3	2	2	1	2	-	-	-	1	2	2	3	3	2	1
CO3	3	2	1	3	1	-	-	-	2	2	1	3	3	3	2
CO4	1	1	2	3	3	-	-	-	3	3	1	1	3	2	2
CO5	1	3	2	3	1	-	-	-	2	1	3	3	1	1	2
AVG	1.8	2.2	1.6	2.6	1.8	-	-	-	1.8	1.8	2	2.2	2.4	2.2	1.8

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23CSE23 **CLOUD SERVICES MANAGEMENT** (for B.E/B.Tech-CSE, IT and AIDS)

L	T	P	C
2	0	2	3

COURSE OBJECTIVES:

- Introduce Cloud Service Management terminology, definition & concepts
- Compare and contrast cloud service management with traditional IT service management
- Identify strategies to reduce risk and eliminate issues associated with adoption of cloudservices
- Select appropriate structures for designing, deploying and running cloud-based services ina business environment
- Illustrate the benefits and drive the adoption of cloud-based services to solve real worldproblems

UNIT-I **CLOUD SERVICE MANAGEMENT FUNDAMENTALS** **6**

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-II **CLOUD SERVICES STRATEGY** **6**

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-III **CLOUD SERVICE MANAGEMENT** **6**

Cloud Service Reference Model, Cloud Service Life Cycle, 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

UNIT-IV **CLOUD SERVICE ECONOMICS** **6**

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-V **CLOUD SERVICE GOVERNANCE & VALUE** **6**

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

30 PERIODS

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PRACTICAL EXERCISES: **30 PERIODS**

1. Create a Cloud Organization in AWS/Google Cloud/or any equivalent Open Source cloud softwares like Openstack, Eucalyptus, Open Nebula with Role-based access control
2. Create a Cost-model for a web application using various services and do Cost-benefitanalysis
3. Create alerts for usage of Cloud resources
4. Create Billing alerts for your Cloud Organization
5. Compare Cloud cost for a simple web application across AWS, Azure and GCP andsuggest the best on

TOTAL:60 (30+30) PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Exhibit cloud-design skills to build and automate business solutions using cloud technologies.

CO2: Possess Strong theoretical foundation leading to excellence and excitement towardsadoption of cloud-based services

CO3: Solve the real world problems using Cloud services and technologies.

CO4: Increased flexibility, scalability, and cost predictability, while reducing the burden of large upfront investments.

CO5: Enhancing accessibility, collaboration, and learning experiences

TEXT BOOKS:

1. Cloud Service Management and Governance: Smart Service Management in Cloud Era byEnamul Haque, Enel Publications
2. Cloud Computing: Concepts, Technology & Architecture by Thomas Erl, Ricardo Puttini,Zaigham Mohammad 2013
3. Cloud Computing Design Patterns by Thomas Erl, Robert Cope, Amin Naserpour

REFERENCES

1. Economics of Cloud Computing by Praveen Ayyappa, LAP Lambert Academic Publishing
2. Mastering Cloud Computing Foundations and Applications Programming Rajkumar Buyya, Christian Vechhiola, S. Thamarai Selvi

E-RESOURCES

https://onlinecourses.nptel.ac.in/noc25_cs107/preview

https://www.koenig-solutions.com/cloud-management-training-courses

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CO's – PO's & PSO's MAPPING

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	1	1	1	-	-	-	2	1	3	2	2	1	3
2	3	1	2	3	2	-	-	-	1	2	3	1	2	2	2
3	1	1	3	1	3	-	-	-	3	3	1	1	3	2	1
4	1	1	1	2	3	-	-	-	2	3	3	1	1	1	1
5	1	3	3	2	2	-	-	-	1	3	1	2	1	3	2
AVg.	1.8	1.8	2	1.8	2.2	-	-	-	1.8	2.4	2.2	1.4	1.8	1.8	1.8

1 - low, 2 - medium, 3 - high, '-' - no correlation

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		L	T	P	C
23CSE34	DATA WAREHOUSING	2	0	2	3

COURSE OBJECTIVES:

- To know the details of data warehouse Architecture.
- To understand the OLAP Technology.
- To understand the partitioning strategy
- To differentiate various schema.
- To understand the roles of process manager & system manager.

UNIT-I INTRODUCTION TO DATA WAREHOUSE 5

Data warehouse Introduction - Data warehouse components- operational database Vs data warehouse – Data warehouse Architecture – Three-tier Data Warehouse Architecture - Autonomous Data Warehouse- Autonomous Data Warehouse Vs Snowflake - Modern Data Warehouse

UNIT-II ETL AND OLAP TECHNOLOGY 6

What is ETL – ETL Vs ELT – Types of Data warehouses - Data warehouse Design and Modeling - Delivery Process - Online Analytical Processing (OLAP) - Characteristics of OLAP - Online Transaction Processing (OLTP) Vs OLAP - OLAP operations- Types of OLAP- ROLAP Vs MOLAP Vs HOLAP.

UNIT-III META DATA, DATA MART AND PARTITION STRATEGY 7

Meta Data – Categories of Metadata – Role of Metadata – Metadata Repository – Challenges for Meta Management - Data Mart – Need of Data Mart- Cost Effective Data Mart- Designing Data Marts- Cost of Data Marts- Partitioning Strategy – Vertical partition – Normalization – Row Splitting- Horizontal Partition.

UNIT-IV DIMENSIONAL MODELING AND SCHEMA 6

Dimensional Modeling- Multi-Dimensional Data Modeling – Data Cube- Star Schema- Snowflake schema- Star Vs Snowflake schema- Fact constellation Schema- Schema Definition - Process Architecture- Types of Data Base Parallelism – Datawarehouse Tools.

UNIT-V SYSTEM & PROCESS MANAGERS 6

Data Warehousing System Managers: System Configuration Manager- System Scheduling Manager - System Event Manager - System Database Manager - System Backup Recovery Manager - Data Warehousing Process Managers: Load Manager – Warehouse Manager- Query Manager – Tuning – Testing.

TOTAL : 30 PERIODS

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PRACTICAL EXERCISES: **30 PERIODS**

1. Data exploration and integration with WEKA
2. Apply weka tool for data validation
3. Plan the architecture for real time application
4. Write the query for schema definition
5. Design data ware house for real time applications
6. Analyse the dimensional Modeling
7. Case study using OLAP
8. Case study using OTLP
9. Implementation of warehouse testing.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Design data warehouse architecture for various Problems

CO2: Apply the OLAP Technology

CO3: Analyse the partitioning strategy

CO4: Critically analyze the differentiation of various schemas for given problem

CO5: Frame roles of process manager & system manager

TEXT BOOKS:

1. Alex Berson and Stephen J. Smith "Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, Thirteenth Reprint 2008.
2. Ralph Kimball, "The Data Warehouse Toolkit: The Complete Guide to Dimensional Modeling", Third edition, 2013.

REFERENCES:

1. Paul Raj Ponniah, "Data warehousing fundamentals for IT Professionals", 2012
2. K.P. Soman, ShyamDiwakar and V. Ajay "Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2006

CO's – PO's & PSO's MAPPING

CO	PO											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3	3	2	2	-	-	-	3	-	-	3
2	3	2	2	2	3	-	-	-	2	-	2	2
3	3	3	3	3	-	-	-	-	-	-	-	3
4	3	3	3	3	-	-	-	-	-	-	-	3
5	3	2	2	2	-	2	-	-	-	-	2	2
Avg.	3	2.6	2.6	1.2	2.5	1	-	-	2.5	-	2	2.6

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE35	STORAGE TECHNOLOGIES (for B.E/B.Tech-CSE, IT and AIDS)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Characterize the functionalities of logical and physical components of storage
- Describe various storage networking technologies
- Identify different storage virtualization technologies
- Discuss the different backup and recovery strategies
- Understand common storage management activities and solutions

UNIT-I **STORAGE SYSTEMS** **9**

Introduction to Information Storage: Digital data and its types, Information storage, Key characteristics of data center and Evolution of computing platforms. Information Lifecycle Management. Third Platform Technologies: Cloud computing and its essential characteristics, Cloud services and cloud deployment models, Big data analytics, Social networking and mobile computing, Characteristics of third platform infrastructure and Imperatives for third platform transformation. Data Center Environment: Building blocks of a data center, Compute systems and compute virtualization and Software-defined data center

UNIT-II **INTELLIGENT STORAGE SYSTEMS AND RAID** **5**

Components of an intelligent storage system, Components, addressing, and performance of hard disk drives and solid-state drives, RAID, Types of intelligent storage systems, Scale-up and scale-out storage Architecture.

UNIT-III **STORAGE NETWORKING TECHNOLOGIES AND VIRTUALIZATION** **13**

Block-Based Storage System, File-Based Storage System, Object-Based and Unified Storage. Fibre Channel SAN: Software-defined networking, FC SAN components and architecture, FC SAN topologies, link aggregation, and zoning, Virtualization in FC SAN environment. Internet Protocol SAN: iSCSI protocol, network components, and connectivity, Link aggregation, switch aggregation,and VLAN, FCIP protocol, connectivity, and configuration. Fibre Channel over Ethernet SAN: Components of FCoE SAN,FCoE SAN connectivity, Converged Enhanced Ethernet, FCoE architecture.

UNIT-IV **BACKUP, ARCHIVE AND REPLICATION** **12**

Introduction to Business Continuity, Backup architecture, Backup targets and methods, Data deduplication, Cloud-based and mobile device backup, Data archive, Uses of replication and its characteristics, Compute based, storage-based, and network-based

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replication, Data migration, Disaster Recovery as a Service DRaaS).

UNIT-V **SECURING STORAGE INFRASTRUCTURE** 6

Information security goals, Storage security domains, Threats to a storage infrastructure, Security controls to protect a storage infrastructure, Governance, risk, and compliance, Storage infrastructure management functions, Storage infrastructure management processes.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Demonstrate the fundamentals of information storage management and various models ofCloud infrastructure services and deployment

CO2: Illustrate the usage of advanced intelligent storage systems and RAID

CO3: Interpret various storage networking architectures - SAN, including storage subsystems andvirtualization

CO4: Examine the different role in providing disaster recovery and remote replication technologies

CO5: Infer the security needs and security measures to be employed in information storagemanagement

TEXT BOOKS:

1 EMC Corporation, Information Storage and Management, Wiley, India

2 Jon Tate, Pall Beck, Hector Hugo Ibarra, Shanmuganathan Kumaravel and Libor Miklas, Introduction to Storage Area Networks, Ninth Edition, IBM - Redbooks, December 2017

3 Ulf Troppens, Rainer Erkens, Wolfgang Mueller-Friedt, Rainer Wolafka, Nils Haustein , Storage Networks Explained, Second Edition, Wiley, 2009

CO's – PO's & PSO's MAPPING

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1	2	1	3	3	-	-	-	1	1	1	3	1	2	1
2	3	1	2	3	3	-	-	-	3	2	3	2	2	3	1
3	1	1	3	2	2	-	-	-	3	1	1	2	2	3	3
4	3	2	1	2	2	-	-	-	1	1	3	1	3	2	1
5	1	3	2	1	2	-	-	-	1	2	3	1	3	2	1
AVg.	1.8	1.8	1.8	2.2	2.4	-	-	-	1.8	1.4	2.2	1.8	2.2	2.4	1.4

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE36	SOFTWARE DEFINED NETWORKS (for B.E/B.Tech-CSE, IT and AIDS)	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To understand the need for SDN and its data plane operations
- To understand the functions of control plane
- To comprehend the migration of networking functions to SDN environment
- To explore various techniques of network function virtualization
- To comprehend the concepts behind network virtualization

UNIT-I **SDN: INTRODUCTION** **6**

Evolving Network Requirements – The SDN Approach – SDN architecture - SDN Data Plane ,Control plane and Application Plane

UNIT-II **SDN DATA PLANE AND CONTROL PLANE** **6**

Data Plane functions and protocols - OpenFLow Protocol - Flow Table - Control Plane Functions - Southbound Interface, Northbound Interface – SDN Controllers - Ryu, OpenDaylight, ONOS - Distributed Controllers

UNIT-III **SDN APPLICATIONS** **6**

SDN Application Plane Architecture – Network Services Abstraction Layer – Traffic Engineering – Measurement and Monitoring – Security – Data Center Networking

UNIT-IV **NETWORK FUNCTION VIRTUALIZATION** **6**

Network Virtualization - Virtual LANs – OpenFlow VLAN Support - NFV Concepts – Benefits and Requirements – Reference Architecture

UNIT-V **NFV FUNCTIONALITY** **6**

NFV Infrastructure – Virtualized Network Functions – NFV Management and Orchestration – NFVUse cases – SDN and NFV

TOTAL : 30 PERIODS

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PRACTICAL EXERCISES: **30 PERIODS**

1. Setup your own virtual SDN lab
   i) Virtual box/Mininet Environment for SDN - http://mininet.org
   ii) https://www.kathara.org
   i. Iii) GNS3
2. Create a simple mininet topology with SDN controller and use Wireshark to capture and visualize the OpenFlow messages such as OpenFlow FLOW MOD, PACKET IN, PACKET OUT etc.
3. Create a SDN application that uses the Northbound API to program flow table rules on theswitch for various use cases like L2 learning switch, Traffic Engineering, Firewall etc.
4. Create a simple end-to-end network service with two VNFs using vim-emu https://github.com/containernet/vim-emu
5. Install OSM and onboard and orchestrate network service.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Describe the motivation behind SDN

CO2: Identify the functions of the data plane and control plane

CO3: Design and develop network applications using SDN

CO4: Orchestrate network services using NFV

CO5: Explain various use cases of SDN and NFV

TEXT BOOKS:

1. William Stallings, "Foundations of Modern Networking: SDN, NFV, QoE, IoT and Cloud", Pearson Education, 1st Edition, 2015

REFERENCES

1. Ken Gray, Thomas D. Nadeau, "Network Function Virtualization", Morgan Kauffman, 2016.
2. Thomas D Nadeau, Ken Gray, "SDN: Software Defined Networks", O'Reilly Media, 2013.
3. Fei Hu, "Network Innovation through OpenFlow and SDN: Principles and Design", 1stEdition, CRC Press, 2014.
4. Paul Goransson,Chuck BlackTimothyCulver,"Software DefinedNetworks: A Comprehensive Approach", 2nd Edition, Morgan Kaufmann Press, 2016.
5. Oswald Coker, Siamak Azodolmolky, "Software-Defined Networking with OpenFlow", 2ndEdition, O'Reilly Media, 2017.

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CO's – PO's & PSO's MAPPING

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1	2	3	1	3	-	-	-	2	3	1	3	1	2	1
2	2	1	2	2	3	-	-	-	2	2	2	2	1	3	2
3	2	2	2	3	3	-	-	-	3	1	1	2	1	3	3
4	2	2	2	3	1	-	-	-	1	3	1	2	2	2	2
5	3	3	1	1	3	-	-	-	1	2	1	2	2	1	3
AVg.	2	2	2	2	2.6	-	-	-	1.8	2.2	1.2	2.2	1.4	2.2	2.2

1 - low, 2 - medium, 3 - high, '-' - no correlation

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		L	T	P	C
23CSE37	**STREAM PROCESSING** (for B.E/B.Tech-CSE, IT and AIDS)	2	0	2	3

COURSE OBJECTIVES:

- Introduce Data Processing terminology, definition & concepts
- Define different types of Data Processing
- Explain the concepts of Real-time Data processing
- Select appropriate structures for designing and running real-time data services in a business environment
- Illustrate the benefits and drive the adoption of real-time data services to solve real worldproblems

UNIT-I **FOUNDATIONS OF DATA SYSTEMS** 6

Introduction to Data Processing, Stages of Data processing, Data Analytics, Batch Processing, Stream processing, Data Migration, Transactional Data processing, Data Mining, Data Management Strategy, Storage, Processing, Integration, Analytics, Benefits of Data as a Service, Challenges

UNIT-II **REAL-TIME DATA PROCESSING** 6

Introduction to Big data, Big data infrastructure, Real-time Analytics, Near real-time solution, Lambda architecture, Kappa Architecture, Stream Processing,Understanding Data Streams, Message Broker, Stream Processor, Batch & Real-time ETL tools, Streaming Data Storage

UNIT-III **DATA MODELS AND QUERY LANGUAGES** 6

Relational Model, Document Model, Key-Value Pairs, NoSQL, Object-Relational Mismatch, Many- to-One and Many-to-Many Relationships, Network data models, Schema Flexibility, Structured Query Language, Data Locality for Queries, Declarative Queries, Graph Data models, Cypher Query Language, Graph Queries in SQL, The Semantic Web, CODASYL, SPARQL

UNIT-IV **EVENT PROCESSING WITH APACHE KAFKA** 6

Apache Kafka, Kafka as Event Streaming platform, Events, Producers, Consumers, Topics, Partitions, Brokers, Kafka APIs, Admin API, Producer API, Consumer API, Kafka Streams API, Kafka Connect API

UNIT-V **REAL-TIME PROCESSING USING SPARK STREAMING** 6

Structured Streaming, Basic Concepts, Handling Event-time and Late Data, Fault-tolerant Semantics, Exactly-once Semantics, Creating Streaming Datasets, Schema Inference, Partitioningof Streaming datasets, Operations on Streaming Data, Selection, Aggregation, Projection, Watermarking, Window operations, Types of Time windows, Join Operations, Deduplication

TOTAL : 30 PERIODS

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PRACTICAL EXERCISES: **30 PERIODS**

1. Install MongoDB
2. Design and Implement Simple application using MongoDB
3. Query the designed system using MongoDB
4. Create a Event Stream with Apache Kafka
5. Create a Real-time Stream processing application using Spark Streaming
6. Build a Micro-batch application
7. Real-time Fraud and Anomaly Detection,
8. Real-time personalization, Marketing, Advertising

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Understand the applicability and utility of different streaming algorithms.

CO2: Describe and apply current research trends in data-stream processing.

CO3: Analyze the suitability of stream mining algorithms for data stream systems.

CO4: Program and build stream processing systems, services and applications

CO5: Solve problems in real-world applications that process data streams

TOTAL:60 PERIODS

TEXT BOOKS:

1. Streaming Systems: The What, Where, When and How of Large-Scale Data Processing byTyler Akidau, Slava Chemyak, Reuven Lax, O'Reilly publication
2. Designing Data-Intensive Applications by Martin Kleppmann, O'Reilly Media
3. Practical Real-time Data Processing and Analytics : Distributed Computing and EventProcessing using Apache Spark, Flink, Storm and Kafka, Packt Publishing

REFERENCES

1. https://spark.apache.org/docs/latest/streaming-programming-guide.html
2. Kafka.apache.org

CO's – PO's & PSO's MAPPING

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	2	3	1	-	-	-	2	3	1	2	1	3	3
2	2	1	1	2	2	-	-	-	3	2	2	3	1	2	1
3	3	1	2	3	3	-	-	-	2	2	1	1	2	2	1
4	2	1	3	3	3	-	-	-	3	3	1	1	1	2	1
5	3	3	1	2	2	-	-	-	3	3	2	3	2	3	2
AVg.	2.6	1.8	1.8	2.6	2.2	-	-	-	2.6	2.6	1.4	2	1.4	2.4	1.6

1 - low, 2 - medium, 3 - high, '-' - no correlation

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		L	T	P	C
23CSE38	**SECURITY AND PRIVACY IN CLOUD** (for B.E/B.Tech-CSE, IT and AIDS)	2	0	2	3

COURSE OBJECTIVES:

- To Introduce Cloud Computing terminology, definition & concepts
- To understand the security design and architectural considerations for Cloud
- To understand the Identity, Access control in Cloud
- To follow best practices for Cloud security using various design patterns
- To be able to monitor and audit cloud applications for security

UNIT-I **FUNDAMENTALS OF CLOUD SECURITY CONCEPTS** **7**

Overview of cloud security- Security Services - Confidentiality, Integrity, Authentication, Non- repudiation, Access Control - Basic of cryptography - Conventional and public-key cryptography, hash functions, authentication, and digital signatures.

UNIT-II **SECURITY DESIGN AND ARCHITECTURE FOR CLOUD** **6**

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

UNIT-III **ACCESS CONTROL AND IDENTITY MANAGEMENT** **6**

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-IV **CLOUD SECURITY DESIGN PATTERNS** **6**

Introduction to Design Patterns, Cloud bursting, Geo-tagging, Secure Cloud Interfaces, Cloud Resource Access Control, Secure On-Premise Internet Access, Secure External Cloud

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UNIT-V **MONITORING, AUDITING AND MANAGEMENT** **5**

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

TOTAL : 30 PERIODS

PRACTICAL EXERCISES: **30 PERIODS**

1. Simulate a cloud scenario using Cloud Sim and run a scheduling algorithm not present in CloudSim
2. simulate resource management using cloud sim
3. simulate log forensics using cloud sim
4. simulate a secure file sharing using a cloud sim
5. Implement data anonymization techniques over the simple dataset (masking, k-anonymization,etc)
6. Implement any encryption algorithm to protect the images
7. Implement any image obfuscation mechanism
8. Implement a role-based access control mechanism in a specific scenario
9. implement an attribute-based access control mechanism based on a particular scenario
10. Develop a log monitoring system with incident management in the cloud

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Understand the cloud concepts and fundamentals.
CO2: Explain the security challenges in the cloud.
CO3: Define cloud policy and Identity and Access Management.
CO4: Understand various risks and audit and monitoring mechanisms in the cloud.
CO5: Define the various architectural and design considerations for security in the cloud.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Raj Kumar Buyya , James Broberg, andrzejGoscinski, —Cloud Computing:||, Wiley 2013
2. Dave shackle ford, —Virtualization Security||, SYBEX a wiley Brand 2013.
3. Mather, Kumaraswamy and Latif, —Cloud Security and Privacy||, OREILLY 2011

REFERENCES

1. Mark C. Chu-Carroll —Code in the Cloud||,CRC Press, 2011
2. Mastering Cloud Computing Foundations and Applications Programming RajkumarBuyya, Christian Vechhiola, S. ThamaraiSelvi

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CO's – PO's & PSO's MAPPING

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	1	2	-	-	-	1	1	1	3	3	1	2
2	1	3	2	3	1	-	-	-	2	2	3	2	3	1	2
3	3	2	2	3	2	-	-	-	3	1	1	2	2	3	1
4	2	1	2	3	3	-	-	-	3	2	3	3	1	1	2
5	1	3	3	1	1	-	-	-	2	3	3	2	2	3	2
AVg.	2	2.4	2.4	2.2	1.8	-	-	-	2.2	1.8	2.2	2.4	2.2	1.8	1.8

1 - low, 2 - medium, 3 - high, '-' - no correlation

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VERTICAL 4: CYBER SECURITY AND DATA PRIVACY											
S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
1.	23CSE41	Ethical Hacking	PE	2	0	2	4	3	50	50	100
2.	23CSE42	Digital and Mobile Forensics	PE	2	0	2	4	3	50	50	100
3.	23CSE43	Social Network Security	PE	2	0	2	4	3	50	50	100
4.	23CSE44	Modern Cryptography	PE	2	0	2	4	3	50	50	100
5.	23CSE45	Engineering Secure Software Systems	PE	2	0	2	4	3	50	50	100
6.	23CSE46	Cryptocurrency and Blockchain Technologies	PE	2	0	2	4	3	50	50	100
7.	23CSE47	Network Security	PE	2	0	2	4	3	50	50	100
8.	23CSE38	Security and Privacy in Cloud	PE	2	0	2	4	3	50	50	100

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23CSE41	ETHICAL HACKING	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To understand the basics of computer based vulnerabilities.
- To explore different foot printing, reconnaissance and scanning methods.
- To expose the enumeration and vulnerability analysis methods.
- To understand hacking options available in Web and wireless applications.
- To explore the options for network protection.

UNIT-I INTRODUCTION 6

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-II FOOT PRINTING, RECONNAISSANCE AND SCANNING NETWORKS 6

Foot printing Concepts – Foot printing through Search Engines, Web Services, Social Networking Sites, Website, Email - Competitive Intelligence – Foot printing through Social Engineering – Foot printing Tools - Network Scanning Concepts - Port-Scanning Tools - Scanning Techniques - Scanning Beyond IDS and Firewall

UNIT-III ENUMERATION AND VULNERABILITY ANALYSIS 6

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-IV SYSTEM HACKING 6

Hacking Web Servers - Web Application Components- Vulnerabilities - Tools for Web Attackers and Security Testers Hacking Wireless Networks - Components of a Wireless Network – War driving- Wireless Hacking - Tools of the Trade

UNIT-V NETWORK PROTECTION SYSTEMS 6

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 – Honey pots.

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TOTAL : 30 PERIODS
PRACTICAL: 30 PERIODS

PRACTICAL EXERCISES

1. Install Kali or Backtrack Linux / Metasploitable/ Windows XP
2. Practice the basics of reconnaissance.
3. Using FOCA / Search Diggity tools, extract metadata and expanding the target list.
4. Aggregates information from public databases using online free tools like Paterva's Maltego.
5. Information gathering using tools like Robtex
6. Scan the target using tools like Nessus.
7. View and capture network traffic using Wire shark.
8. Automate dig for vulnerabilities and match exploits using Armitage

FOCA : http://www.informatica64.com/foca.aspx.
Nessus :
http://www.tenable.com/products/nessus.
Wire shark : http://www.wireshark.org.
Armitage :
http://www.fastandeasyhacking.com/. Kali or
Backtrack Linux, Metasploitable, Windows XP

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : To express knowledge on basics of computer based vulnerabilities

CO2 : To gain understanding on different foot printing, reconnaissance and scanning methods.

CO3 : To demonstrate the enumeration and vulnerability analysis methods

CO4 : To gain knowledge on hacking options available in Web and wireless applications.

CO5 : To acquire knowledge on the options for network protection.

TEXT BOOKS:

1. Michael T. Simpson, Kent Backman, and James E. Corley, Hands-On Ethical Hacking and Network Defense, Course Technology, Delmar Cengage Learning, 2010.
2. The 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.

REFERENCE BOOKS:

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

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CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	2	1	-	-	-	1	2	2	1	1	2	3
CO2	1	2	1	2	1	-	-	-	2	2	1	1	1	2	2
CO3	2	2	3	3	1	-	-	-	1	2	1	2	2	3	1
CO4	2	1	1	2	1	-	-	-	1	3	3	3	3	2	1
CO5	2	3	1	1	2	-	-	-	2	1	1	1	1	1	3
AVG	1.8	2	1.8	2	1.2	-	-	-	1.4	2	1.6	1.6	1.6	2	2

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE42 **DIGITAL AND MOBILE FORENSICS**

L	T	P	C
2	0	2	3

COURSE OBJECTIVES:

- To understand basic digital forensics and techniques.
- To understand digital crime and investigation.
- To understand how to be prepared for digital forensic readiness.
- To understand and use forensics tools for iOS devices.
- To understand and use forensics tools for Android devices.

UNIT-I **INTRODUCTION TO DIGITAL FORENSICS** **6**

Forensic Science – Digital Forensics – Digital Evidence – The Digital Forensics Process – Introduction – The Identification Phase – The Collection Phase – The Examination Phase – The Analysis Phase – The Presentation Phase

UNIT-II **DIGITAL CRIME AND INVESTIGATION** **6**

Digital Crime – Substantive Criminal Law – General Conditions – Offenses – Investigation Methods for Collecting Digital Evidence – International Cooperation to Collect Digital Evidence

UNIT-III **DIGITAL FORENSIC READINESS** **6**

Introduction – Law Enforcement versus Enterprise Digital Forensic Readiness – Rationale for Digital Forensic Readiness – Frameworks, Standards and Methodologies – Enterprise Digital Forensic Readiness – Challenges in Digital Forensics

UNIT-IV **iOS FORENSICS** **6**

Mobile Hardware and Operating Systems - iOS Fundamentals – Jailbreaking – File System – Hardware – iPhone Security – iOS Forensics – Procedures and Processes – Tools – Oxygen Forensics – MobilEdit – iCloud

UNIT-V **ANDROID FORENSICS** **6**

Android basics – Key Codes – ADB – Rooting Android – Boot Process – File Systems – Security – Tools – Android Forensics – Forensic Procedures – ADB – Android Only Tools – Dual Use Tools – Oxygen Forensics – MobilEdit – Android App Decompiling

30 PERIODS

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COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Have knowledge on digital forensics.

CO2 : Know about digital crime and investigations.

CO3 : Be forensic ready.

CO4 : Investigate, identify and extract digital evidence from iOS devices.

CO5 : Investigate, identify and extract digital evidence from Android devices.

LAB EXPERIMENTS: **30 PERIODS**

1. Installation of Sleuth Kit on Linux. List all data blocks. Analyze allocated as well as unallocated blocks of a disk image.
2. Data extraction from call logs using Sleuth Kit.
3. Data extraction from SMS and contacts using Sleuth Kit.
4. Install Mobile Verification Toolkit or MVT and decrypt encrypted iOS backups.
5. Process and parse records from the iOS system.
6. Extract installed applications from Android devices.
7. Extract diagnostic information from Android devices through the adb protocol.
8. Generate a unified chronological timeline of extracted records,

TOTAL : 60 PERIODS

TEXT BOOKS:

1. Andre Arnes, "Digital Forensics", Wiley, 2018.

2.Chuck Easttom, "An In-depth Guide to Mobile Device Forensics", First Edition, CRC Press, 2022.

REFERENCE BOOKS:

1. Vacca, J, Computer Forensics, Computer Crime Scene Investigation, 2nd Ed, Charles River Media, 2005, ISBN: 1-58450-389.

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	2	1	-	-	-	1	1	3	3	1	3	1
CO2	3	3	3	3	3	-	-	-	2	2	1	2	1	3	1
CO3	3	3	2	3	1	-	-	-	3	2	1	1	3	2	3
CO4	3	1	2	2	3	-	-	-	1	3	3	2	1	3	3
CO5	1	3	2	3	2	-	-	-	2	3	2	3	1	2	1
AVG	3	2	2	3	2	-	-	-	2	2	2	2	1	3	2

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE43 **SOCIAL NETWORK SECURITY**

L	T	P	C
2	0	2	3

COURSE OBJECTIVES:

- To develop semantic web related simple applications
- To explain Privacy and Security issues in Social Networking
- To explain the data extraction and mining of social networks
- To discuss the prediction of human behavior in social communities
- To describe the Access Control, Privacy and Security management of social networks

UNIT-I **FUNDAMENTALS OF SOCIAL NETWORKING** **6**

Introduction to Semantic Web, Limitations of current Web, Development of Semantic Web, Emergence of the Social Web, Social Network analysis, Development of Social Network Analysis, Key concepts and measures in network analysis, Historical overview of privacy and security, Major paradigms, for understanding privacy and security

UNIT-II **SECURITY ISSUES IN SOCIAL NETWORKS** **6**

The evolution of privacy and security concerns with networked technologies, Contextual influences on privacy attitudes and behaviors, Anonymity in a networked world

UNIT-III **EXTRACTION AND MINING IN SOCIAL NETWORKING DATA** **6**

Extracting evolution of Web Community from a Series of Web Archive, Detecting communities in social networks, Definition of community, Evaluating communities, Methods for community detection and mining, Applications of community mining algorithms, Tools for detecting communities social network infrastructures and communities, Big data and Privacy

UNIT-IV **PREDICTING HUMAN BEHAVIOR AND PRIVACY ISSUES** **6**

Understanding and predicting human behavior for social communities, User data Management, Inference and Distribution, Enabling new human experiences, Reality mining, Context, Awareness, Privacy in online social networks, Trust in online environment, What is Neo4j, Nodes, Relationships, Properties

UNIT-V **ACCESS CONTROL, PRIVACY AND IDENTITY MANAGEMENT** **6**

Understand the access control requirements for Social Network, Enforcing Access Control Strategies, Authentication and Authorization, Roles-based Access Control, Host, storage and network access control options, Firewalls, Authentication, and Authorization in Social Network, Identity & Access Management, Single Sign-on, Identity Federation, Identity providers and service consumers, The role of Identity provisioning

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30 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Develop semantic web related simple applications

CO2 : Address Privacy and Security issues in Social Networking

CO3 : Explain the data extraction and mining of social networks

CO4 : Discuss the prediction of human behavior in social communities

CO5 : Describe the applications of social networks

PRACTICAL EXERCISES: **30 PERIODS**

1. Design own social media application
2. Create a Network model using Neo4j
3. Read and write Data from Graph Database
4. Find "Friend of Friends" using Neo4j
5. Implement secure search in social media
6. Create a simple Security & Privacy detector

TOTAL : 60 PERIODS

TEXT BOOKS:

1. Peter Mika, "Social Networks and the Semantic Web, First Edition, Springer 2007.

2. BorkoFurht, "Handbook of Social Network Technologies and Application, First Edition, Springer, 2010.

3. Learning Neo4j 3.x – Second Edition By Jérôme Baton, Rik Van Bruggen, Packt publishing.

4. David Easley, Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning about a Highly Connected World||, First Edition, Cambridge University Press, 2010.

REFERENCE BOOKS:

1 Easley D. Kleinberg J., "Networks, Crowds, and Markets – Reasoning about a Highly Connected World||, Cambridge University Press, 2010.

2. Jackson, Matthew O., "Social and Economic Networks", Princeton University Press, 2008.

3. GuandongXu ,Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", First Edition, Springer, 2011.

4. Dion Goh and Schubert Foo, "Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively", IGI Global Snippet, 2008.

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5. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, "Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modeling", IGI Global Snippet, 2009.

6. John G. Breslin, Alexander Passant and Stefan Decker, "The Social Semantic Web", Springer, 2009.

E-RESOURCES:

1.

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	3	2	-	-	-	3	2	1	2	3	3	2
CO2	2	2	2	3	3	-	-	-	1	2	2	3	3	3	2
CO3	2	1	1	3	2	-	-	-	1	2	1	1	1	3	3
CO4	3	3	3	3	2	-	-	-	1	1	1	1	2	1	3
CO5	1	3	2	2	2	-	-	-	1	1	3	1	2	3	3
AVG	2.2	2	2	2.8	2.2	-	-	-	1.4	1.6	1.6	1.6	2.2	2.6	2.6

1 - low, 2 - medium, 3 - high, '-' - no correlation

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		L	T	P	C
23CSE44	MODERN CRYPTOGRAPHY	2	0	2	3

COURSE OBJECTIVES:

- To learn about Modern Cryptography.
- To focus on how cryptographic algorithms and protocols work and how to use them.
- To build a pseudorandom permutation.
- To construct Basic cryptanalytic techniques.
- To provide instruction on how to use the concepts of block ciphers and message authentication codes.

UNIT-I **INTRODUCTION** **6**

Basics of Symmetric Key Cryptography, Basics of Asymmetric Key Cryptography, Hardness of Functions. Notions of Semantic Security (SS) and Message Indistinguishability (MI): Proof of Equivalence of SS and MI, Hard Core Predicate, Trap-door permutation, Gold wasser-Micali Encryption. Goldreich-Levin Theorem: Relation between Hardcore Predicates and Trap-door permutations.

UNIT-II **FORMAL NOTIONS OF ATTACKS** **6**

Attacks under Message Indistinguishability: Chosen Plaintext Attack (IND-CPA), Chosen Ciphertext Attacks (IND-CCA1 and IND-CCA2), Attacks under Message Non-malleability: NM-CPA and NM-CCA2, Inter-relations among the attack model

UNIT-III **RANDOM ORACLES** **6**

Provable Security and asymmetric cryptography, hash functions. One-way functions: Weak and Strong one-way functions. Pseudo-random Generators (PRG): Blum-Micali-Yao Construction, Construction of more powerful PRG, Relation between One-way functions and PRG, Pseudo-random Functions (PRF)

UNIT-IV **BUILDING A PSEUDORANDOM PERMUTATION** **6**

The LubyRackoff Construction: Formal Definition, Application of the LubyRackoff Construction to the construction of Block Ciphers, The DES in the light of LubyRackoff Construction.

UNIT-V **MESSAGE AUTHENTICATION CODES** **6**

Left or Right Security (LOR). Formal Definition of Weak and Strong MACs, Using a PRF as a MAC, Variable length MAC. Public Key Signature Schemes: Formal Definitions, Signing and Verification, Formal Proofs of Security of Full Domain Hashing. Assumptions for Public Key Signature Schemes: One-way functions Imply Secure One-time Signatures. Shamir's Secret Sharing Scheme. Formally Analyzing Cryptographic Protocols. Zero Knowledge Proofs and Protocols.

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30 PERIODS

PRACTICAL EXERCISES **30 PERIODS**

1. Implement Feige-Fiat-Shamir identification protocol.
2. Implement GQ identification protocol.
3. Implement Schnorr identification protocol.
4. Implement Rabin one-time signature scheme.
5. Implement Merkle one-time signature scheme.
6. Implement Authentication trees and one-time signatures.
7. Implement GMR one-time signature scheme.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Interpret the basic principles of cryptography and general cryptanalysis.

CO2 : Determine the concepts of symmetric encryption and authentication.

CO3 : Identify the use of public key encryption, digital signatures, and key establishment.

CO4 : Articulate the cryptographic algorithms to compose, build and analyze simple cryptographic solutions.

CO5 : Express the use of Message Authentication Codes.

TEXT BOOKS:

1. Hans Delfs and Helmut Knebl, Introduction to Cryptography: Principles and Applications, Springer Verlag.

2. Wenbo Mao, Modern Cryptography, Theory and Practice, Pearson Education (Low Priced Edition)

REFERENCE BOOKS:

1. Shaffi Gold wasser and Mihir Bellare, Lecture Notes on Cryptography, Available at http://citeseerx.ist.psu.edu/.

2. OdedGoldreich, Foundations of Cryptography, CRC Press (Low Priced Edition Available), Part 1 and Part 23

3 William Stallings, "Cryptography and Network Security: Principles and Practice", PHI 3rd Edition, 2006.

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CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	-	-	-	2	1	1	2	2	1	1
CO2	1	3	2	1	2	-	-	-	3	2	2	2	2	1	3
CO3	1	1	2	3	2	-	-	-	1	1	1	3	1	1	3
CO4	3	1	2	1	3	-	-	-	3	2	1	2	3	2	1
CO5	2	3	3	3	3	-	-	-	3	1	1	1	2	1	1
AVG	2	2.2	2.4	2.2	2.2	-	-	-	2.4	1.4	1.2	2	2	1.2	1.8

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE45 **ENGINEERING SECURE SOFTWARE SYSTEMS** **L T P C** 2 0 2 3

COURSE OBJECTIVES:

- Know the importance and need for software security.
- Know about various attacks.
- Learn about secure software design.
- Understand risk management in secure software development.
- Know the working of tools related to software security.

UNIT-I **NEED OF SOFTWARE SECURITY AND LOW-LEVEL ATTACKS** **6**

Software Assurance and Software Security - Threats to software security - Sources of software insecurity - Benefits of Detecting Software Security - Properties of Secure Software – Memory-Based Attacks: Low-Level Attacks Against Heap and Stack - Defense Against Memory-Based Attacks

UNIT-II **SECURE SOFTWARE DESIGN** **7**

Requirements Engineering for secure software - SQUARE process Model - Requirements elicitation and prioritization- Isolating The Effects of Untrusted Executable Content - Stack Inspection – Policy Specification Languages – Vulnerability Trends – Buffer Overflow – Code Injection - Session Hijacking. Secure Design - Threat Modeling and Security Design Principles

UNIT-III **SECURITY RISK MANAGEMENT** **5**

Risk Management Life Cycle – Risk Profiling – Risk Exposure Factors – Risk Evaluation and Mitigation – Risk Assessment Techniques – Threat and Vulnerability Management

UNIT-IV **SECURITY TESTING** **8**

Traditional Software Testing – Comparison - Secure Software Development Life Cycle - Risk Based Security Testing – Prioritizing Security Testing With Threat Modeling – Penetration Testing – Planning and Scoping - Enumeration – Remote Exploitation – Web Application Exploitation - Exploits and Client Side Attacks – Post Exploitation – Bypassing Firewalls and Avoiding Detection - Tools for Penetration Testing

UNIT-V **SECURE PROJECT MANAGEMENT** **4**

Governance and security - Adopting an enterprise software security framework - Security and project management - Maturity of Practice

0 PERIODS

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PRACTICAL EXERCISES

1.Implement the SQL injection attack.
2.Implement the Buffer Overflow attack.
3.Implement Cross Site Scripting and Prevent XSS.
4.Perform Penetration testing on a web application to gather information about the system, then initiate XSS and SQL injection attacks using tools like Kali Linux.
5.Develop and test the secure test cases
6.Penetration test using kali Linux

30 PERIODS

COURSE OUTCOMES:

Upon completion of the course, the student will be able to

CO1 : Identify various vulnerabilities related to memory attacks.

CO2 : Apply security principles in software development.

CO3 : Evaluate the extent of risks.

CO4 : Involve selection of testing techniques related to software security in the testing phase of software development.

CO5 : Use tools for securing software.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Julia H. Allen, "Software Security Engineering", Pearson Education, 2008

2.Evan Wheeler, "Security Risk Management: Building an Information Security Risk Management Program from the Ground Up", First edition, Syngress Publishing, 2011

3.Chris Wysopal, Lucas Nelson, Dino Dai Zovi, and Elfriede Dustin, "The Art of Software Security Testing: Identifying Software Security Flaws (Symantec Press)", Addison-Wesley Professional, 2006

REFERENCE BOOKS:

1. Robert C. Seacord, "Secure Coding in C and C++ (SEI Series in Software Engineering)", Addison-Wesley Professional, 2005.

2.Jon Erickson, "Hacking: The Art of Exploitation", 2nd Edition, No Starch Press, 2008.

3.Mike Shema, "Hacking Web Apps: Detecting and Preventing Web Application Security Problems", First edition, Syngress Publishing, 2012

4.Bryan Sullivan and Vincent Liu, "Web Application Security, A Beginner's Guide", Kindle Edition, McGraw Hill, 2012

5.Lee Allen, "Advanced Penetration Testing for Highly-Secured Environments: The Ultimate Security Guide (Open Source: Community Experience Distilled)", Kindle Edition, Packt Publishing,2012

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CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	3	2	-	-	-	2	1	2	2	2	2	1
CO2	2	2	2	3	3	-	-	-	2	1	2	2	1	2	1
CO3	1	2	2	2	1	-	-	-	1	1	2	1	2	2	1
CO4	2	3	2	2	2	-	-	-	2	1	2	2	2	2	1
CO5	2	1	2	2	3	-	-	-	2	1	1	2	2	1	2
AVG	1.8	2.2	2	2.4	2.2	-	-	-	1.8	1	1.8	1.8	1.8	1.8	1.2

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE46	CRYPTOCURRENCY AND BLOCKCHAIN TECHNOLOGIES	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To understand the basics of Blockchain
- To learn Different protocols and consensus algorithms in Blockchain
- To learn the Blockchain implementation frameworks
- To understand the Blockchain Applications
- To experiment the Hyperledger Fabric, Ethereum networks

UNIT-I INTRODUCTION TO BLOCKCHAIN 7

Blockchain- Public Ledgers, Blockchain as Public Ledgers - Block in a Blockchain, Transactions- The Chain and the Longest Chain - Permissioned Model of Blockchain, Cryptographic -Hash Function, Properties of a hash function-Hash pointer and Merkle tree

UNIT-II BITCOIN AND CRYPTOCURRENCY 6

A basic crypto currency, Creation of coins, Payments and double spending, FORTH – the precursor for Bitcoin scripting, Bitcoin Scripts , Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay

UNIT-III BITCOIN CONSENSUS 6

Bitcoin Consensus, Proof of Work (PoW)- Hashcash PoW , Bitcoin PoW, Attacks on PoW, monopoly problem- Proof of Stake- Proof of Burn - Proof of Elapsed Time - Bitcoin Miner, Mining Difficulty, Mining Pool-Permissioned model and use cases.

UNIT-IV HYPERLEDGER FABRIC & ETHEREUM 5

Architecture of Hyperledger fabric v1.1- chain code- Ethereum: Ethereum network, EVM, Transaction fee, Mist Browser, Ether, Gas, Solidity.

UNIT-V BLOCKCHAIN APPLICATIONS 6

Smart contracts, Truffle Design and issue- DApps- NFT. Blockchain Applications in Supply Chain Management, Logistics, Smart Cities, Finance and Banking, Insurance,etc- Case Study.

30 PERIODS

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PRACTICAL EXERCISES: 30 PERIODS

1. Install and understand Docker container, Node.js, Java and Hyperledger Fabric, Ethereum and perform necessary software installation on local machine/create instance on cloud to run.
2. Create and deploy a blockchain network using Hyperledger Fabric SDK for Java Set up and initialize the channel, install and instantiate chain code, and perform invoke and query on your blockchain network.
3. Interact with a blockchain network. Execute transactions and requests against a blockchain network by creating an app to test the network and its rules.
4. Deploy an asset-transfer app using blockchain. Learn app development within a Hyperledger Fabric network.
5. Use blockchain to track fitness club rewards. Build a web app that uses Hyperledger Fabric to track and trace member rewards.
6. Car auction network: A Hello World example with Hyperledger Fabric Node SDK and IBM Blockchain Starter Plan. Use Hyperledger Fabric to invoke chain code while storing results and data in the starter plan

TOTAL : 60 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 :	Understand emerging abstract models for Block chain Technology
CO2 :	Identify major research challenges and technical gaps existing between theory and practice in the crypto currency domain.
CO3 :	It provides conceptual understanding of the function of Blockchain as a method of securing distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable.
CO4 :	Apply hyperledger Fabric and Ethereum platform to implement the Block chain Application.
CO5:	Evaluate case studies to understand the practical challenges, benefits, and limitations of blockchain applications in industry.

TEXT BOOKS:

1. Bashir and Imran, Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks, 2017.
2. Andreas Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", O'Reilly, 2014.

REFERENCE BOOKS:

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1. Daniel Drescher, "Blockchain Basics", First Edition, Apress, 2017.
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. V Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.
3. Melanie Swan, "Blockchain: Blueprint for a New Economy", O'Reilly, 2015
4. Ritesh Modi, "Solidity Programming Essentials: A Beginner's Guide to Build Smart Contracts for Ethereum and Blockchain", Packt Publishing
5. Handbook of Research on Blockchain Technology, published by Elsevier Inc. ISBN: 9780128198162, 2020.

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	-	-	-	1	-	-	2	3	1	1
CO2	3	3	3	3	1	-	-	-	2	-	-	2	1	2	1
CO3	3	3	3	3	2	-	-	-	3	-	-	2	2	3	3
CO4	3	2	3	2	3	-	-	-	3	-	-	2	2	2	3
CO5	3	2.75	2.75	2.5	1.75	-	-	-	2.25	-	-	2	2	2.2	2
AVG	**3**	**3**	**2**	**2**	**1**	-	-	-	**1**	-	-	**2**	**3**	**1**	**1**

1 - low, 2 - medium, 3 - high, '-' - no correlation

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		L	T	P	C
23CSE47	NETWORK SECURITY	2	0	2	3

COURSE OBJECTIVES:

- To learn the fundamentals of cryptography.
- To learn the key management techniques and authentication approaches.
- To explore the network and transport layer security techniques.
- To understand the application layer security standards.
- To learn the real time security practices.

UNIT-I **INTRODUCTION** **8**

Basics of cryptography, conventional and public-key cryptography, hash functions, authentication, and digital signatures.

UNIT-II **KEY MANAGEMENT AND AUTHENTICATION** **7**

Key Management and Distribution: Symmetric Key Distribution, Distribution of Public Keys, X.509 Certificates, Public-Key Infrastructure. User Authentication: Remote User-Authentication Principles, Remote User-Authentication Using Symmetric Encryption, Kerberos Systems, Remote User Authentication Using Asymmetric Encryption.

UNIT-III **ACCESS CONTROL AND SECURITY** **4**

Network Access Control: Network Access Control, Extensible Authentication Protocol, IEEE 802.1X Port-Based Network Access Control - IP Security - Internet Key Exchange (IKE). Transport-Level Security: Web Security Considerations, Secure Sockets Layer, Transport Layer Security, HTTPS standard, Secure Shell (SSH) application.

UNIT-IV **APPLICATION LAYER SECURITY** **5**

Electronic Mail Security: Pretty Good Privacy, S/MIME, DomainKeys Identified Mail. Wireless Network Security: Mobile Device Security

UNIT-V **FUNCTIONS, MODULES AND FILES** **6**

Firewalls and Intrusion Detection Systems: Intrusion Detection Password Management, Firewall Characteristics Types of Firewalls, Firewall Basing, Firewall Location and Configurations. Block chains, Cloud Security and IoT security

30 PERIODS

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PRACTICAL EXERCISES: **30 PERIODS**

1. Implement symmetric key algorithms
2. Implement asymmetric key algorithms and key exchange algorithms
3. Implement digital signature schemes
4. Installation of Wire shark, tcp dump and observe data transferred in client-server communication using UDP/TCP and identify the UDP/TCP datagram.
5. Check message integrity and confidentiality using SSL
6. Experiment Eavesdropping, Dictionary attacks, MITM attacks
7. Experiment with Sniff Traffic using ARP Poisoning
8. Demonstrate intrusion detection system using any tool.
9. Explore network monitoring tools
10. Study to configure Firewall, VPN

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Classify the encryption techniques

CO2 : Illustrate the key management technique and authentication.

CO3 : Evaluate the security techniques applied to network and transport layer

CO4 : Discuss the application layer security standards.

CO5 : Apply security practices for real time applications.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Cryptography and Network Security: Principles and Practice, 6th Edition, William Stallings, 2014, Pearson, ISBN 13:9780133354690.

REFERENCE BOOKS:

1. Network Security: Private Communications in a Public World, M. Speciner, R. Perlman, C. Kaufman, Prentice Hall, 2002.

2. Linux ip tables Pocket Reference, Gregor N. Purdy, O'Reilly, 2004, ISBN-13: 978-0596005696.

3. Linux Firewalls, by Michael Rash, No Starch Press, October 2007, ISBN: 978-1-59327-141-1.

4. Network Security, Firewalls And VPNs, J. Michael Stewart, Jones & Bartlett Learning, 2013, ISBN-10: 1284031675, ISBN-13: 978-1284031676.

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5. The Network Security Test Lab: A Step-By-Step Guide, Michael Gregg, Dream tech Press, 2015, ISBN-10:8126558148, ISBN-13: 978-8126558148

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	-	-	-	2	1	2	1	2	3	1
CO2	1	1	3	2	2	-	-	-	2	2	1	1	3	1	2
CO3	1	2	1	1	2	-	-	-	3	3	1	3	2	1	3
CO4	2	2	3	2	3	-	-	-	3	3	2	1	2	1	3
CO5	2	1	3	2	2	-	-	-	2	1	1	3	2	1	1
AVG	1.8	1.8	2.4	1.8	2.2	-	-	-	2.4	2	1.4	1.8	2.2	1.4	2

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE38 **SECURITY AND PRIVACY IN CLOUD**

L	T	P	C
2	0	2	3

COURSE OBJECTIVES:

- To Introduce Cloud Computing terminology, definition & concepts
- To understand the security design and architectural considerations for Cloud
- To understand the Identity, Access control in Cloud
- To follow best practices for Cloud security using various design patterns
- To be able to monitor and audit cloud applications for security

UNIT-I **FUNDAMENTALS OF CLOUD SECURITY CONCEPTS** **7**

Overview of cloud security- Security Services - Confidentiality, Integrity, Authentication, Non- repudiation, Access Control - Basic of cryptography - Conventional and public-key cryptography, hash functions, authentication, and digital signatures.

UNIT-II **SECURITY DESIGN AND ARCHITECTURE FOR CLOUD** **6**

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.

UNIT-III **ACCESS CONTROL AND IDENTITY MANAGEMENT** **6**

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-IV **CLOUD SECURITY DESIGN PATTERNS** **6**

Introduction to Design Patterns, Cloud bursting, Geo-tagging, Secure Cloud Interfaces, Cloud Resource Access Control, Secure On-Premise Internet Access, Secure External Cloud.

UNIT-V **MONITORING, AUDITING AND MANAGEMENT** **5**

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.

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TOTAL : 30 PERIODS

PRACTICAL EXERCISES: **30 PERIODS**

1. Simulate a cloud scenario using Cloud Sim and run a scheduling algorithm not present in CloudSim
2. simulate resource management using cloud sim
3. simulate log forensics using cloud sim
4. simulate a secure file sharing using a cloud sim
5. Implement data anonymization techniques over the simple dataset (masking, k-anonymization,etc)
6. Implement any encryption algorithm to protect the images
7. Implement any image obfuscation mechanism
8. Implement a role-based access control mechanism in a specific scenario
9. implement an attribute-based access control mechanism based on a particular scenario
10. Develop a log monitoring system with incident management in the cloud

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Understand the cloud concepts and fundamentals.
CO2: Explain the security challenges in the cloud.
CO3: Define cloud policy and Identity and Access Management.
CO4: Understand various risks and audit and monitoring mechanisms in the cloud.
CO5: Define the various architectural and design considerations for security in the cloud.

TOTAL:60 PERIODS

TEXT BOOKS:

1. Raj Kumar Buyya , James Broberg, andrzejGoscinski, —Cloud Computing:||, Wiley 2013
2. Dave shackle ford, —Virtualization Security||, SYBEX a wiley Brand 2013.
3. Mather, Kumaraswamy and Latif, —Cloud Security and Privacy||, OREILLY 2011

REFERENCES

1. Mark C. Chu-Carroll —Code in the Cloud||,CRC Press, 2011
2. Mastering Cloud Computing Foundations and Applications Programming RajkumarBuyya, Christian Vechhiola, S. ThamaraiSelvi

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CO's – PO's & PSO's MAPPING

SVHEC-R2023

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	1	2	-	-	-	1	1	1	3	3	1	2
CO2	1	3	2	3	1	-	-	-	2	2	3	2	3	1	2
CO3	3	2	2	3	2	-	-	-	3	1	1	2	2	3	1
CO4	2	1	2	3	3	-	-	-	3	2	3	3	1	1	2
CO5	1	3	3	1	1	-	-	-	2	3	3	2	2	3	2
AVG	2	2.4	2.4	2.2	1.8	-	-	-	2.2	1.8	2.2	2.4	2.2	1.8	1.8

1 - low, 2 - medium, 3 - high, '-' - no correlation

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VERTICAL 5: CREATIVE MEDIA											
S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
1.	23CSE51	Augmented Reality/Virtual Reality	PE	2	0	2	4	3	50	50	100
2.	23CSE52	Multimedia and Animation	PE	2	0	2	4	3	50	50	100
3.	23CSE53	Video Creation and Editing	PE	2	0	2	4	3	50	50	100
4.	23CSE24	UI and UX Design	PE	2	0	2	4	3	50	50	100
5.	23CSE55	Digital marketing	PE	2	0	2	4	3	50	50	100
6.	23CSE58	Multimedia Data Compression and Storage	PE	2	0	2	4	3	50	50	100
7.	23CSE57	Game Development	PE	2	0	2	4	3	50	50	100
8.	23CSE56	Visual Effects	PE	2	0	2	4	3	50	50	100

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23CSE51	AUGMENTED REALITY/ VIRTUAL REALITY	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To impart the fundamental aspects and principles of AR/VR technologies.
- To know the internal soft the hardware and software components involved in the development of AR/VR enabled applications.
- To learn about the graphical processing units and their architectures.
- To gain knowledge about AR/VR application development.
- To know the technologies involved in the development of AR/VR based applications.

UNIT-I **INTRODUCTION** **7**

Introduction to Virtual Reality and Augmented Reality–Definition–Introduction to Trajectories and Hybrid Space-Three I's of Virtual Reality – Virtual Reality Vs 3D Computer Graphics – Benefits of Virtual Reality–Components of VR System– Introduction to AR-AR Technologies-Input Devices– 3D Position Trackers – Types of Trackers – Navigation and Manipulation Interfaces – Gesture Interfaces–Types of Gesture Input Devices – Output Devices –Graphics Display – Human Visual System–Personal Graphics Displays–Large Volume Displays–Sound Displays–Human Auditory System.

UNIT-II **VR MODELING** **6**

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.

UNIT-III **VR PROGRAMMING** **6**

VR Programming – Toolkits and Scene Graphs –World Tool Kit – Java 3D – Comparison of World ToolKit and Java 3D.

UNIT-IV **APPLICATIONS** **6**

Human Factors in VR – Methodology and Terminology – VR Health and Safety Issues – VR and Society-Medical Applications of VR–Education, Arts and Entertainment –Military VR Applications –Emerging Applications of VR–VR Applications in Manufacturing–Applications of VR in Robotics –Information Visualization–VR in Business–VR in Entertainment–VR in Education.

UNIT-V **AUGMENTEDREALITY** **5**

Introduction to Augmented Reality-Computer vision for AR-Interaction-Modelling and Annotation- Navigation-Wearable devices

TOTAL : 30 PERIODS

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PRACTICAL EXERCISES: **30 PERIODS**

1. Study of tools like Unity, Maya,3DSMAX, AR toolkit, Vuforia and Blender.
2. Use the primitive objects and apply various projection types by handling camera.
3. Download objects from assets to re and apply various lighting and shading effects.
4. Model three dimensional objects using various modeling techniques and apply textures over them.
5. Create three dimensional realistic scenes and develop simple virtual reality enabled mobile applications which have limited interactivity.
6. Add audio and text special effects to the developed application.
7. Develop VR enabled applications using motion trackers and sensors incorporating full haptic interactivity.
8. Develop AR enabled applications with interactivity like E learning environment, Virtual walk throughs and visualization of historic places.
9. Develop AR enabled simple applications like human anatomy visualization, DNA/RNA structure visualization and surgery simulation.
10. Develop simple MR enabled gaming applications

COURSE OUTCOMES:

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

CO1: Understand the basic concepts of AR and VR

CO2: Understand the tools and technologies related to AR/VR

CO3: Know the working principle of AR/VR related Sensor devices

CO4: Design of various models using modeling techniques

CO5: Develop AR/VR applications in different domains

TOTAL: 60 (30+30) PERIODS

TEXT BOOKS:

1. Charles Palmer, John Williamson, "Virtual Reality Blueprints: Create compelling VR experiences for mobile", Packt Publisher, 2018

2. Dieter Schmalstieg, Tobias Hollerer, "Augmented Reality: Principles & Practice", Addison Wesley, 2016

3. JohnVince,"IntroductiontoVirtualReality",Springer-Verlag,2004.

4. William R. Sherman, Alan B. Craig: Understanding Virtual Reality – Interface, Application, Design", Morgan Kaufmann, 2003.

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E-RESOURCES:

https://virtualrealityforeducation.com/resources/

https://www.coursera.org/learn/ar

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	3	-	-	-	2	2	1	2	2	1	2
CO2	3	2	2	1	3	-	-	-	3	2	2	3	3	1	2
CO3	3	3	2	2	3	-	-	-	3	2	1	2	3	2	2
CO4	3	3	3	2	3	-	-	-	3	2	2	3	3	2	2
CO5	3	3	3	3	3	-	-	-	3	3	3	3	3	3	3
AVG	3.00	2.60	2.40	2.00	3.00	-	-	-	2.80	2.20	1.80	2.60	2.80	1.80	2.20

1 - low, 2 - medium, 3 - high, '-' - no correlation

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		L	T	P	C
23CSE52	MULTIMEDIA AND ANIMATION (for B.E/B.Tech-CSE, IT and AIDS)	2	0	2	3

COURSE OBJECTIVES:

To grasp the fundamental knowledge of Multimedia elements and systems

- To get familiar with Multimedia file format sand standards
- To learn the process of Authoring multimedia presentations
- Tolearnthetechniquesofanimationin2Dand3Dandforthemobile UI
- To explore different popular applications of multimedia

UNIT-I **INTRODUCTION TO MULTIMEDIA** **6**

Definitions, Elements, Multimedia Hardware and Software, Distributed multimedia systems, challenges: security, sharing / distribution, storage, retrieval, processing, computing. Multimedia metadata, Multimedia databases, Hypermedia, Multimedia Learning.

UNIT-II **MULTIMEDIA FILE FORMATS AND STANDARDS** **6**

File formats – Text, Image file formats, Graphic and animation file formats, Digital audio and Video file formats, Color in image and video, Color Models. Multimedia data and file formats for the web..

UNIT-III **MULTIMEDIA AUTHORING** **6**

Authoring metaphors, Tools Features and Types: Card and Page Based Tools, Icon and Object Based Tools, Time Based Tools, Cross Platform Authoring Tools, Editing Tools, PaintingandDrawingTools,3DModelingandAnimationTools,ImageEditingTools, audioEditingTools,DigitalMovieTools,Creatinginteractivepresentations,virtuallearning,simulations .

UNIT-IV **ANIMATION** **6**

Principles of animation: staging, squash and stretch, timing, onion skinning, secondary action, 2D, 2 ½ D, and 3D animation, Animation techniques: Keyframe, Morphing, Inverse Kinematics, Hand Drawn, Character rigging, vector animation, stop motion, motion graphics, , Fluid Simulation, skeletal animation, skinning Virtual Reality, Augmented Reality.

UNIT-V **AUGMENTED REALITY** **6**

Multimedia Big data computing, social networks, smart phones, surveillance, Analytics, Multimedia Cloud Computing, Multimedia streaming cloud, media on demand, security and forensics, Online social networking, multimedia ontology, Content based retrieval from digital libraries.

TOTAL : 30 PERIODS

LIST OF EXPERIMENTS:

Working with Image Editing tools:

InstalltoolslikeGIMP/InkScape/Krita/Pencilandperformeditingoperations:

- Use different selection and transform tools to modify or improve an image
- Create logos and banners for home pages of websites.

Working with Audio Editing tools:

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- Install tools like, Audacity/Ardour for audio editing, sound mixing and special effects like fade-in or fade-out etc.,
- Perform audio compression by choosing a proper codec.

Working with Video Editing and conversion tools:

Install tools like OpenShot/Cinelerra/HandBrakeforeditingvideocontent.

- Edit and mix video content, remove noise, create special effects, add captions.
- Compress and convert video file format to other popular formats.

Working with web/mobile authoring tools:

Adapt/KompoZer/BlueGriffon/BlueFish/AptanaStudio/NetBeans/WordPress/Expression Web:

- Design simple Home page with banners, logos, tables quick links etc
- Provide a search interface and simple navigation from the homepage to the inside pages of the website.
- Design Responsive web pages for use on both web and mobile interfaces.

Working with Animation tools:

Install tools like, Krita, Wick Editor, Blender:

- Perform a simple 2D animation with sprites
- Performsimple3Danimationwithkeyframes,kinematics

Working with Mobile UI animation tools: Origami studio/Lottie/Framer etc.,

Working with E-Learning authoring tools:

Install tools like EdApp/Moovly/CourseLab/IsEazyand CamStudio/Ampache, VideoLAN:

- Demonstrate screen recording and further editing for e-learning content.
- Create a simple E-Learning module for a topic of your choice.

Creating VR and AR applications:

- Any affordable VR viewer like Google Cardboard and any development platform like Openspace 3D / ARCore etc.

Note: all tools listed are open source. Usage of any proprietary tools in place of open source tools is not restricted.

30 PERIODS

TOTAL:60 PERIODS

COURSEOUTCOMES:

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

- Get the bigger picture of the context of Multimedia and its applications
- Use the different types of media elements of different formats on content pages

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- Author 2D and 3D creative and interactive presentations for different target multimedia applications.
- Usedifferentstandardanimationtechniquesfor2D,21/2D,3Dapplications
- Understand the complexity of multimedia applications in the context of cloud, security, bigdata streaming, social networking, CBIR etc.,

TEXTBOOKS:

1.Ze-NianLi,MarkS.Drew,JiangchuanLiu,FundamentalsofMultimedia",ThirdEdition, Springer Texts in Computer Science, 2021. (UNIT-I, II, III)

REFERENCES:

1.John M Blain, The Complete Guide to Blender Graphics: Computer Modeling & Animation, CRC press, 3rd Edition, 2016.

2.GeraldFriedland,RameshJain,"MultimediaComputing",CambridgeUniversityPress, 2018.

3.Prabhat K.Andleigh, Kiran Thakrar, "Multimedia System Design"Pearson Education, 1stEdition, 2015.

4.MohsenAminiSalehi,XiangboLi,"MultimediaCloudComputingSystems",SpringerNature, 1st Edition, 2021.

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	3	-	-	-	3	2	1	2	3	2	3
CO2	3	3	3	3	3	-	-	-	3	3	2	2	3	2	3
CO3	3	3	3	3	3	-	-	-	3	3	2	3	3	2	3
CO4	3	3	3	3	3	2	-	-	3	3	3	3	3	3	3
CO5	3	3	3	3	3	2	-	-	3	3	3	3	3	3	3
AVG	3.00	2.80	3.00	2.80	3.00	2.00	-	-	3.00	2.80	2.20	2.60	3.00	2.40	3.00

1 - low, 2 - medium, 3 - high, '-' - no correlation

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		L	T	P	C
23CSE53	**VIDEO CREATION AND EDITING** (for B.E/B.Tech-CSE, IT and AIDS)	2	0	2	3

COURSE OBJECTIVES:

- To introduce the broad perspective of linear and nonlinear editing concepts.
- To understand the concept of Storytelling styles.
- To be familiar with audio and video recording. To apply different media tools.
- To learn and understand the concepts of AVID XPRESS DV 4.

UNIT-I **FUNDAMENTALS** **6**

Evolution of filmmaking - linear editing - non-linear digital video - Economy of Expression - risks associated with altering reality through editing.

UNIT-II **STORYTELLING** **6**

File formats – Text, Image file formats, Graphic and animation file formats, Digital audio and Video file formats, Color in image and video, Color Models. Multimedia data and file formats for the web..

UNIT-III **USING AUDIO AND VIDEO** **6**

Capturing digital and analog video importing audio putting video on exporting digital video to tape recording to CDs and VCDs.

UNIT-IV **WORKING WITH FINAL CUT PRO** **6**

Working with clips and the Viewer - working with sequences, the Timeline, and the canvas - Basic Editing - Adding and Editing Testing Effects - Advanced Editing and Training Techniques - Working with Audio - Using Media Tools - Viewing and Setting Preferences.

UNIT-V **WORKING WITH AVID XPRESS DV 4** **6**

Starting Projects and Working with Project Window - Using Basic Tools and Logging - Preparing to Record and Recording - Importing Files - Organizing with Bins - Viewing and Making Footage - Using Timeline and Working in Trim Mode - Working with Audio - Output Options.

TOTAL : 30 PERIODS

LIST OF EXPERIMENTS: **30 PERIODS**

1. Write a Movie Synopsis (Individual/Team Writing)
2. Present team stories in class.
3. Script/Storyboard Writing(Individual Assignment)
4. Pre-Production: Personnel, budgeting, scheduling, location scouting, casting, contracts & agreements
5. Production: Single camera production personnel & equipment, Documentary Production
6. Writing The Final Proposal: Overview, Media Treatments, Summary, Pitching
7. Write Documentary & Animation Treatment
8. Post-production: Editing, Sound design, Finishing

TOTAL:60 PERIODS

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COURSEOUTCOMES:

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

CO1: Compare the strengths and limitations of Nonlinear editing.

CO2: Identify the infrastructure and significance of storytelling.

CO3: Apply suitable methods for recording to CDs and VCDs.

CO4: Address the core issues of advanced editing and training techniques.

CO5: Design and develop projects using AVID XPRESS DV 4

TEXTBOOKS:

1. Avid Xpress DV 4 User Guide, 2007.
2. Final Cut Pro 6 User Manual, 2004.
3. Keith Underdahl, "Digital Video for Dummies", Third Edition, Dummy Series, 2001.
4. Robert M. Goodman and Partick McGarth, "Editing Digital Video: The Complete Creative and Technical Guide", Digital Video and Audio, McGraw – Hill 2003.

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	1	1	-	-	-	1	2	3	2	3	1	1
CO2	2	3	3	3	1	-	-	-	1	2	2	1	1	1	1
CO3	2	2	3	3	1	-	-	-	3	1	1	1	2	1	2
CO4	2	2	2	2	1	-	-	-	3	1	1	1	2	2	2
CO5	2	1	3	3	1	-	-	-	3	2	1	2	2	2	1
AVG	2.2	1.8	2.6	2.4	1	-	-	-	2.2	1.6	1.6	1.4	2	1.4	1.4

1 - low, 2 - medium, 3 - high, '-' - no correlation

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		L	T	P	C
23CSE24	**UI AND UX DESIGN** (for B.E/ B.Tech -CSE, IT and AIDS)	2	0	2	3

COURSE OBJECTIVES:

- To understand the various Research Methods used in Design
- To explore the various Tools used in UI&UX
- Creating a wire frame and prototype
- To provide a sound knowledge in UI&UX
- To understand the need for UI and UX

UNIT-I **FOUNDATIONS OF UX DESIGN** **6**

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

UNIT-II **WIRE FRAMING, PROTOTYPING AND TESTING** **6**

Sketching Principles - Sketching Red Routes - Responsive Design – Wire framing - Creating Wire flows - Building a Prototype - Building High-Fidelity Mockups - Designing Efficiently with Tools - Interaction Patterns - Conducting Usability Tests - Other Evaluative User Research Methods - Synthesizing Test Findings - Prototype Iteration

UNIT-III **RESEARCH, DESIGNING, IDEATING, & INFORMATION ARCHITECTURE** **6**

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

UNIT-IV **FOUNDATIONS OF DESIGN** **6**

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

UNIT-V **FOUNDATIONS OF UI DESIGN** **6**

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Visual and UI Principles-UI Elements and Patterns- Interaction Behaviors and Principles–Branding-Style Guides

PRACTICALEXERCISES: **30 PERIODS**

30 PERIODS

1. Designing a Responsive layout for an societal application
2. Exploring various UI Interaction Patterns
3. Developing an interface with proper UI Style Guides
4. Developing Wire flow diagram for application using open source software
5. Exploring various open source collaborative interface Platform
6. Hands on Design Thinking Process for a new product
7. Brainstorming feature for proposed product
8. Defining the Look and Feel of the new Project
9. Create a Sample Pattern Library for that product (Moodboard, Fonts ,Colors based on UI principles)
10. Identify a customer problem to solve
11. Conduct end-to-end user research- User research, creating person as, Ideation process (User stories, Scenarios), Flow diagrams, Flow Mapping

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Demonstrate UX Skills in product development.

CO2: Implement Sketching principles.

CO3: Create Wire frame and Prototype.

CO4: Build UI for user Applications.

CO5: Evaluate UX design of any product or application.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. JoelMarsh,"UXforBeginners",O'Reilly,2022.
2. JonYablonski,"LawsofUXusingPsychologytoDesignBetterProduct&Services"O'Reilly 2021.

REFERENCE BOOKS:

1. JeniferTidwell,CharlesBrewer,AynneValencia,"DesigningInterface"3rdEdition,O'Reilly 2020.
2. Steve Schoger, Adam Wathan"RefactoringUI", 2018.
3. SteveKrug,"Don'tMakeMeThink,Revisited:ACommonsenseApproachtoWeb&Mobile", ThirdEdition, 2015.
4. https://www.nngroup.com/articles/
5. https://www.interaction-design.org/literature

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CO's–PO's& PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	3	2	2	-	-	-	2	3	1	2	1	3	3
CO2	1	2	3	3	1	-	-	-	3	2	1	3	3	3	3
CO3	1	2	3	2	1	-	-	-	2	1	1	1	3	2	2
CO4	3	1	1	3	1	-	-	-	3	3	2	1	3	3	1
CO5	2	3	1	3	2	-	-	-	1	2	2	2	1	2	2
AVG	1.6	2.2	2.2	2.6	1.4	-	-	-	2.2	2.2	1.4	1.8	2.2	2.6	2.2

1-low,2-medium,3- high,'-'- no correlation

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		L	T	P	C
23CSE55	**DIGITAL MARKETING** (for B.E/B.Tech-CSE, IT and AIDS)	2	0	2	3

COURSE OBJECTIVES:

- The primary objective of this module is to examine and explore the role and importance of digital marketing in today's rapidly changing business environment.
- It also focuses on how digital marketing can be utilized by organizations and how its effectiveness can be measured.

UNIT-I **INTRODUCTION TO ONLINE MARKET** **6**

Online Market space- Digital Marketing Strategy- Components - Opportunities for building Brand Website - Planning and Creation - Content Marketing.

UNIT-II **SEARCH ENGINE OPTIMISATION** **6**

Search Engine optimisation - Keyword Strategy- SEO Strategy - SEO success factors -On-Page Techniques - Off-Page Techniques. Search Engine Marketing- How Search Engine works- SEM components- PPC advertising -Display Advertisement

UNIT-III **E- MAIL MARKETING** **6**

E- Mail Marketing - Types of E- Mail Marketing - Email Automation - Lead Generation - Integrating Email with Social Media and Mobile- Measuring and maximizing email campaign effectiveness. Mobile Marketing- Mobile Inventory/channels- Location based; Context based; Coupons and offers, Mobile Apps, Mobile Commerce, SMS Campaigns-Profiling and targeting

UNIT-IV **SOCIAL MEDIA MARKETING** **6**

Social Media Marketing - Social Media Channels- Leveraging Social media for brand conversations and buzz. Successful /benchmark Social media campaigns. Engagement Marketing- Building Customer relationships - Creating Loyalty drivers - Influencer Marketing.

UNIT-V **DIGITAL TRANSFORMATION** **6**

Digital Transformation & Channel Attribution- Analytics- Ad-words, Email, Mobile, Social Media, Web Analytics - Changing your strategy based on analysis- Recent trends in Digital marketing.

TOTAL : 30 PERIODS

LIST OF EXPERIMENTS: **30 PERIODS**

1. Subscribe to a weekly/quarterly newsletter and analyze how its content and structure aid with the branding of the company and how it aids its potential customer segments.
2. Perform keyword search for a skincare hospital website based on search volume and competition using Google keyword planner tool.
3. Demonstrate how to use the Google WebMasters Indexing API
4. Discuss an interesting case study regarding how an insurance company manages leads.
5. Discuss negative and positive impacts and ethical implications of using social media for political advertising.
6. Discuss how Predictive analytics is impacting marketing automation.

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COURSEOUTCOMES:

CO1: To examine and explore the role and importance of digital marketing in today's rapidly changing business environment..

CO2: To focuses on how digital marketing can be utilized by organizations and how its effectiveness can be measured.

CO3: To know the key elements of a digital marketing strategy.

CO4: To study how the effectiveness of a digital marketing campaign can be measured

CO5: To demonstrate advanced practical skills in common digital marketing tools such as SEO, SEM, Social media and Blogs, CBIR etc.,

TOTAL:60 PERIODS

TEXTBOOKS:

1. Fundamentals of Digital Marketing by Puneet Singh Bhatia; Publisher: Pearson Education;
2. First edition (July 2017);ISBN-10: 933258737X;ISBN-13: 978-9332587373.
3. Digital Marketing by Vandana Ahuja ; Publisher: Oxford University Press (April 2015). ISBN- 10: 0199455449
4. Marketing 4.0: Moving from Traditional to Digital by Philip Kotler; Publisher: Wiley; 1st edition (April 2017); ISBN10: 9788126566938;ISBN 13: 9788126566938;ASIN: 8126566930.
5. Ryan, D. (2014). Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, Kogan Page Limited..
6. Barker, Barker, Bormann and Neher(2017), Social Media Marketing: A Strategic Approach, 2E South-Western ,Cengage Learning.
7. Pulizzi,J Beginner's Guide to Digital Marketing , Mcgraw Hill Education

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	3	-	-	-	3	2	1	2	3	2	3
CO2	3	3	3	3	3	-	-	-	3	3	2	2	3	2	3
CO3	1	1	1	2	2	-	-	-	1	2	1	1	3	2	1
CO4	3	2	2	3	1	-	-	-	1	3	2	3	2	3	2
CO5	2	3	1	3	3	-	-	-	2	3	1	2	1	2	1
AVG	2.2	2.2	1.6	2	2.4	-	-	-	1.2	2.4	2	2.4	2.4	2.6	2

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE58	MULTIMEDIA DATA COMPRESSION AND STORAGE (for B.E/B.Tech-CSE, IT and AIDS)	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To understand the basics of compression techniques
- To understand the categories of compression for text, image and video
- To explore the modalities of text, image and video compression algorithms
- To know about basics of consistency of data availability in storage devices
- To understand the concepts of data streaming services

UNIT-I **BASICS OF DATA COMPRESSION** **6**

Introduction --Lossless and Lossy Compression- Basics of Huffmann coding- Arithmetic coding-Dictionary techniques- Context based compression – Applications

UNIT-II **IMAGE COMPRESSION** **6**

Lossless Image compression – JPEG-CALIC-JPEG LS-Prediction using conditional averages –ProgressiveImageTransmission–LosslessImagecompressionformats–Applications-Facsimile encoding

UNIT-III **VIDEO COMPRESSION** **6**

Introduction – Motion Compensation – Video Signal Representation – H.261 – MPEG

UNIT-IV **DATAPLACEMENT ON DISKS** **6**

Statistical placement on Disks – Striping on Disks – Replication Placement on Disks – Constraint allocation on Disks – Tertiary storage Devices – Continuous Placement on Hierarchical storage system – Statistical placement on Hierarchical storage systems – Constraint allocation on Hierarchical storage system

UNIT-V **DISK SCHEDULING METHODS** **6**

Scheduling methods for disk requests –Feasibility conditions of concurrent streams–Scheduling methods for request streams

TOTAL : 30 PERIODS

LIST OF EXPERIMENTS:

1. Construct Huffman codes for given symbol probabilities.
2. Encode run lengths with fixed-length code.
3. Lempel-Ziv algorithm for adaptive variable-length encoding
4. Compress the given word using arithmetic coding based on the frequency of the letters.
5. Write a shell script, which converts all images in the current directory in JPEG.
6. Write a program to split images from a video without using any primitives.
7. Create a photo album of a trip by applying appropriate image dimensions and format.

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8. Write the code for identifying the popularity of content retrieval from media server.
9. Write the code for ensuring data avail ability in disks using strip based method.
10. Program for scheduling requests for data streams.

30 PERIODS

TOTAL:60 PERIODS

COURSEOUTCOMES:

CO1: Understand the basics of text, Image and Video compression

CO2: Understand the various compression algorithms for multimedia content

CO3: Explore the applications of various compression techniques

CO4: Explore knowledge on multimedia storage on disks

CO5: Understand scheduling methods for request streams

TEXTBOOKS:

1. KhalidSayood, Introduction to Data Compression, Morgan Kaufmann Series in Multimedia Information and Systems, 2018, 5th Edition.

2. PhilipK.C.Tse, Multimedia Information Storage and Retrieval: Techniques and Technologies, 2008

REFERENCES

1. David Salomon, A concise introduction to data compression,2008.

2. Lenald Best, Best's Guide to Live Stream Video Broadcasting, BCB Live Teachingseries, 2017.

3. Yun-QingShi, Image And Video Compression For Multimedia Engineering Fundamentals Algorithms And Standards, Taylor& Francis,2019

4. Irina Bocharova, Compression for Multimedia ,Cambridge University Press;1st edition, 2009

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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CO2	3	2	2	1	2	-	-	-	-	-	-	-	2	2	2
CO3	3	2	2	1	2	-	-	-	-	-	-	-	2	2	2
CO4	3	2	2	1	1	-	-	-	-	-	-	-	2	2	2
CO5	3	2	2	1	1	-	-	-	-	-	-	-	2	2	2
AVG	3	2	2	1	1.4	-	-	-	-	-	-	-	2	2	2

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE57	GAME DEVELOPMENT (for B.E/B.Tech-CSE, IT and AIDS)	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To know the basics of 2D and 3D graphics for game development.
- To know the stages of game development.
- To understand the basics of a game engine.
- To survey the gaming development environment and toolkits.
- To learn and develop simple games using Pygame environment.

UNIT-I **3D GRAPHICS FOR GAME DESIGN** **6**

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-II **GAME DESIGN PRINCIPLES** **6**

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-III **GAME ENGINE DESIGN** **6**

Rendering Concept – Software Rendering – Hardware Rendering – Spatial Sorting Algorithms – Algorithms for Game Engine– Collision Detection – Game Logic – Game AI – Path finding.

UNIT-IV **OVERVIEW OF GAMING PLATFORMS AND FRAMEWORKS** **6**

Pygame Game development–Unity–Unity Scripts –Mobile Gaming, Game Studio , Unity Single player and Multi-Player games.

UNIT-V **GAMEDEVELOPMENTUSINGPYGAME** **6**

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–DeviceHandlinginPygame–OverviewofIsometricandTileBasedarcadeGames – Puzzle Games.

TOTAL : 30 PERIODS

COURSEOUTCOMES:

CO1: Explain the concepts of 2D and 3d Graphics

CO2: Design game design documents.

CO3: Implementation of gaming engines.

CO4: Survey gaming environments and frameworks.

CO5: Implement a simple game in Pygame.

30 PERIODS

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LIST OF EXPERIMENTS:

1. Installation of a game engine, e.g.,Unity, Unreal Engine, familiarization of the GUI. Conceptualize the theme for a 2D game.
2. Character design, sprites, movement and character control
3. Level design: design of the world in the form of tiles along with interactive and collectible objects.
4. Design of interaction between the player and the world, optionally using the physics engine.
5. Developing a 2D interactive using Pygame
6. Developing a Puzzle game
7. Design of menus and user interaction in mobile platforms.
8. Developing a 3D Game using Unreal
9. Developing a Multiplayer game using unity

TOTAL:60PERIODS

REFERENCES:

1. SanjayMadhav,"GameProgrammingAlgorithmsandTechniques:APlatformAgnostic Approach", Addison Wesley,2013.
2. Will McGugan, "Beginning Game Development with Python and Pygame: From Novice to Professional", Apress,2007.
3. PaulCraven,"PythonArcadegames",ApressPublishers,2016.
4. David H. Eberly, "3D Game Engine Design: A Practical Approach to Real-Time Computer Graphics", Second Edition, CRC Press,2006.
5. JungHyunHan,"3DGraphicsforGameProgramming",ChapmanandHall/CRC,2011.

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	2	-	-	-	-	-	-	-	2	2	2
CO2	1	2	2	1	2	-	-	-	-	-	-	-	2	2	1
CO3	1	1	1	2	1	-	-	-	-	-	-	-	2	2	2
CO4	3	3	1	3	3	-	-	-	-	-	-	-	2	2	3
CO5	3	3	2	1	3	-	-	-	-	-	-	-	2	2	3
AVG	2.2	2.2	1.6	1.6	2.2	-	-	-	-	-	-	-	2	2	2.2

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE56	VISUAL EFFECTS (for B.E/B.Tech-CSE, IT and AIDS)	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To get a basic idea on animation principles and techniques
- To get exposure to CGI, color and light elements of VFX
- To have a better understanding of basic special effects techniques
- To have a knowledge of state of the art vfx techniques
- To become familiar with popular compositing techniques.

UNIT-I **ANIMATIONBASICS** **6**

VFXproductionpipeline,Principlesofanimation,Techniques:Keyframe,kinematics,Fullanimation, limited animation, Rotoscoping, stopmotion, object animation, pixilation, rigging, shapekeys, motion paths.

UNIT-II **CGI, COLOR ,LIGHT** **6**

CGI – virtual worlds, Photorealism, physical realism, function realism, 3D Modeling and Rendering: color -Color spaces, color depth, Color grading, color effects, HDRI, Light – Area andmesh lights, image based lights, PBR lights, photometric light, BRDF shading model

UNIT-III **SPECIAL EFFECTS** **6**

Special Effects – props, scaled models, animatronics, pyro techniques, Schüfftan process, Particle effects – wind, rain, fog, fire.

UNIT-IV **VISUAL EFFECTS TECHNIQUES** **6**

Motion Capture, Matt Painting, Rigging, Front Projection.Rotoscoping, Match Moving – Tracking, camera reconstruction, planar tracking, Calibration, Point Cloud Projection, Ground plane determination, 3D Match Moving.

UNIT-V **COMPOSITING** **6**

Compositing – chroma key, blue screen/green screen, background projection, alpha compositing, deep image compositing, multiple exposure, matting, VFX tools -Blender, Natron, GIMP.

TOTAL : 30 PERIODS

LIST OF EXPERIMENTS:

Using Natron:

- Understanding Natron Environment:
- Working with color and using color grading
- Using Channels
- Merging images
- Using Roto paint
- Performing Tracking and stabilizing
- Transforming elements
- Stereoscopic compositing

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Using Blender:

- Motion Tracking– camera and object tracking
- Camera fx, color grading, vignettes
- Compositing images and video files
- Multilayer rendering

30 PERIODS

TOTAL:60 PERIODS

COURSEOUTCOMES:

At the end of the course, the student will be able to

CO1: To implement animation in 2D/3D following the principles and techniques

CO2: To use CGI, color and light elements in VFX applications

CO3: To create special effects using any of the state of the art tools

CO4: To apply popular visual effects techniques using advanced tools

CO5: To use compositing tools for creating VFX for a variety of applications

TEXTBOOKS:

1. Chris Roda, Real Time Visual Effects for the Technical Artist, CRC Press, 1st Edition, 2022.

2. Steve Wright, Digital Compositing for film and video, Rout ledge, 4th Edition, 2017.

3 .John Gress, Digital Visual Effects and Compositing, New Riders Press, 1st Edition, 2014.

REFERENCES:

1. Jon Gress, "Digital Visual Effects and Compositing", New Riders Press, 1stEdition, 2014.

2. Robin Brinkman, The Art and Science of Digital Compositing: Techniques for Visual Effects, Animation and Motion Graphics", Morgan Kauffman, 2008.

3. Luiz Velho, Bruno Madeira, "Introduction to Visual Effects A Computational Approach", Routledge, 2023.

4. Jasmine Katatikarn, Michael Tanzillo, "Lighting for Animation: The art of visual storytelling , Routledge, 1stEdition, 2016.

5. EranDinur,"TheCompleteguidetoPhotorealism,forVisualEffects,Visualization

6. Jeffrey A. Okun, Susan Zwerman, Christopher McKittrick, " The VES Handbook of Visual Effects: Industry Standard VFX Practices and Procedures", Third Edition, 2020.and Games", Rout ledge, 1st Edition, 2022.

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CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	-	-	-	1	2	1	1	3	3	2
CO2	1	3	3	2	1	-	-	-	3	2	2	2	1	1	1
CO3	2	3	3	2	1	-	-	-	1	2	1	2	2	2	2
CO4	3	3	2	2	3	-	-	-	3	3	2	2	2	3	1
CO5	1	2	1	1	2	-	-	-	1	3	2	3	2	3	1
AVG	2	2.8	2.4	2	1.6	-	-	-	1.8	2.4	1.6	2	2	2.4	1.4

1 - low, 2 - medium, 3 - high, '-' - no correlation

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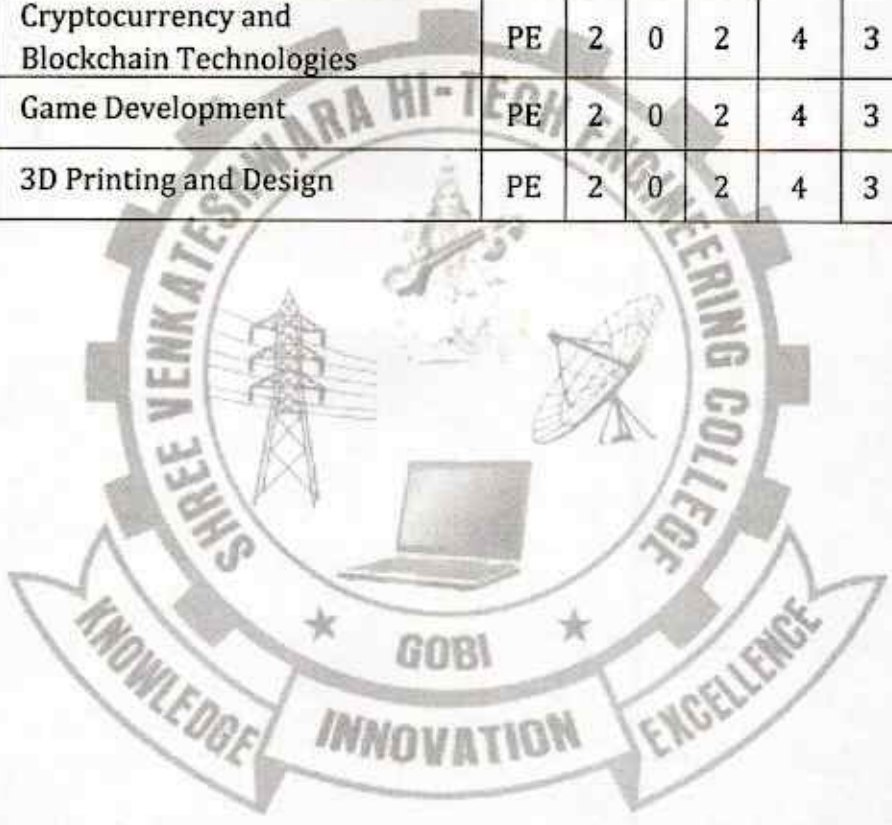
VERTICAL 6: EMERGING TECHNOLOGIES											
S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
1.	23CSE51	Augmented Reality/Virtual Reality	PE	2	0	2	4	3	50	50	100
2.	23CSE62	Robotic Process Automation	PE	2	0	2	4	3	50	50	100
3.	23CSE13	Neural Networks and Deep Learning	PE	2	0	2	4	3	50	50	100
4.	23CSE64	Cyber security	PE	2	0	2	4	3	50	50	100
5.	23CSE65	Quantum Computing	PE	2	0	2	4	3	50	50	100
6.	23CSE46	Cryptocurrency and Blockchain Technologies	PE	2	0	2	4	3	50	50	100
7.	23CSE57	Game Development	PE	2	0	2	4	3	50	50	100
8.	23CSE68	3D Printing and Design	PE	2	0	2	4	3	50	50	100



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23CSE51	AUGMENTED REALITY/ VIRTUAL REALITY	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To impart the fundamental aspects and principles of AR/VR technologies.
- To know the internal soft the hardware and software components involved in the development of AR/VR enabled applications.
- To learn about the graphical processing units and their architectures.
- To gain knowledge about AR/VR application development.
- To know the technologies involved in the development of AR/VR based applications.

UNIT-I **INTRODUCTION** **7**

Introduction to Virtual Reality and Augmented Reality–Definition–Introduction to Trajectories and Hybrid Space-Three I's of Virtual Reality – Virtual Reality Vs 3D Computer Graphics – Benefits of Virtual Reality–Components of VR System– Introduction to AR-AR Technologies-Input Devices– 3D Position Trackers – Types of Trackers – Navigation and Manipulation Interfaces – Gesture Interfaces–Types of Gesture Input Devices – Output Devices –Graphics Display – Human Visual System–Personal Graphics Displays–Large Volume Displays–Sound Displays–Human Auditory System.

UNIT-II **VR MODELING** **6**

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.

UNIT-III **VR PROGRAMMING** **6**

VR Programming – Toolkits and Scene Graphs –World Tool Kit – Java 3D – Comparison of World ToolKit and Java 3D.

UNIT-IV **APPLICATIONS** **6**

Human Factors in VR – Methodology and Terminology – VR Health and Safety Issues – VR and Society-Medical Applications of VR–Education, Arts and Entertainment –Military VR Applications –Emerging Applications of VR–VR Applications in Manufacturing–Applications of VR in Robotics –Information Visualization–VR in Business–VR in Entertainment–VR in Education.

UNIT-V **AUGMENTEDREALITY** **5**

Introduction to Augmented Reality-Computer vision for AR-Interaction-Modelling and Annotation- Navigation-Wearable devices

TOTAL : 30 PERIODS

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PRACTICAL EXERCISES: **30 PERIODS**

1. Study of tools like Unity, Maya,3DSMAX, AR toolkit, Vuforia and Blender.
2. Use the primitive objects and apply various projection types by handling camera.
3. Download objects from assets to re and apply various lighting and shading effects.
4. Model three dimensional objects using various modeling techniques and apply textures over them.
5. Create three dimensional realistic scenes and develop simple virtual reality enabled mobile applications which have limited interactivity.
6. Add audio and text special effects to the developed application.
7. Develop VR enabled applications using motion trackers and sensors incorporating full haptic interactivity.
8. Develop AR enabled applications with interactivity like E learning environment, Virtual walk throughs and visualization of historic places.
9. Develop AR enabled simple applications like human anatomy visualization, DNA/RNA structure visualization and surgery simulation.
10. Develop simple MR enabled gaming applications

COURSE OUTCOMES:

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

CO1: Understand the basic concepts of AR and VR

CO2: Understand the tools and technologies related to AR/VR

CO3: Know the working principle of AR/VR related Sensor devices

CO4: Design of various models using modeling techniques

CO5: Develop AR/VR applications in different domains

TOTAL: 60 (30+30) PERIODS

TEXT BOOKS:

1. Charles Palmer, John Williamson, "Virtual Reality Blueprints: Create compelling VR experiences for mobile", Packt Publisher, 2018

2. Dieter Schmalstieg, Tobias Hollerer, "Augmented Reality: Principles & Practice", Addison Wesley, 2016

3. JohnVince,"IntroductiontoVirtualReality",Springer-Verlag,2004.

4. William R. Sherman, Alan B. Craig: Understanding Virtual Reality – Interface, Application, Design", Morgan Kaufmann, 2003.

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E-RESOURCES:

https://virtualrealityforeducation.com/resources/

https://www.coursera.org/learn/ar

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	3	-	-	-	2	2	1	2	2	1	2
CO2	3	2	2	1	3	-	-	-	3	2	2	3	3	1	2
CO3	3	3	2	2	3	-	-	-	3	2	1	2	3	2	2
CO4	3	3	3	2	3	-	-	-	3	2	2	3	3	2	2
CO5	3	3	3	3	3	-	-	-	3	3	3	3	3	3	3
AVG	3.00	2.60	2.40	2.00	3.00	-	-	-	2.80	2.20	1.80	2.60	2.80	1.80	2.20

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE62	ROBOTIC PROCESS AUTOMATION	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To understand the basic concepts of Robotic Process Automation.
- To expose to the key RPA design and development strategies and methodologies.
- To learn the fundamental RPA logic and structure.
- To explore the Exception Handling, Debugging and Logging operations in RPA.
- To learn to deploy and Maintain the software bot.

UNIT-I INTRODUCTION TO ROBOTIC PROCESS AUTOMATION 6

Emergence of Robotic Process Automation (RPA), Evolution of RPA, Differentiating RPA from Automation - Benefits of RPA - Application areas of RPA, Components of RPA, RPA Platforms. Robotic Process Automation Tools - Templates, User Interface, Domains in Activities, Workflow Files.

UNIT-II AUTOMATION PROCESS ACTIVITIES 6

Sequence, Flowchart & Control Flow: Sequencing the Workflow, Activities, Flowchart, Control Flow for Decision making. Data Manipulation: Variables, Collection, Arguments, Data Table, Clipboard management, File operations Controls: Finding the control, waiting for a control, Act on a control, UiExplorer, Handling Events

UNIT-III APP INTEGRATION, RECORDING AND SCRAPING 6

App Integration, Recording, Scraping, Selector, Workflow Activities. Recording mouse and keyboard actions to perform operation, Scraping data from website and writing to CSV. Process Mining.

UNIT-IV EXCEPTION HANDLING AND CODE MANAGEMENT 6

Exception handling, Common exceptions, Logging- Debugging techniques, Collecting crash dumps, Error reporting. Code management and maintenance: Project organization, Nesting workflows, Reusability, Templates, Commenting techniques, State Machine.

UNIT-V DEPLOYMENT AND MAINTENANCE 5

Publishing using publish utility, Orchestration Server, Control bots, Orchestration Server to deploy bots, License management, Publishing and managing updates. RPA Vendors - Open Source RPA, Future of RPA

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TOTAL : 30 PERIODS

PRACTICAL EXERCISES: **30 PERIODS**

Setup and Configure a RPA tool and understand the user interface of the tool:

1. Create a Sequence to obtain user inputs display them using a message box;
2. Create a Flowchart to navigate to a desired page based on a condition;
3. Create a State Machine workflow to compare user input with a random number.
4. Build a process in the RPA platform using UI Automation Activities.
5. Create an automation process using key System Activities, Variables and Arguments
6. Also implement Automation using System Trigger .
7. Automate login to (web)Email account
8. Recording mouse and keyboard actions.
9. Scraping data from website and writing to CSV .
10. Implement Error Handling in RPA platform.
11. Web Scraping.
12. Email Query Processing.

COURSE OUTCOMES:

By the end of this course, the students will be able to:

CO1: Enunciate the key distinctions between RPA and existing automation techniques and platforms.

CO2: Use UiPath to design control flows and work flows for the target process.

CO3: Implement recording, web scraping andprocess mining by automation.

CO4: Use UIPath Studio to detect, and handle exceptions in automation processes.

CO5: Implement and use Orchestrator for creation, monitoring, scheduling, and controlling of automated bots and process

TEXT BOOKS:

1. Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool - UiPath by Alok Mani Tripathi, Packt Publishing, 2018.
2. Tom Taulli , "The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems", Apress publications, 2020.

REFERENCES:

1. Frank Casale (Author), Rebecca Dilla (Author), Heidi Jaynes (Author), Lauren Livingston (Author), Introduction to Robotic Process Automation: a Primer, Institute of Robotic Process Automation, Amazon Asia-Pacific Holdings Private Limited, 2018
2. Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant, Amazon Asia-Pacific Holdings Private Limited, 2018 3. A Gerardus Blokdyk, "Robotic Process Automation Rpa A Complete Guide ", 2020 .

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CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	-	-	-	1	3	3	2	2	2	1
CO2	1	1	2	3	3	-	-	-	1	2	3	1	3	2	1
CO3	2	3	2	3	3	-	-	-	2	3	1	1	3	3	3
CO4	1	2	1	2	2	-	-	-	1	2	1	3	3	3	2
CO5	3	3	3	3	3	-	-	-	3	1	1	1	3	2	1
AVG	2	2.2	2	2.4	2.8	-	-	-	1.6	2.2	1.8	1.6	2.8	2..4	1.6

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE13	NEURAL NETWORKS AND DEEP LEARNING	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To understand the basics in deep neural networks
- To understand the basics of associative memory and unsupervised learning networks
- To apply CNN architectures of deep neural networks
- To analyze the key computations underlying deep learning, then use them to build and train deep neural networks for various tasks.
- To apply auto encoders and generative models for suitable applications

UNIT-I INTRODUCTION 7

Neural Networks-Application Scope of Neural Networks-Artificial Neural Network: An Introduction Evolution of Neural Networks-Basic Models of Artificial Neural Network- Important Terminologies of ANNs-Supervised Learning Network.

UNIT-II ASSOCIATIVE MEMORY AND UNSUPERVISED LEARNING NETWORKS 6

Training Algorithms for Pattern Association-Autoassociative Memory Network-Heteroassociative Memory Network-Bidirectional Associative Memory (BAM)-Hopfield Networks-Iterative Autoassociative Memory Networks-Temporal Associative Memory Network-Fixed Weight Competitive Nets-Kohonen Self-Organizing Feature Maps-Learning Vector Quantization-Counter propagation Networks-Adaptive Resonance Theory Network.

UNIT-III THIRD-GENERATION NEURAL NETWORKS 6

Spiking Neural Networks-Convolutional Neural Networks-Deep Learning Neural Networks-Extreme Learning Machine Model-Convolutional Neural Networks: The Convolution Operation – Motivation – Pooling – Variants of the basic Convolution Function – Structured Outputs – Data Types – Efficient Convolution Algorithms – Neuroscientific Basis – Applications: Computer Vision, Image Generation, Image Compression.

UNIT-IV DEEP FEEDFORWARD NETWORKS 5

History of Deep Learning- A Probabilistic Theory of Deep Learning- Gradient Learning – Chain Rule and Backpropagation - Regularization: Dataset Augmentation – Noise Robustness -Early Stopping, Bagging and Dropout - batch normalization- VC Dimension and Neural Nets.

UNIT-V RECURRENT NEURAL NETWORKS 5

Recurrent Neural Networks: Introduction – Recursive Neural Networks – Bidirectional RNNs – Deep Recurrent Networks – Applications: Image Generation, Image Compression, Natural

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Language Processing. Complete Auto encoder, Regularized Autoencoder, Stochastic Encoders and Decoders, Contractive Encoders.

TOTAL : 30 PERIODS

LAB EXPERIMENTS: **30 PERIODS**

1. Implement simple vector addition in Tensor Flow.
2. Implement a regression model in Keras.
3. Implement a perceptron in Tensor Flow/Keras Environment.
4. Implement a Feed-Forward Network in Tensor Flow/Keras.
5. Implement an Image Classifier using CNN in Tensor Flow/Keras.
6. Improve the Deep learning model by fine tuning hyper parameters.
7. Implement a Transfer Learning concept in Image Classification.
8. Using a pre trained model on Keras for Transfer Learning
9. Perform Sentiment Analysis using RNN
10. Implement an LSTM based Auto encoder in Tensor Flow/Keras.
11. Image generation using GAN

ADDITIONAL EXPERIMENTS:

12. Train a Deep learning model to classify a given image using pre trained model
13. Recommendation system from sales data using Deep Learning
14. Implement Object Detection using CNN
15. Implement any simple Reinforcement Algorithm for an NLP problem

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Apply Convolution Neural Network for image processing.

CO2: Understand the basics of associative memory and unsupervised learning networks.

CO3: Apply CNN and its variants for suitable applications.

CO4: Analyze the key computations underlying deep learning and use them to build and train deep neural networks for various tasks.

CO5: Apply auto encoders and generative models for suitable applications.

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TEXT BOOKS:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016.

2. Francois Chollet, "Deep Learning with Python", Second Edition, Manning Publications, 2021.

REFERENCES BOOKS :

1. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and TensorFlow", Oreilly, 2018.

2. Josh Patterson, Adam Gibson, "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017.

3. Charu C. Aggarwal, "Neural Networks and Deep Learning: A Textbook", Springer International Publishing, 1st Edition, 2018.

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	3	1	-	-	2	1	-	-	2	2	1
CO2	3	1	2	1	-	-	-	-	-	1	2	2	-	1	-
CO3	3	3	3	3	3	1	-	-	2	1	-	-	2	2	1
CO4	3	3	3	3	3	-	-	-	2	-	2	3	2	2	2
CO5	1	1	3	2	3	-	-	-	2	-	-	-	1	1	-
AVG	2.6	2	2.8	2.2	2.4	0.4	0	0	1.6	0.6	0.8	1	1.4	1.6	0.8

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE64	CYBER SECURITY	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To learn cybercrime and cyber law.
- To understand the cyber attacks and tools for mitigating them.
- To understand information gathering.
- To learn how to detect a cyber attack.
- To learn how to prevent a cyber attack.

UNIT-I **INTRODUCTION** **7**

Cyber Security – History of Internet – Impact of Internet – CIA Triad; Reason for Cyber Crime – Need for Cyber Security – History of Cyber Crime; Cybercriminals – Classification of Cybercrimes – A Global Perspective on Cyber Crimes; Cyber Laws – The Indian IT Act – Cybercrime and Punishment.

UNIT-II **ATTACKS AND COUNTERMEASURES** **6**

OSWAP; Malicious Attack Threats and Vulnerabilities: Scope of Cyber-Attacks – Security Breach – Types of Malicious Attacks – Malicious Software – Common Attack Vectors – Social engineering Attack – Wireless Network Attack – Web Application Attack – Attack Tools – Countermeasures.

UNIT-III **RECONNAISSANCE** **6**

Harvester – Whois – Netcraft – Host – Extracting Information from DNS – Extracting Information from E-mail Servers – Social Engineering Reconnaissance; Scanning – Port Scanning – Network Scanning and Vulnerability Scanning – Scanning Methodology – Ping Sweer Techniques – Nmap Command Switches – SYN – Stealth – XMAS – NULL – IDLE – FIN Scans – Banner Grabbing and OS Finger printing Techniques.

UNIT-IV **INTRUSION DETECTION** **5**

Host -Based Intrusion Detection – Network -Based Intrusion Detection – Distributed or Hybrid Intrusion Detection – Intrusion Detection Exchange Format – Honeypots – Example System Snort.

UNIT-V **INTRUSION PREVENTION** **5**

Firewalls and Intrusion Prevention Systems: Need for Firewalls – Firewall Characteristics and Access Policy – Types of Firewalls – Firewall Basing – Firewall Location and Configurations – Intrusion Prevention Systems – Example Unified Threat Management Products.

TOTAL : 30 PERIODS

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PRACTICAL EXERCISES: **30 PERIODS**

1. Install Kali Linux on Virtual box
2. Explore Kali Linux and bash scripting
3. Perform open source intelligence gathering using Netcraft, Whois Lookups, DNS Reconnaissance, Harvester and Maltego
4. Understand the nmap command d and scan a target using nmap
5. Install metasploitable2 on the virtual box and search for unpatched vulnerabilities
6. Use Metasploit to exploit an unpatched vulnerability
7. Install Linus server on the virtual box and install ssh
8. Use Fail2banto scan log files and ban Ips that show the malicious signs
9. Launch brute-force attacks on the Linux server using Hydra.
10. Perform real-time network traffic analysis and data pocket logging using Snort

COURSE OUTCOMES:

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

CO1: Explain the basics of cyber security, cyber crime and cyber law (K2)

CO2: Classify various types of attacks and learn the tools to launch the attacks (K2)

CO3 Apply various tools to perform information gathering (K3)

CO4: Apply intrusion techniques to detect intrusion (K3)

CO5: Apply intrusion prevention techniques to prevent intrusion (K3)

TEXTBOOKS

1. Anand Shinde, "Introduction to Cyber Security Guide to the World of Cyber Security", Notion Press, 2021 (Unit 1)

2. Nina Godbole, Sunit Belapure, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley Publishers, 2011 (Unit 1)

REFERENCES

1. David Kim, Michael G. Solomon, "Fundamentals of Information Systems Security", Jones & Bartlett Learning Publishers, 2013 (Unit 2)

2. Patrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made easy", Elsevier, 2011 (Unit 3)

3. Kimberly Graves, "CEH Official Certified Ethical hacker Review Guide", Wiley Publishers, 2007 (Unit 3)

4. William Stallings, Lawrie Brown, "Computer Security Principles and Practice", Third Edition, Pearson Education, 2015 (Units 4 and 5)

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5. Georgia Weidman, "Penetration Testing: A Hands-On Introduction to Hacking", No Starch Press, 2014 (Lab)

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	2	2	-	-	-	1	1	3	2	1	3	2
CO2	2	1	2	2	2	-	-	-	3	2	2	1	1	2	1
CO3	1	1	1	3	3	-	-	-	1	2	1	1	3	3	2
CO4	1	1	1	2	2	-	-	-	2	3	3	3	3	1	3
CO5	3	1	3	1	3	-	-	-	3	1	2	2	2	2	2
AVG	2	1.4	1.6	2	2.4	-	-	-	2	1.8	2.2	1.8	2	2.2	2

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE65	QUANTUM COMPUTING	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

To know the background of classical computing and quantum computing.

- To learn the fundamental concepts behind quantum computation.
- To study the details of quantum mechanics and its relation to Computer Science.
- To gain knowledge about the basic hardware and mathematical models of quantum computation.
- To learn the basics of quantum information and the theory behind it.

UNIT-I QUANTUM COMPUTING BASIC CONCEPTS 6

Complex Numbers - Linear Algebra - Matrices and Operators - Global Perspectives Postulates of Quantum Mechanics – Quantum Bits - Representations of Qubits – Superpositions

UNIT-II QUANTUM GATES AND CIRCUITS 5

Universal logic gates - Basic single qubit gates - Multiple qubit gates - Circuit development - Quantum error correction

UNIT-III QUANTUM ALGORITHMS 7

Quantum parallelism - Deutsch's algorithm - The Deutsch–Jozsa algorithm - Quantum Fourier transform and its applications - Quantum Search Algorithms: Grover's Algorithm

UNIT-IV QUANTUM INFORMATION THEORY 6

Data compression - Shannon's noiseless channel coding theorem - Schumacher's quantum noiseless channel coding theorem - Classical information over noisy quantum channels

UNIT-V QUANTUM CRYPTOGRAPHY 6

Classical cryptography basic concepts - Private key cryptography - Shor's Factoring Algorithm - Quantum Key Distribution - BB84 - Ekart 91

TOTAL : 30 PERIODS

PRACTICAL EXERCISES: 30 PERIODS

1. Single qubit gate simulation - Quantum Composer
2. Multiple qubit gate simulation - Quantum Composer
3. Composing simple quantum circuits with q-gates and measuring the output into classical bits.
4. IBM Qiskit Platform Introduction
5. Implementation of Shor's Algorithms

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6. Implementation of Grover's Algorithm
7. Implementation of Deutsch's Algorithm
8. Implementation of Deutsch-Jozsa's Algorithm
9. Integer factorization using Shor's Algorithm
10. QKD Simulation
11. Mini Project such as implementing an API for efficient search using Grover's Algorithms

COURSE OUTCOMES:

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

CO1: Understand the basics of quantum computing.
CO2: Understand the background of Quantum Mechanics.
CO3: Analyze the computation models.
CO4: Model the circuits using quantum computation environments and frameworks.
CO5: Understand the quantum operations such as noise and error–correction.

TEXTBOOKS

1. Parag K Lala, Mc Graw Hill Education, "Quantum Computing, A Beginners Introduction", First edition (1 November 2020).
2. Michael A. Nielsen, Issac L. Chuang, "Quantum Computation and Quantum Information", Tenth Edition, Cambridge University Press, 2010.
3. Chris Bernhardt, The MIT Press; Reprint edition (8 September 2020), "Quantum Computing for Everyone".

REFERENCES

1. Scott Aaronson, "Quantum Computing Since Democritus", Cambridge University Press, 2013.
2. N. David Mermin, "Quantum Computer Science: An Introduction", Cambridge University Press, 2007

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	-	-	-	-	2	-	-	-	2	3	2
CO2	3	2	2	2	-	-	-	-	2	-	-	-	2	3	1
CO3	3	3	3	3	2	-	-	-	3	-	-	-	3	2	2
CO4	3	3	3	3	3	-	-	-	3	-	-	-	1	3	2
CO5	3	3	2	3	-	-	-	-	2	-	-	-	1	3	3
AVG	3	2.6	2.4	2.6	1				2.4				1.8	2.8	2

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE46	CRYPTOCURRENCY AND BLOCKCHAIN TECHNOLOGIES	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To understand the basics of Blockchain
- To learn Different protocols and consensus algorithms in Blockchain
- To learn the Blockchain implementation frameworks
- To understand the Blockchain Applications
- To experiment the Hyperledger Fabric, Ethereum networks

UNIT-I **INTRODUCTION TO BLOCKCHAIN** **7**

Blockchain- Public Ledgers, Blockchain as Public Ledgers - Block in a Blockchain, Transactions- The Chain and the Longest Chain - Permissioned Model of Blockchain, Cryptographic -Hash Function, Properties of a hash function-Hash pointer and Merkle tree

UNIT-II **BITCOIN AND CRYPTOCURRENCY** **6**

A basic crypto currency, Creation of coins, Payments and double spending, FORTH – the precursor for Bitcoin scripting, Bitcoin Scripts , Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay

UNIT-III **BITCOIN CONSENSUS** **6**

Bitcoin Consensus, Proof of Work (PoW)- Hashcash PoW , Bitcoin PoW, Attacks on PoW ,monopoly problem- Proof of Stake- Proof of Burn - Proof of Elapsed Time - Bitcoin Miner, Mining Difficulty, Mining Pool-Permissioned model and use cases.

UNIT-IV **HYPERLEDGER FABRIC & ETHEREUM** **5**

Architecture of Hyperledger fabric v1.1- chain code- Ethereum: Ethereum network, EVM, Transaction fee, Mist Browser, Ether, Gas, Solidity.

UNIT-V **BLOCKCHAIN APPLICATIONS** **6**

Smart contracts, Truffle Design and issue- DApps- NFT. Blockchain Applications in Supply Chain Management, Logistics, Smart Cities, Finance and Banking, Insurance,etc- Case Study.

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COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Understand emerging abstract models for Block chain Technology

CO2 : Identify major research challenges and technical gaps existing between theory and practice in the crypto currency domain.

CO3 : It provides conceptual understanding of the function of Blockchain as a method of securing distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable.

CO4 : Apply hyper ledger Fabric and Ethereum platform to implement the Block chain Application.

CO5: Apply Blockchain Applications in supplychain management with real time examples.

30 PERIODS

PRACTICAL

30 PERIODS

1. Install and understand Docker container, Node.js, Java and Hyperledger Fabric, Ethereum and perform necessary software installation on local machine/create instance on cloud to run.
2. Create and deploy a blockchain network using Hyperledger Fabric SDK for Java Set up and initialize the channel, install and instantiate chain code, and perform invoke and query on your blockchain network.
3. Interact with a blockchain network. Execute transactions and requests against a blockchain network by creating an app to test the network and its rules.
4. Deploy an asset-transfer app using blockchain. Learn app development within a Hyperledger Fabric network.
5. Use blockchain to track fitness club rewards. Build a web app that uses Hyperledger Fabric to track and trace member rewards.
6. Car auction network: A Hello World example with Hyperledger Fabric Node SDK and IBM Blockchain Starter Plan. Use Hyperledger Fabric to invoke chain code while storing results and data in the starter plan

TOTAL : 60(30+30) PERIODS

TEXT BOOKS:

1 Bashir and Imran, Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks, 2017.

2.Andreas Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", O'Reilly, 2014.

REFERENCE BOOKS:

1.Daniel Drescher, "Blockchain Basics", First Edition, Apress, 2017.

2.Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.

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3.Melanie Swan, "Blockchain: Blueprint for a New Economy", O'Reilly, 2015

4.Ritesh Modi, "Solidity Programming Essentials: A Beginner's Guide to Build Smart Contracts for Ethereum and Blockchain", Packt Publishing

5.Handbook of Research on Blockchain Technology, published by Elsevier Inc. ISBN: 9780128198162, 2020.

E.RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_cs44
2. https://www.coursera.org/articles/blockchain-cryptocurrency

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	-	-	-	1	-	-	2	3	1	1
CO2	3	3	3	3	1	-	-	-	2	-	-	2	1	2	1
CO3	3	3	3	3	2	-	-	-	3	-	-	2	2	3	3
CO4	3	2	3	2	3	-	-	-	3	-	-	2	2	2	3
CO5	3	2.75	2.75	2.5	1.75	-	-	-	2.25	-	-	2	2	2.2	2
AVG	**3**	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**1**	**-**	**-**	**2**	**3**	**1**	**1**

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE57 **GAME DEVELOPMENT**

L	T	P	C
2	0	2	3

COURSE OBJECTIVES:

- To know the basics of 2D and 3D graphics for game development.
- To know the stages of game development.
- To understand the basics of a game engine.
- To survey the gaming development environment and tool kits.
- To learn and develop simple games using Pygame environment

UNIT-I **3D GRAPHICS FOR GAME DESIGN** **6**

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-II **GAME DESIGN PRINCIPLES** **6**

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-III **GAME ENGINE DESIGN** **6**

Rendering Concept – Software Rendering – Hardware Rendering – Spatial Sorting Algorithms – Algorithms for Game Engine– Collision Detection – Game Logic – Game AI – Pathfinding.

UNIT-IV **OVERVIEW OF GAMING PLATFORMS AND FRAMEWORKS** **6**

Pygame Game development – Unity – Unity Scripts –Mobile Gaming, Game Studio, Unity Single player and Multi-Player games.

UNIT-V **GAME DEVELOPMENT USING PYGAME** **6**

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 Games.

TOTAL : 30 PERIODS

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PRACTICAL EXERCISES: **30 PERIODS**

1. Installation of a game engine, e.g., Unity, Unreal Engine, familiarization of the GUI. Conceptualize the theme for a 2D game.
2. Character design, sprites, movement and character control
3. Level design: design of the world in the form of tiles along with interactive and collectible Objects.
4. Design of interaction between the player and the world, optionally using the physics engine.
5. Developing a 2D interactive using Pygame
6. Developing a Puzzle game
7. Design of menus and user interaction in mobile platforms.
8. Developing a 3D Game using Unreal
9. Developing a Multiplayer game using unity

COURSE OUTCOMES:

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

CO1: Explain the concepts of 2D and 3d Graphics

CO2: Design game design documents.

CO3: Design game design documents.

CO4: Survey gaming environments and frameworks.

CO5: Implement a simple game in Pygame.

REFERENCES

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.
4. David H. Eberly, "3D Game Engine Design: A Practical Approach to Real-Time Computer Graphics", Second Edition, CRC Press,2006.
5. Jung Hyun Han, "3D Graphics for Game Programming", Chapman and Hall/CRC, 2011.

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CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	2	-	-	-	3	1	2	3	3	3	2
CO2	1	1	2	1	2	-	-	-	2	2	3	2	3	3	1
CO3	1	1	1	2	1	-	-	-	1	1	1	1	2	1	2
CO4	3	3	2	1	1	-	-	-	2	2	1	1	2	2	3
CO5	3	3	2	1	1	-	-	-	1	3	2	1	1	1	3
AVG	2.2	2	1.6	1.6	1.4	-	-	-	1.8	1.8	1.8	1.6	2.2	2	2.2

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE68 **3D PRINTING AND DESIGN**

L	T	P	C
2	0	2	3

COURSE OBJECTIVES:

- To discuss on basics of 3D printing
- To explain the principles of 3D printing technique
- To explain and illustrate inkjet technology
- To explain and illustrate laser technology
- To discuss the applications of 3D printing

UNIT-I **INTRODUCTION** **6**

Introduction; Design considerations – Material, Size, Resolution, Process; Modelling and viewing - 3D; Scanning; Model preparation – Digital; Slicing; Software; File formats

UNIT-II **PRINCIPLE** **6**

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-III **INKJET TECHNOLOGY** **6**

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 – Continous jet, Mulitjet; Powder based fabrication – Colourjet.

UNIT-IV **LASER TECHNOLOGY** **6**

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;

UNIT-V **INDUSTRIAL APPLICATIONS** **6**

Product Models, manufacturing – Printed electronics, Biopolymers, Packaging, Healthcare, Food, Medical, Biotechnology, Displays; Future trends;

TOTAL : 30 PERIODS

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PRACTICAL EXERCISES: **30 PERIODS**

1. Study the interface and basic tools in the CAD software.
2. Study 3D printer(s) including print heads, build envelope, materials used and related support removal system(s).
3. Review of geometry terms of a 3D mesh.
4. Commands for moving from 2D to 3D.
5. Advanced CAD commands to navigate models in 3D space
6. Design any four everyday objects

   Refer to web sites like Thingiverse, Shapeways and GitFab to design four everyday objects that utilize the advantages of 3D printing

   Choose four models from a sharing site like Thingiverse, Shapeways or Gitfab.

   - Improve upon a file and make it your own. Some ideas include:
   - Redesign it with a specific user in mind
   - Redesign it for a slightly different purpose
   - Improve the look of the product
7. Use the CAM software to prepare files for 3D printing.
8. Manipulate machine movement and material layering.
9. Repair a 3D mesh using
   - Freeware utilities: Autodesk MeshMixer (http://goo.gl/x5nhYc), MeshLab (http://goo.gl/fgztLl) or Netfabb Basic or Cloud Service (http://goo.gl/Q1P47a)
   - Freeware tool tutorials: Netfabb Basic or Cloud Service (http://goo.gl/Q1P47a), Netfabb and MeshLab (http://goo.gl/WPOVec)
   - Professional tools: Magics or Netfabb

Equipment : one 3D printer for every 10-15 students.

COURSE OUTCOMES:

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

CO1: Outline and examine the basic concepts of 3D printing technology.
CO2: Outline 3D printing workflow.
CO3: Explain and categorise the concepts and working principles of 3D printing using inkjet Technique.
CO4: Explain and categorise the working principles of 3D printing using laser technique.
CO5: Explain various method for designing and modeling for industrial applications.

TOTAL:60 PERIODS

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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.

REFERENCES:

1. Chua, C.K., Leong K.F. and Lim C.S., Rapid prototyping: Principles and applications, second edition, World Scientific Publishers, 2010.
2. Ibrahim Zeid, Mastering CAD CAM Tata McGraw-Hill Publishing Co., 2007.
3. Joan Horvath, Mastering 3D Printing, APress, 2014.

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	2	3	1	-	-	2	-	2	2	3	2	1
CO2	3	2	3	3	3	2	-	-	3	-	3	2	3	2	2
CO3	2	2	2	2	2	2	-	-	2	-	2	2	3	2	2
CO4	2	2	2	2	3	2	-	-	2	-	2	2	3	3	1
CO5	1	3	3	3	3	3	-	-	3	-	3	3	3	3	3
AVG	1.8	2	2.4	2.4	2.8	2	-	-	2.4	-	2.4	2.2	2	2.4	1.8

1 - low, 2 - medium, 3 - high, '-' - no correlation

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VERTICAL 7: AIDS II											
S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
1.	23ADE71	Bio-Inspired Optimization Techniques	PE	2	0	2	4	3	50	50	100
2.	23CSE22	App Development	PE	2	0	2	4	3	50	50	100
3.	23ADE72	Health care Analytics	PE	2	0	2	4	3	50	50	100
4.	23CSE64	Cyber Security	PE	2	0	2	4	3	50	50	100
5.	23CSE75	Optimization Techniques	PE	2	0	2	4	3	50	50	100
6.	23CSE76	Game Theory	PE	2	0	2	4	3	50	50	100
7.	23CSE77	Cognitive Science	PE	2	0	2	4	3	50	50	100
8.	23CSE78	Ethics And AI	PE	2	0	2	4	3	50	50	100

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23ADE71	BIO-INSPIRED OPTIMIZATION TECHNIQUES (BE/B.Tech-Common to all Branches)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand fundamental topics in bio-inspired optimization techniques
- To Learn the collective systems such as ACO, PSO, and BCO
- To develop skills in biologically inspired algorithm design with an emphasis on solving realworld problems
- To understand the most appropriate types of algorithms for different data analysis problemsand to introduce some of the most appropriate implementation strategies.
- To implement the Bio-inspired technique with other traditional algorithms.

UNIT-I	INTRODUCTION	9

Optimization Techniques: Introduction to Optimization Problems – Single and Muti- objective Optimization – Classical Techniques – Overview of various Optimization methods – Evolutionary Computing: Genetic Algorithm and Genetic Programming: Basic concept – encoding – representation – fitness function – Reproduction – differences between GA and Traditional optimization methods – Applications – Bio- inspired Computing (BIC): Motivation – Overview of BIC – usage of BIC – merits and demerits of BIC.

UNIT-II	SWARM INTELLIGENCE	9

Introduction – Biological foundations of Swarm Intelligence – Swarm Intelligence in Optimization – Ant Colonies: Ant Foraging Behavior – Towards Artificial Ants – Ant Colony Optimization (ACO) – S-ACO – Ant Colony Optimization Metaheuristic: Combinatorial Optimization – ACO Metaheuristic– Problem solving using ACO – Other Metaheuristics – Simulated annealing – Tabu Search –Local search methods – Scope of ACO algorithms

UNIT-III	NATURAL TO ARTIFICIAL SYSTEMS	9

Biological Nervous Systems – artificial neural networks – architecture – Learning Paradigms – unsupervised learning – supervised learning – reinforcement learning – evolution of neural networks – hybrid neural systems – Biological Inspirations in problem solving – Behavior of Social Insects: Foraging –Division of Labor – Task Allocation – Cemetery Organization and Brood Sorting - Nest Building – Cooperative transport.

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UNIT-IV	**SWARM ROBOTICS**	**9**
Foraging for food – Clustering of objects – Collective Prey retrieval – Scope of Swarm Robotics – Social Adaptation of Knowledge: Particle Swarm – Particle Swarm Optimization (PSO) – Particle Swarms for Dynamic Optimization Problems – Artificial Bee Colony (ABC) Optimization biologically inspired algorithms in engineering.		
UNIT-V	**CASE STUDIES**	**9**
Other Swarm Intelligence algorithms: Fish Swarm – Bacteria foraging – Intelligent Water Drop Algorithms – Applications of biologically inspired algorithms in engineering. Case Studies: ACOand PSO for NP-hard problems – Routing problems – Assignment problems – Scheduling problems – Subset problems – Machine Learning Problems – Travelling Salesman problem.		
		TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Familiarity with the basics of several biologically inspired optimization techniques.

CO2 : Familiarity with the basics of several biologically inspired computing paradigms.

CO3 : Ability to select an appropriate bio-inspired computing method and implement for anyapplication and data set.

CO4 : Theoretical understanding of the differences between the major bio-inspired computingmethods.

CO5 : Learn Other Swarm Intelligence algorithms and implement the Bio-inspired technique withother traditional algorithms.

TEXT BOOKS:

1. A.E. Elben and J. E. Smith, "Introduction to Evolutionary Computing", Springer, 2010. Elben and J. E. Smith, "Introduction to Evolutionary Computing", Springer, 2010.

2. Floreano D. and Mattiussi C., "Bio-Inspired Artificial Intelligence: Theories, Methods, andTechnologies", MIT Press, Cambridge, MA, 2008.

3. Leandro Nunes de Castro, " Fundamentals of Natural Computing, Basic Concepts, Algorithms and Applications", Chapman & Hall/ CRC, Taylor and Francis roup, 2007

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REFERENCE BOOKS:

1.Eric Bonabeau, Marco Dorigo, Guy Theraulaz, "Swarm Intelligence: From Natural to ArtificialSystems", Oxford University press, 2000.

2. Christian Blum, Daniel Merkle (Eds.), "Swarm Intelligence: Introduction and Applications",Springer Verlag, 2008.

3. Leandro N De Castro, Fernando J Von Zuben, "Recent Developments in BiologicallyInspired Computing", Idea Group Inc., 2005.

4.Albert Y.Zomaya, "Handbook of Nature-Inspired and Innovative Computing", Springer, 2006.

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	3	1	-	-	-	3	1	1	3	2	1	3
CO2	2	3	2	3	2	-	-	-	2	2	2	1	2	3	2
CO3	1	1	1	1	3	-	-	-	1	3	1	2	3	3	1
CO4	3	2	1	2	2	-	-	-	2	3	3	3	3	1	3
CO5	2	2	3	1	2	-	-	-	1	1	3	1	1	1	3
AVG	2.2	2	1.6	2	2	-	-	-	1.8	2	2	2	2.2	1.8	2.4

1 - low, 2 - medium, 3 - high, '-' - no correlation

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		L	T	P	C
23CSE22	**APP DEVELOPMENT** (for B.E/B.Tech-CSE, IT and AIDS)	2	0	2	3

COURSE OBJECTIVES:

- To learn development of native applications with basic GUI Components
- To develop cross-platform applications with event handling
- To develop applications with location and data storage capabilities
- To develop web applications with database access

UNIT-I FUNDAMENTALS OF MOBILE & WEB APPLICATION DEVELOPMENT 6

Basics of Web and Mobile application development, Native App, Hybrid App, Cross-platform App,What is Progressive Web App, Responsive Web design.

UNIT-II NATIVE APP DEVELOPMENT USING JAVA 6

Native Web App, Benefits of Native App, Scenarios to create Native App, Tools for creating Native App, Cons of Native App, Popular Native App Dev elopment Frameworks, Java & Kotlin for Android, Swift & Objective-C for iOS, Basics of React Native, Native Components, JSX, State, Props.

UNIT-III HYBRID APP DEVELOPMENT 6

Hybrid Web App, Benefits of Hybrid App, Criteria for creating Native App, Tools for creating Hybrid App, Cons of Hybrid App, Popular Hybrid App Development Frameworks, Ionic, Apache Cordova.

UNIT-IV CROSS-PLATFORM APP DEVELOPMENT USING REACT-NATIVE 6

What is Cross-platform App, Benefits of Cross-platform App, Criteria for creating Cross-platform App, Tools for creating Cross-platform App, Cons of Cross-platform App, Popular Cross-platform App Development Frameworks, Flutter, Xamarin, React-Native, Basics of React Native, Native Components, JSX, State, Props.

UNIT-V NON-FUNCTIONAL CHARACTERISTICS OF APP FRAMEWORKS 6

Comparison of different Ap p frameworks, Build Performance, App Performance, Debugging capabilities, Time to Market, Maintainability, Ease of Development, UI/UX, Reusability

30 PERIODS

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PRACTICAL EXERCISES: **30 PERIODS**

1. Using react native, build a cross platform application for a BMI calculator.
2. Build a cross platform application for a simple expense manager which allows entering expenses and income on each day and displays category wise weekly income and expense.
3. Develop a cross platform application to convert units from imperial system to metric system (km to miles, kg to pounds etc.,)
4. Design and develop a cross platform application for day to day task (to-do) management.
5. Design an android application using Cordova for a user login screen with username, password, reset button and a submit button. Also, include header image and a label. Use layout managers.
6. Design and develop an android application using Apache Cordova to find and display the current location of the user.
7. Write programs using Java to create Android application having Databases
   - For a simple library application.
   - For displaying books available, books lend, book reservation. Assume that student information is available in a database which has been stored in a database server.

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Develop Native applications with GUI Components.

CO2: Develop hybrid applications with basic event handling.

CO3: Implement cross-platform applications with location and data storage capabilities.

CO4: Implement cross platform applications with basic GUI and event handling.

CO5: Develop web applications with cloud database access.

TOTAL : 60 PERIODS

TEXT BOOKS:

1. Head First Android Development, Dawn Griffiths, O'Reilly, 1st edition.
2. Apache Cordova in Action, Raymond K. Camden, Manning. 2015.
3. Full Stack React Native: Create beautiful mobile apps with JavaScript and React Native, Anthony Accomazzo, Houssein Djirdeh, Sophia Shoemaker, Devin Abbott, FullStack publishing.

REFERENCE BOOKS:

1. Android Programming for Beginners, John Horton, Packt Publishing, 2nd Edition.
2. Native Mobile Development by Shaun Lewis, Mike Dunn.
3. Building Cross-Platform Mobile and Web Apps for Engineers and Scientists: An Active Learning Approach, Pawan Lingras, Matt Triff, Rucha Lingras.
4. Apache Cordova 4 Programming, John M Wargo, 2015.
5. React Native Cookbook, Daniel Ward, Packt Publishing, 2nd Edition.

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CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	3	-	-	-	1	1	2	1	2	3	3
CO2	2	1	3	2	2	-	-	-	3	2	2	3	3	2	1
CO3	2	2	2	1	2	-	-	-	1	1	1	1	1	1	2
CO4	1	3	1	1	3	-	-	-	1	1	3	2	1	3	1
CO5	1	1	3	1	3	-	-	-	1	1	2	1	3	2	1
AVG	1.6	1.8	2	1.4	2.6	-	-	-	1.4	1.2	2	1.6	2	2.2	1.6

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23ADE72	HEALTH CARE ANALYTICS (BE/B.Tech-Common to all Branches)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Understand the health data formats, health care policy and standards
- Learn the significance and need of data analysis and data visualization
- Understand the health data management frameworks
- Learn the use of machine learning and deep learning algorithms in healthcare
- Apply healthcare analytics for critical care applications

UNIT-I	**INTRODUCTION TO HEALTHCARE ANALYSIS**	**9**

Overview - History of Healthcare Analysis Parameters on medical care systems- Health care policy- Standardized code sets – Data Formats – Machine Learning Foundations: Tree Like reasoning , Probabilistic reasoning and Bayes Theorem, Weighted sum approach.

UNIT-II	**ANALYTICS ON MACHINE LEARNING**	**9**

Machine Learning Pipeline – Pre-processing –Visualization – Feature Selection – Training model parameter – Evaluation model : Sensitivity , Specificity , PPV ,NPV, FPR ,Accuracy , ROC , Precision Recall Curves , Valued target variables –Python: Variables and types, Data Structures and containers , Pandas Data Frame :Operations – Scikit –Learn : Pre-processing , Feature Selection.

UNIT-III	**HEALTH CARE MANAGEMENT**	**9**

IOT- Smart Sensors – Migration of Healthcare Relational database to NoSQL Cloud Database – Decision Support System – Matrix block Cipher System – Semantic Framework Analysis – Histogram bin Shifting and Rc6 Encryption – Clinical Prediction Models – Visual Analytics for Healthcare.

UNIT-IV	**HEALTHCARE AND DEEP LEARNING**	**9**

Introduction on Deep Learning – DFF network CNN- RNN for Sequences – Biomedical Image and Signal Analysis – Natural Language Processing and Data Mining for Clinical Data – Mobile Imaging and Analytics – Clinical Decision Support System.

UNIT-V	**CASE STUDIES**	**9**

Predicting Mortality for cardiology Practice –Smart Ambulance System using IOT –Hospital Acquired Conditions (HAC) program- Healthcare and Emerging Technologies – ECG Data Analysis.

TOTAL : 45 PERIODS

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COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Use machine learning and deep learning algorithms for health data analysis

CO2 : Apply the data management techniques for healthcare data

CO3 : Evaluate the need of healthcare data analysis in e-healthcare, telemedicine and other critical care applications

CO4 : Design health data analytics for real time applications

CO5 : Design emergency care system using health data analysis

REFERENCE BOOKS:

1.Chandan K.Reddy, Charu C. Aggarwal, "Health Care data Analysis", First edition, CRC, 2015.

2.Vikas Kumar, "Health Care Analysis Made Simple", Packt Publishing, 2018.

3.Nilanjan Dey, Amira Ashour , Simon James Fong, Chintan Bhatl, "Health Care Data Analysis and Management, First Edition, Academic Press, 2018.

4.Hui Jang, Eva K.Lee, "HealthCare Analysis : From Data to Knowledge to Healthcare Improvement", First Edition, Wiley, 2016.

5.Kulkarni , Siarry, Singh ,Abraham, Zhang, Zomaya , Baki, "Big Data Analytics in HealthCare", Springer, 2020.

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	1	3	-	-	-	3	2	1	1	2	2	2
CO2	3	1	1	3	1	-	-	-	3	2	3	1	3	3	3
CO3	2	1	2	1	2	-	-	-	2	2	1	3	3	2	1
CO4	2	2	3	3	1	-	-	-	2	3	1	2	3	2	2
CO5	1	2	2	1	1	-	-	-	1	3	3	2	2	2	2
AVG	2.2	1.8	2.2	1.8	1.6	-	-	-	2.2	2.4	1.8	1.8	2.6	2.2	2

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE64	CYBER SECURITY (for B.E/B.Tech-CSE, IT and AIDS)	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To learn cybercrime and cyber law.
- To understand the cyber attacks and tools for mitigating them.
- To understand information gathering.
- To learn how to detect a cyber attack.
- To learn how to prevent a cyber attack.

UNIT-I **INTRODUCTION** **7**

Cyber Security – History of Internet – Impact of Internet – CIA Triad; Reason for Cyber Crime – Need for Cyber Security – History of Cyber Crime; Cybercriminals – Classification of Cybercrimes – A Global Perspective on Cyber Crimes; Cyber Laws – The Indian IT Act – Cybercrime and Punishment.

UNIT-II **ATTACKS AND COUNTERMEASURES** **6**

OSWAP; Malicious Attack Threats and Vulnerabilities: Scope of Cyber-Attacks – Security Breach – Types of Malicious Attacks – Malicious Software – Common Attack Vectors – Social engineering Attack – Wireless Network Attack – Web Application Attack – Attack Tools – Countermeasures.

UNIT-III **RECONNAISSANCE** **6**

Harvester – Whois – Netcraft – Host – Extracting Information from DNS – Extracting Information from E-mail Servers – Social Engineering Reconnaissance; Scanning – Port Scanning – Network Scanning and Vulnerability Scanning – Scanning Methodology – Ping Sweer Techniques – Nmap Command Switches – SYN – Stealth – XMAS – NULL – IDLE – FIN Scans – Banner Grabbing and OS Finger printing Techniques.

UNIT-IV **INTRUSION DETECTION** **5**

Host -Based Intrusion Detection – Network -Based Intrusion Detection – Distributed or Hybrid Intrusion Detection – Intrusion Detection Exchange Format – Honeypots – Example System Snort.

UNIT-V **INTRUSION PREVENTION** **5**

Firewalls and Intrusion Prevention Systems: Need for Firewalls – Firewall Characteristics and Access Policy – Types of Firewalls – Firewall Basing – Firewall Location and Configurations – Intrusion Prevention Systems – Example Unified Threat Management Products.

TOTAL : 30 PERIODS

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PRACTICAL EXERCISES: **30 PERIODS**

1. Install Kali Linux on Virtual box
2. Explore Kali Linux and bash scripting
3. Perform open source intelligence gathering using Netcraft, Whois Lookups, DNS Reconnaissance, Harvester and Maltego
4. Understand the nmap command d and scan a target using nmap
5. Install metasploitable2 on the virtual box and search for unpatched vulnerabilities
6. Use Metasploit to exploit an unpatched vulnerability
7. Install Linus server on the virtual box and install ssh
8. Use Fail2banto scan log files and ban Ips that show the malicious signs
9. Launch brute-force attacks on the Linux server using Hydra.
10. Perform real-time network traffic analysis and data pocket logging using Snort

COURSE OUTCOMES:

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

CO1: Explain the basics of cyber security, cyber crime and cyber law (K2)
CO2: Classify various types of attacks and learn the tools to launch the attacks (K2)
CO3 Apply various tools to perform information gathering (K3)
CO4: Apply intrusion techniques to detect intrusion (K3)
CO5: Apply intrusion prevention techniques to prevent intrusion (K3)

TEXTBOOKS

1. Anand Shinde, "Introduction to Cyber Security Guide to the World of Cyber Security", Notion Press, 2021 (Unit 1)
2. Nina Godbole, Sunit Belapure, "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley Publishers, 2011 (Unit 1)

REFERENCES

1. David Kim, Michael G. Solomon, "Fundamentals of Information Systems Security", Jones & Bartlett Learning Publishers, 2013 (Unit 2)
2. Patrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made easy", Elsevier, 2011 (Unit 3)
3. Kimberly Graves, "CEH Official Certified Ethical hacker Review Guide", Wiley Publishers, 2007 (Unit 3)
4. William Stallings, Lawrie Brown, "Computer Security Principles and Practice", Third Edition, Pearson Education, 2015 (Units 4 and 5)
5. Georgia Weidman, "Penetration Testing: A Hands-On Introduction to Hacking", No Starch Press, 2014 (Lab)

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	2	2	-	-	-	1	1	3	2	1	3	2
CO2	2	1	2	2	2	-	-	-	3	2	2	1	1	2	1
CO3	1	1	1	3	3	-	-	-	1	2	1	1	3	3	2
CO4	1	1	1	2	2	-	-	-	2	3	3	3	3	1	3
CO5	3	1	3	1	3	-	-	-	3	1	2	2	2	2	2
AVG	2	1.4	1.6	2	2.4	-	-	-	2	1.8	2.2	1.8	2	2.2	2

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE75	OPTIMIZATION TECHNIQUES (for B.E/B.Tech-CSE,IT and AIDS)	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- Formulate and solve linear programming problems (LPP)
- Evaluate Integer Programming Problems, Transportation and Assignment Problems.
- Obtain a solution to network problems using CPM and PERT techniques.
- Able to optimize the function subject to the constraints.
- Identify and solve problems under Markovian queuing models.

UNIT-I **LINEAR MODELS** **6**

Introduction of Operations Research - mathematical formulation of LPP- Graphical Methods to solve LPP- Simplex Method- Two-Phase method

UNIT-II **INTEGER PROGRAMMING AND TRANSPORTATION PROBLEMS** **6**

Integer programming: Branch and bound method- Transportation and Assignment problems - Traveling salesman problem.

UNIT-III **PROJECT SCHEDULING** **6**

Project network -Diagram representation – Floats - Critical path method (CPM) – PERT- Cost considerations in PERT and CPM

UNIT-IV **CLASSICAL OPTIMIZATION THEORY** **6**

Unconstrained problems – necessary and sufficient conditions - Newton-Raphson method, Constrained problems – equality constraints – inequality constraints - Kuhn-Tucker conditions.

UNIT-V **QUEUING MODELS** **6**

Introduction, Queuing Theory, Operating characteristics of a Queuing system, Constituents of a Queuing system, Service facility, Queue discipline, Single channel models, multiple service channels.

30 PERIODS

PRACTICALS

1. Solving simplex maximization problems using R programming.
2. Solving simplex minimization problems using R programming.
3. Solving mixed constraints problems – Big M & Two phase method using TORA.
4. Solving transportation problems using R.
5. Solving assignment problems using R.
6. Solving optimization problems using LINGO.
7. Studying Primal-Dual relationships in LP using TORA.
8. Solving LP problems using dual simplex method using TORA.

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9. Sensitivity & post optimality analysis using LINGO.
10. Solving shortest route problems using optimization software
11. Solving Project Management problems using optimization software
12. Testing random numbers and random variates for their uniformity.
13. Testing random numbers and random variates for their independence
14. Solve single server queuing model using simulation software package.
15. Solve multi server queuing model using simulation software package.

30 PERIODS

COURSE OUTCOMES:

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

CO1 : Formulate and solve linear programming problems (LPP)

CO2 : Evaluate Integer Programming Problems, Transportation and Assignment Problems.

CO3 : Obtain a solution to network problems using CPM and PERT techniques.

CO4 : Able to optimize the function subject to the constraints.

CO5 : Identify and solve problems under Markovian queuing models

TOTAL: 60 PERIODS

TEXT BOOKS:

1 Hamdy A Taha, Operations Research: An Introduction, Pearson, 10th Edition, 2017.

REFERENCE BOOKS:

1.ND Vohra, Quantitative Techniques in Management, Tata McGraw Hill, 4th Edition, 2011.

2.J. K. Sharma, Operations Research Theory and Applications, Macmillan, 5th Edition, 2012.

3.Hiller F.S, Liberman G.J, Introduction to Operations Research, 10th Edition McGraw Hill, 2017.

4.Jit. S. Chandran, Mahendran P. Kawatra, KiHoKim, Essentials of Linear Programming, Vikas Publishing House Pvt.Ltd. New Delhi, 1994.

5.Ravindran A., Philip D.T., and Solberg J.J., Operations Research, John Wiley, 2nd Edition, 2007.

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	-	-	-	2	1	1	2	3	3	3
CO2	3	1	2	2	3	-	-	-	3	2	3	1	2	1	1
CO3	2	3	3	2	2	-	-	-	3	3	1	3	1	3	1
CO4	2	2	1	1	3	-	-	-	2	1	3	1	2	1	2
CO5	2	1	1	3	2	-	-	-	3	3	1	3	3	2	1
AVG	2.4	2	1.8	1.8	2.2	-	-	-	2.6	2	1.8	2	2.2	2	1.6

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE76 **GAME THEORY**

L	T	P	C
2	0	2	3

COURSE OBJECTIVES:

- To introduce the student to the notion of a game, its solutions concepts, and other basic notions and tools of game theory, and the main applications for which they are appropriate, including electronic trading markets.
- To formalize the notion of strategic thinking and rational choice by using the tools of game theory, and to provide insights into using game theory in 41odelling applications.
- To draw the connections between game theory, computer science, and economics, especially emphasizing the computational issues.
- To introduce contemporary topics in the intersection of game theory, computer science, and economics.
- To apply game theory in searching, auctioning and trading.

UNIT-I **INTRODUCTION** **6**

Introduction — Making rational choices: basics of Games — strategy — preferences — payoffs — Mathematical basics — Game theory — Rational Choice — Basic solution concepts-non-cooperative versus cooperative games — Basic computational issues — finding equilibria and learning in games- Typical application areas for game theory (e.g. Google's sponsored search, eBay auctions, electricity trading markets).

UNIT-II **GAMES WITH PERFECT INFORMATION** **6**

Games with Perfect Information — Strategic games — prisoner's dilemma, matching pennies - Nash equilibria —mixed strategy equilibrium — zero-sum games

UNIT-III **GAMES WITH IMPERFECT INFORMATION** **6**

Games with Imperfect Information — Bayesian Games — Motivational Examples — General Definitions— Information aspects — Illustrations — Extensive Games with Imperfect — Information — Strategies — Nash Equilibrium —Repeated Games — The Prisoner's Dilemma — Bargaining

UNIT-IV **NON-COOPERATIVE GAME THEORY** **6**

Non-cooperative Game Theory — Self-interested agents — Games in normal form — Analyzing games: from optimality to equilibrium — Computing Solution Concepts of Normal — Form Games— Computing Nash equilibria of two-player, zero-sum games —Computing Nash equilibria of two- player, general- sum games — Identifying dominated strategies

UNIT-V **MECHANISM DESIGN** **6**

Aggregating Preferences — Social Choice — Formal Model — Voting — Existence of social functions — Ranking systems — Protocols for Strategic Agents: Mechanism Design — Mechanism design with unrestricted preferences

30 PERIODS

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COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Discuss the notion of a strategic game and equilibria and identify the characteristics of main applications of these concepts.

CO2 : Discuss the use of Nash Equilibrium for other problems.

CO3 : Identify key strategic aspects and based on these be able to connect them to appropriate game theoretic concepts given a real world situation.

CO4 : Identify some applications that need aspects of Bayesian Games.

CO5 : Implement a typical Virtual Business scenario using Game theory.

LABORATORY EXERCISES:

- Prisoner's dilemma
- Pure Strategy Nash Equilibrium
- Extensive Form – Graphs and Trees, Game Trees
- Strategic Form – Elimination of dominant strategy
- Minimax theorem, minimax strategies
- Perfect information games: trees, players assigned to nodes, payoffs, backward Induction, subgame perfect equilibrium,
- imperfect-information games - Mixed Strategy Nash Equilibrium - Finding mixed-strategy Nash equilibria for zero sum games, mixed versus behavioral strategies.
- Repeated Games
- Bayesian Nash equilibrium

30 PERIODS

TOTAL: 60 PERIODS

TEXT BOOKS/REFERENCES

1.M. J. Osborne, An Introduction to Game Theory. Oxford University Press, 2012.

2.M. Machler, E. Solan, S. Zamir, Game Theory, Cambridge University Press, 2013.

3.N. Nisan, T. Roughgarden, E. Tardos, and V. V. Vazirani, Algorithmic Game Theory. Cambridge University Press, 2007.

4.A.Dixit and S. Skeath, Games of Strategy, Second Edition. W W Norton & Co Inc, 2004.

5.YoavShoham, Kevin Leyton-Brown, Multiagent Systems: Algorithmic, Game-Theoretic, and Logical Foundations, Cambridge University Press 2008.

6.Zhu Han, DusitNiyato, WalidSaad, TamerBasar and Are Hjorungnes, "Game Theory in Wireless and Communication Networks", Cambridge University Press, 2012.

7.Y.Narahari, "Game Theory and Mechanism Design", IISC Press, World Scientific.

CO's – PO's & PSO's MAPPING

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CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	-	-	-	3	2	1	2	3	2	3
CO2	3	3	3	2	3	-	-	-	2	2	2	1	3	3	1
CO3	1	1	3	3	3	-	-	-	3	3	1	2	3	2	2
CO4	2	1	1	1	1	-	-	-	2	3	3	3	2	2	2
CO5	2	2	3	2	1	-	-	-	3	3	2	2	3	3	2
AVG	2.2	2	2.4	2.2	2.2	-	-	-	2.6	2.6	1.8	2	2.8	2.4	2

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE77	COGNITIVE SCIENCE	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To know the theoretical background of cognition.
- To understand the link between cognition and computational intelligence.
- To explore probabilistic programming language.
- To study the computational inference models of cognition.
- To study the computational learning models of cognition.

UNIT-I PHILOSOPHY, PSYCHOLOGY AND NEUROSCIENCE 6

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-II COMPUTATIONAL INTELLIGENCE 6

Machines and Cognition – Artificial Intelligence – Architectures of Cognition – Knowledge Based Systems – Logical Representation and Reasoning – Logical Decision Making –Learning – Language – Vision.

UNIT-III PROBABILISTIC PROGRAMMING LANGUAGE 6

WebPPL Language – Syntax – Using Javascript Libraries – Manipulating probability types and distributions – Finding Inference – Exploring random computation – Coroutines: Functions that receive continuations –Enumeration

UNIT-IV INFERENCE MODELS OF COGNITION 6

Generative Models – Conditioning – Causal and statistical dependence – Conditional dependence –Data Analysis – Algorithms for Inference.

UNIT-V LEARNING MODELS OF COGNITION 6

Learning as Conditional Inference – Learning with a Language of Thought – Hierarchical Models– Learning (Deep) Continuous Functions – Mixture Models.

30 PERIODS

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PRACTICAL EXERCISES

1. Demonstration of Mathematical functions using WebPPL.
2. Implementation of reasoning algorithms.
3. Developing an Application system using generative model.
4. Developing an Application using conditional inference learning model.
5. Application development using hierarchical model.
6. Application development using Mixture model.

30 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Understand the underlying theory behind cognition.

CO2 : Connect to the cognition elements computationally.

CO3 : Implement mathematical functions through WebPPL..

CO4 : Develop applications using cognitive inference model.

CO5 : Develop applications using cognitive learning model.

TOTAL: 60 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.Judith Hurwitz, Marcia Kaufman, Adrian Bowles, Cognitive Computing and Big Data Analytics, Wiley Publications, 2015

REFERENCE BOOKS:

1. Noah D. Goodman, Andreas Stuhlmuller, "The Design and Implementation of Probabilistic Programming Languages", Electronic version of book, https://dippl.org/.

2.Noah D. Goodman, Joshua B. Tenenbaum, The ProbMods Contributors, "Probabilistic Models of Cognition", Second Edition, 2016, https://probmods.org/

CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	3	2	2	-	-	-	1	1	2	2	1	2	2
CO2	2	2	1	1	2	-	-	-	3	2	3	1	2	3	2
CO3	1	3	1	3	3	-	-	-	1	3	1	3	3	1	2
CO4	2	1	1	2	3	-	-	-	1	2	3	1	3	3	1
CO5	1	2	3	2	2	-	-	-	1	2	2	2	2	2	1
AVG	1.8	1.8	1.8	2	2.4	-	-	-	1.4	2	2.2	1.8	2.2	2.2	1.6

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23CSE78 **ETHICS AND AI**

L	T	P	C
2	0	2	3

COURSE OBJECTIVES:

- Study the morality and ethics in AI
- Learn about the Ethical initiatives in the field of artificial intelligence
- Study about AI standards and Regulations
- Study about social and ethical issues of Robot Ethics
- Study about AI and Ethics- challenges and opportunities

UNIT-I **INTRODUCTION** **6**

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

UNIT-II **ETHICAL INITIATIVES IN AI** **6**

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

UNIT-III **AI STANDARDS AND REGULATION** **6**

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

UNIT-IV **ROBOETHICS: SOCIAL AND ETHICAL IMPLICATION OF ROBOTICS** **6**

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

UNIT-V **AI AND ETHICS- CHALLENGES AND OPPORTUNITIES** **6**

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

30 PERIODS

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COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : Learn about morality and ethics in AI.

CO2 : Acquire the knowledge of real time application ethics, issues and its challenges.

CO3 : Understand the ethical harms and ethical initiatives in AI

CO4 : Learn about AI standards and Regulations like AI Agent, Safe Design of Autonomous and Semi-Autonomous Systems

CO5 : Understand the concepts of Roboethics and Morality with professional responsibilities.

CO6 : Learn about the societal issues in AI with National and International Strategies on AI

PRACTICAL EXERCISES

1. Recent case study of ethical initiatives in healthcare, autonomous vehicles and defense
2. Exploratory data analysis on a 2 variable linear regression model
3. Experiment the regression model without a bias and with bias
4. Classification of a dataset from UCI repository using a perceptron with and without bias
5. Case study on ontology where ethics is at stake
6. Identification on optimization in AI affecting ethics

30 PERIODS

TOTAL:60 PERIODS

TEXT BOOKS:

1. y. Eleanor Bird, Jasmin Fox-Skelly, Nicola Jenner, Ruth Larbey, Emma Weitkamp and Alan Winfield ,"The ethics of artificial intelligence: Issues and initiatives", EPRS | European Parliamentary Research Service Scientific Foresight Unit (STOA) PE 634.452 – March 2020

2.Patrick Lin, Keith Abney, George A Bekey," Robot Ethics: The Ethical and Social Implications of Robotics", The MIT Press- January 2014.

REFERENCE BOOKS:

1.Towards a Code of Ethics for Artificial Intelligence (Artificial Intelligence: Foundations, Theory, and Algorithms) by Paula Boddington, November 2017

2.Mark Coeckelbergh," AI Ethics", The MIT Press Essential Knowledge series, April 2020

E.RESOURCES:

1. https://www.unesco.org/en/artificial-intelligence

2. https://utsouthwestern.libguides.com/artificial-intelligence/ai-ethics

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CO's – PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	1	-	-	-	1	2	1	1	3	1	1
CO2	2	1	1	2	1	-	-	-	1	2	1	1	3	3	1
CO3	2	3	1	1	3	-	-	-	2	1	1	2	3	2	2
CO4	3	1	3	3	2	-	-	-	2	2	3	1	2	1	3
CO5	3	1	1	3	3	-	-	-	2	3	3	3	1	3	3
AVG	2.6	1.6	1.8	2.4	2	-	-	-	1.6	2	1.8	1.6	2.4	2	2

1 - low, 2 - medium, 3 - high, '-' - no correlation

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23MDC51	SOFT AND ANALYTICAL SKILLS - II	L	T	P	C
		1	0	0	0

COURSE OBJECTIVES:

- ☐ To enhance the collaboration and cooperation between individuals towards a common goal
- ☐ To provide a critical perspective on the socialization of men and women.
- ☐ Basic Knowledge about the Verbal Reasoning.
- ☐ To solve the problems in Quantitative Aptitude.
- ☐ Understand the basics of Data Interpretation

UNIT-I **TEAM SKILLS** **3**

Trust and collaboration - Team building – Shouldering responsibilities

UNIT-II **GENDER SENSITIZATION** **3**

Media and the Social Context - Social Networks - Gender Sensitization

UNIT-III **VERBAL REASONING** **3**

Verbal Reasoning: Syllogism, Blood relationship

UNIT-IV **QUANTITATIVE APTITUDE** **3**

Ratio and proportion, Problems on ages, Partnership.

UNIT-V **DATA INTERPRETATION** **3**

Tabulation – Profit & loss, Percentage.

TOTAL : 15 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

- CO1 : Share and exchange knowledge and ideas, clarify doubts, and arrive at a collective decision or understanding.
- CO2 : Meet the needs of an increasingly ethnically and gender-diverse workplace.
- CO3 : Enhance the Aptitude Round Clearing ability in interview process
- CO4 : Solve problems pertaining to quantitative ability.
- CO5 : Interrupt the data.

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TEXT BOOKS:

1. Quantitative Aptitude for Competitive Examination by R.S. Agrawal, S.Chand Publications.
2. Soft Skills: an Integrated Approach to Maximise Personality, Gajendra S. Chauhan, Sangeeta Sharma, Wiley India

REFERENCE BOOKS:

1. Analytical skills by Showick Thorpe, published by S Chand And Company Limited, Ramnagar, New Delhi-110055
2. Quantitative Aptitude and Reasoning by R V Praveen, PHI publishers.
3. Quantitative Aptitude for Competitive Examination by AbhijitGuha, Tata Mc Graw Hill Publications.
4. Personality Development and Soft Skills, Barun K. Mitra, Oxford Press
5. Cornerstone: Developing Soft Skills, Sherfield, Pearson India

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SUB. CODE	INTRODUCTION TO WOMEN AND GENDER STUDIES	L	T	P	C
23MDC52	(Common to: B.E / B.Tech. all Branches)	3	0	0	0

Course Objectives:

The main learning objective of this course is to prepare the students :

- To explore the concepts of sex and gender, understanding how they influence social constructs.
- To educate the key feminist theories and perspectives.
- To provide an overview of global and national women's movements with a focus on historical contexts and impacts.
- To understand how language shapes the ideas about gender, and how it can either reinforce or question traditional gender roles.
- To know how language influence the understanding of gender and how can it support or challenge traditional gender roles. is this correct.

UNIT-I CONCEPTS 9

Sex vs. Gender, masculinity, femininity, socialization, patriarchy, public/ private, essentialism, binaryism, power, hegemony, hierarchy, stereotype, gender roles, gender relation, deconstruction, resistance, sexual division of labour.

UNIT-II FEMINIST THEORY 9

Liberal, Marxist, Socialist, Radical, Psychoanalytic, postmodernist, ecofeminist.

UNIT-III WOMEN'S MOVEMENTS: GLOBAL, NATIONAL AND LOCAL 9

Rise of Feminism in Europe and America. Women's Movement in India.

UNIT-IV GENDER AND LANGUAGE 9

Linguistic Forms and Gender. Gender and narratives.

UNIT-V GENDER AND REPRESENTATION 9

Advertising and popular visual media. Gender and Representation in Alternative Media. Gender and social media.

Total Hours 45

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1: Differentiate between sex and gender, identifying the roles of socialization, patriarchy, and power structures in shaping gender norms and relations.

CO2: Critically evaluate feminist theories and apply them to analyze gender dynamics in variou societal contexts.

CO3: Assess the historical and contemporary significance of women's movements globally an in India, recognizing their contributions to gender equality.

CO4: Understand and analyze the intersection of language, narratives, and gender, identifyin how linguistic constructs influence societal perceptions of gender.

CO5: Examine the representation of gender in mainstream and alternative media, identifyin stereotypes and advocating for more inclusive narratives.

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TEXT BOOKS:

1. Melissa J. Gillis and Srinivasan - Introduction to Women's and Gender Studies: An Interdisciplinary Approach 2nd edtion.
2. Chris Beasley, Feminist Theory Today: An Introduction to Second-Wave Feminism, SAGE Publications.

REFERENCE BOOKS:

1. Dr.Girish Pachauri, Dr.Premlata Maisnam, Dr.Vandana Goswami.- 2023
2. Shagufta Siddiqui,Women and Gender Study: A Critical Exploration - 2024

E-RESOURCES:

- https://plato.stanford.edu/entries/feminism-philosophy
- https://www.unwomen.org/en/digital-library

CO, PO & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	1	1	1	-	-	-	-	-	-	3	3	2
CO2	2	3	3	-	-	2	-	-	-	-	-	-	2	-	-
CO3	1	-	2	2	2	1	-	-	-	-	-	-	1	3	2
CO4	-	2	3	2	1	-	-	-	-	-	-	-	1	2	1
CO5	2	2	1	3	1	1	-	-	-	-	-	-	1	1	-
Avg	1.6	2	1.8	1.6	1	1	-	-	-	-	-	-	1.6	1.8	1

1-low, 2-medium, 3- high, '-'-no correction

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23MDC53	ELEMENTS OF LITERATURE	L	T	P	C
		3	0	0	0

COURSE OBJECTIVES:

- To make the students aware about the finer sensibilities of human existence through an art form. The students will learn to appreciate different forms of literature as suitable modes of expressing human experience.

UNIT-I **INTRODUCTION TO ELEMENTS OF LITERATURE** 9

a) Nature of Literature: Meaning, Characteristics, literature as an art form.
b) Functions of Literature: The aesthetic, moral, and cultural functions of literature.
c) Types of Literature: Introduction to the three main genres: Prose, Poetry, and Drama.

UNIT-II **RELEVANCE OF LITERATURE** 9

a) Enhances Reading, thinking, discussing and writing skills.
b) Develops finer sensibility for better human relationship.
c) Increases understanding of the problem of humanity without bias.

UNIT-III **ELEMENTS OF FICTION** 9

a) Fiction, fact and literary truth.
b) Fictional modes and patterns.
c) Plot character and perspective.

UNIT-IV **ELEMENTS OF POETRY** 9

a) Emotions and imaginations.
b) Figurative language.
c) Figures of Speech: Simile, metaphor, conceit, symbol, pun, personification irony and trend.

UNIT-V **ELEMENTS OF DRAMA** 9

a) Drama as representational art.
b) Drama as narration, mediation and persuasion.
c) Features of tragedy, comedy and satire.

TOTAL: 45 PERIODS

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COURSE OUTCOME:

- Students will be able to understand the relevance of literature in human life and appreciate its aspects in developing finer sensibilities.

TEXT BOOKS:

1) An Introduction to Literary Studies, Mario Klarer, Routledge, 2013.
2) The Elements of Fiction: A Survey, Ulf Wolf (ed), Wolfstuff, 2014.
3) The Elements of Drama, J.L.Styan, Literary Licensing, 2011.
4) An Introduction to the Study of English Literature, W.H. Hudson, Atlantic, 2007.
5) The Experience of Poetry, Graham Mode, Open college of Arts with Open Unv Press, 1991.

REFERENCE BOOKS:

1) To be decided by the teacher and student, on the basis of individual student so as to enable him or her to write the term paper.

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	FILM APPRECIATION	L	T	P	C
23MDC54	(BE/B.Tech- Common to all Branches)	3	0	0	0

In this course on film appreciation, the students will be introduced broadly to the development of film as an art and entertainment form. It will also discuss the language of cinema as it evolved overall century. The students will be taught as to how to read a film and appreciate the various nuances of a film as a text. The students will be guided to study film joyfully.

Theme - A:The Component of Films

A-1:The material and equipment
A-2:The story, screenplay and script
A-3:The actors, crew members, and the director
A-4:The process of film making... structure of a film

Theme- B: Evolution of Film Language

B-1:Film language, form, movement etc.
B-2: Early cinema... silent film (Particularly French)
B-3: The emergence of feature films: Birth of a Nation
B-4: Talkies

Theme-C: Film Theories and Criticism/ Appreciation

C-1:Real list theory; Auteurists
C-2:Psychoanalytic, Ideological, Feminists
C-3: How to read films?
C-4:Film Criticism/Appreciation

Theme–D:Development of Films

D-1:Representative Soviet films
D-2:Representative Japanese films
D-3: Representative Italian films
D-4:Representative Hollywood film and the studio system

Theme-E: Indian Films

E-1:The early era
E-2:The important films made by the directors
E-3: The regional films
E-4:The documentaries in India

READING:
A Reader containing important articles on films will be prepared and given to the students. The students must read them and present in the class and have discussion on these.

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23MDC55	DISASTER RISK REDUCTION AND MANAGEMENT	L	T	P	C
		3	0	0	0

COURSE OBJECTIVES:

- To impart knowledge on concepts related to disaster, disaster risk reduction, disaster management
- To acquaint with the skills for planning and organizing disaster response
- To develop disaster response skills by adopting relevant tools and technology
- To Enhance awareness of institutional processes for Disaster response in the country
- To Develop rudimentary ability to respond to their surroundings with potential Disaster response in areas where they live, with due sensitivity

UNIT-I HAZRADS, VULNERABILITY AND DISASTER RISKS 9

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Types of Disasters: Natural, Human induced, Climate change induced –Earthquake, Landslide, Flood, Drought, Fire etc – Technological disasters- Structural collapse, Industrial accidents, oil spills -Causes, Impacts including social, Economic, political, environmental, health, psychosocial, etc.- Disaster vulnerability profile of India and Tamil Nadu - Global trends in disasters: urban disasters, pandemics, Complex emergencies, - Inter relations between Disasters and Sustainable development Goals

UNIT-II DISASTER RISK REDUCTION (DRR) 9

Sendai Framework for Disaster Risk Reduction, Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community Based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions / Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Early Warning System – Advisories from Appropriate Agencies.- Relevance of indigenous Knowledge, appropriate technology and Local resources.

UNIT-III DISASTER MANAGEMENT 9

Components of Disaster Management – Preparedness of rescue and relief, mitigation, rehabilitation and reconstruction- Disaster Risk Management and post disaster management – Compensation and Insurance- Disaster Management Act (2005) and Policy - Other related policies, plans, programmers and legislation - Institutional Processes and Framework at State and Central Level- (NDMA –SDMA-DDMA-NRDF- Civic Volunteers)

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REFERENCE BOOKS:

1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005.
2. Government of India, National Disaster Management Policy, 2009.
3. Shaw R (2016), Community based Disaster risk reduction, Oxford University Press

E-RESOURCES:

1. https://archive.nptel.ac.in/courses/124/107/124107010/
2. https://nptel.ac.in/courses/124107010

CO's – PO's & PSO's MAPPING

	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	PSO 3
CO1	3	3	2	3	-	-	2	2	-	-	2	-	2	-	1
CO2	3	3	3	3	-	-	2	1	-	-	2	-	2		1
CO3	3	3	3	3	-	-	2	2	-	-	-	-	2		1
CO4	3	3	2	3	-	-	2	1	-	-	2	-	2		1
CO5	3	3	2	3	-	-	2	2	-	-	2	-	3		1

1 - low, 2 - medium, 3 - high, '-' - no correlation

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UNIT-IV **TOOLS AND TECHNOLOGY FOR DISASTER MANAGEMENT** 9

Early warning systems -Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster - Disaster Damage Assessment. - Elements of Climate Resilient Development -Standard operation Procedure for disaster response – Financial planning for disaster Management

UNIT-V **DISASTER MANAGEMENT: CASE STUDIES** 9

Discussion on selected case studies to analyse the potential impacts and actions in the contest of disasters-Landslide Hazard Zonation: Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.- Field work-Mock drill -

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course the students will be able to

CO1 : To impart knowledge on the concepts of Disaster, Vulnerability and Disaster Risk reduction (DRR)

CO2 : To enhance understanding on Hazards, Vulnerability and Disaster Risk Assessment prevention and risk reduction

CO3 : To develop disaster response skills by adopting relevant tools and technology

CO4 : Enhance awareness of institutional processes for Disaster response in the country and

CO5 : Develop rudimentary ability to respond to their surroundings with potential Disaster response in areas where they live, with due sensitivity

TEXT BOOKS:

1. Taimpo (2016), Disaster Management and Preparedness, CRC Publications
2. Singh R (2017), Disaster Management Guidelines for earthquakes, Landslides, Avalanches and tsunami, Horizon Press Publications
3. Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
4. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]

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