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

Regulation 2023 (Autonomous)

Curriculum and Syllabus

Choice Based Credit System (CBCS)

B.E. Computer Science and Engineering

(Artificial Intelligence and Machine Learning)

SHREE VENKATESHWARA HI-TECH ENGINEERING COLLEGE
(Autonomous)
Gobichettipalayam, Erode -638455
Regulation 2023 (UG)
Curriculum and Syllabus
B.E.-Computer Science and Engineering
(Artificial Intelligence and Machine Learning)

I. Program Educational Objective (PEO)

PEO1 : Technical Skills: Apply their technical competence in computer science to solve real world problems, with technical and people leadership

PEO2 : Problem Solving Skills: Conduct cutting edge study and develop solutions on problems of social relevance.

PEO3 : Professional Skills: Work in a business environment, exhibiting team skills, work ethics, adaptability and lifelong learning

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.

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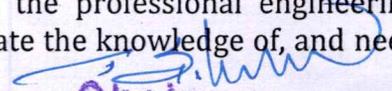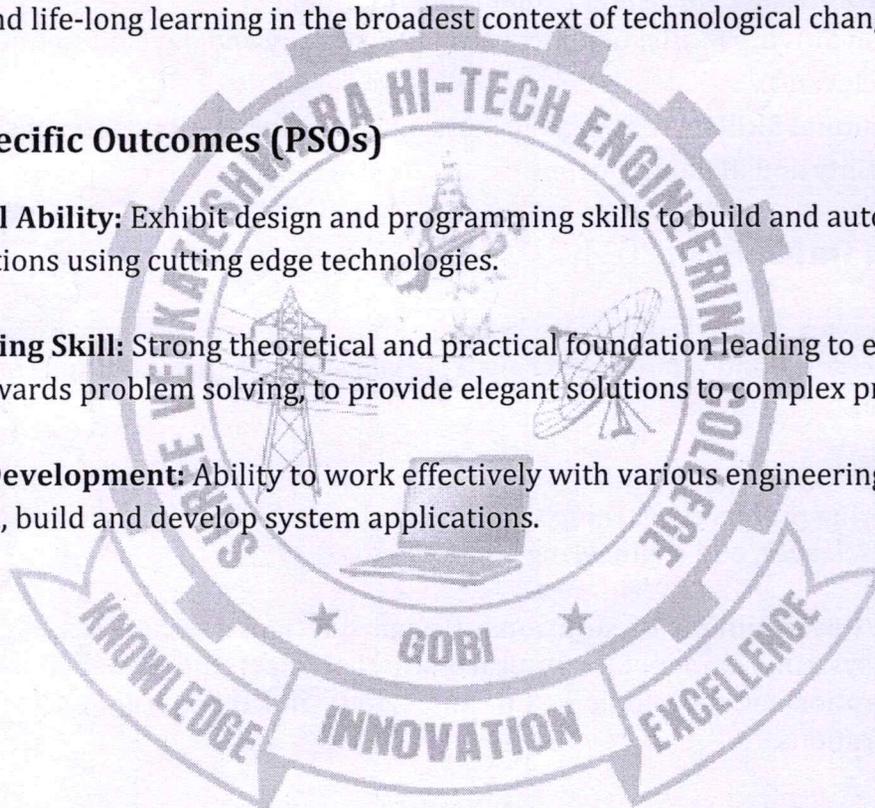
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8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

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)

PSO 1 : Technological Ability: Exhibit design and programming skills to build and automate business solutions using cutting edge technologies.

PSO 2 : Problem Solving Skill: Strong theoretical and practical foundation leading to excellence and excitement towards problem solving, to provide elegant solutions to complex problems.

PSO 3 : Application Development: Ability to work effectively with various engineering fields as a team to design, build and develop system applications.

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Mapping of Course Outcome and Programme Outcome

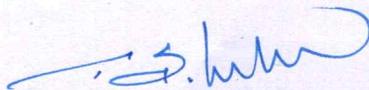| Year	Sem	Course name	PO 1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	2	3
I	I	Induction Programme															
		Professional English - I	-	-	-	2	-	1	-	-	2	3	-	3	-	-	-
		Matrices and Calculus	3	3	1	1	-	-	-	-	2	-	2	3	-	-	-
		Engineering Physics	3	3	2	1	2	-	-	-	-	-	-	1	-	-	-
		Engineering Chemistry	3	2	2	1	1	2	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	-	-	-	-
I	II	Professional English - II	-	-	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	-	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
		Object Oriented Programming	2	1	2	2	2	-	-	-	2	2	1	2	3	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	
		Object Oriented Programming Laboratory	2	2	2	2	2	-	-	-	2	2	2	2	2	2	2
	IV	Machine Learning	2	2	3	2	2	-	-	-	2	2	2	2	2	2	1
		Data Base Design and Management	2	2	2	2	1	-	-	-	2	2	1	1	2	2	2
		Artificial Intelligence	2	2	3	2	2	3	-	1	-	-	-	1	3	3	-
		Theory of Computation	2	2	2	2	1	-	-	-	1	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
		Data Base Design and Management Laboratory	2	2	2	2	2	3	-	1	-	-	-	1	3	3	-
		Artificial Intelligence Laboratory	2	1	2	2	1	-	-	-	2	2	2	2	2	2	2
		Mandatory Course - II Soft and Analytical Skills-I	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
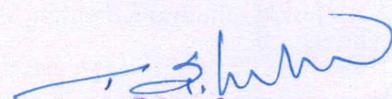
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SUMMARY OF CREDITS

| S.No	Course Category	Credits per Semester								Total Credits	Credits in %	Credits as per AU Curriculum R-2021	Credits as per AICTE Model Curriculum R-2022
		I	II	III	IV	V	VI	VII	VIII				
1	HSS	4	3					5		12	7.27	12	10
2	BS	12	7	4	2					25	15.15	25	16
3	ES	5	9	4						18	10.91	18	08
4	PC		5	15	20.5	14	7.5			62	37.58	61	71
5	PE					6	12			18	10.91	18	16
6	OE						3	9		12	7.27	12	06
7	EEC	1	2	1				4	10	18	10.91	16	38
8	MC		√		√	√ / √	√						-
	Total Credits / Semester	22	26	24	22.5	20	22.5	18	10	165	100	162	165

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,
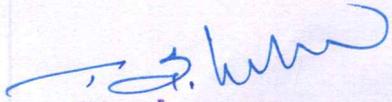
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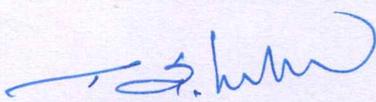## (Autonomous)
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Regulation 2023 (UG)
Curriculum and Syllabus
B.E.-Computer Science and Engineering
(Artificial Intelligence and Machine Learning)

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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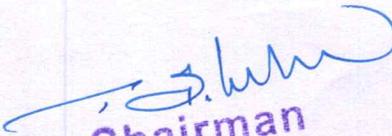### Gobichettipalayam, Erode -638455
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(Artificial Intelligence and Machine Learning)
SEMESTER II

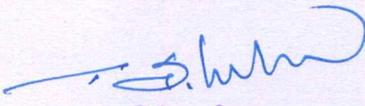| S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
Theory											
1.	23ENT21	Professional English - II	HSS	2	0	0	2	2	40	60	100
2.	23MAT21	Numerical Methods and Statistics	BS	3	1	0	4	4	40	60	100
3.	23PHT21	Physics for Information 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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(Artificial Intelligence and Machine Learning)
SEMESTER III

S.No	Course Code	Course Title	Category	L	T	P	Total Contact Period	Credits	CA	ES	TM
				Periods / Week					Max.Marks		
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.	23CST33	Object Oriented Programming	PC	3	0	0	3	3	40	60	100
5.	23ECI32	Digital Principles and Computer Organization	ES	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
9.	23CSL33	Object Oriented Programming Laboratory	PC	0	0	4	4	2	60	40	100
			Total	**16**	**1**	**14**	**31**	**24**			

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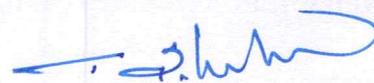## (Autonomous)
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SEMESTER IV

S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
Theory											
1.	23ADT41	Machine Learning	PC	3	0	0	3	3	40	60	100
2.	23ADT42	Data Base Design and Management	PC	3	0	0	3	3	40	60	100
3.	23ADT43	Artificial Intelligence	PC	3	0	0	3	3	40	60	100
4.	23CST42	Theory of Computation	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	0	11	29	22.5			

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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.	23AMI51	Natural Language Processing	PC	3	0	2	5	4	50	50	100
2.	23CST51	Cryptography and Cyber Security	PC	3	0	0	3	3	40	60	100
3.	23CST52	Distributed Computing	PC	3	0	0	3	3	40	60	100
4.	23CSI52	Object Oriented Software Engineering	PC	3	0	2	5	4	50	50	100
5.		Professional Elective I*	PE	-	-	-	-	3	-	-	100
6.		Professional Elective II*	PE	-	-	-	-	3	-	-	100
Mandatory Courses											
7.	23MDC51	Mandatory Course – III Soft and Analytical Skills-II	MC	1	0	0	1	0	100	-	100
8.		Mandatory Course – IV&	MC	3	0	0	3	0	100	-	100
						Total		20			

* 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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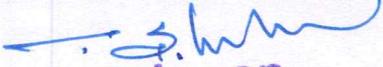### (Artificial Intelligence and Machine Learning)

SEMESTER VI

S.No	Course Code	Course Title	Category	Periods / Week L	T	P	Total Contact Period	Credits	Max.Marks CA	ES	TM
Theory											
1.	23AMI61	Deep Learning for Vision	PC	3	0	1	4	3.5	50	50	100
2.	23ECI62	Embedded Systems and IoT	PC	3	0	2	5	4	50	50	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 Courses											
8.		Mandatory Course – V &	MC	3	0	0	3	0	100	-	100
					Total			**22.5**			

* 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 given under Mandatory Course-V)

@ The students individually undergo training in reputed Firms/Research Institutes/ 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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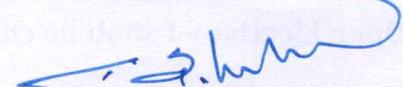## (Artificial Intelligence and Machine Learning)

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 - 2	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.	23AML71	Summer internship@	EEC	0	0	0	0	2	100	-	100
7.	23AML72	Mini Project	EEC	0	0	2	2	1	100	-	100
				Total	14	0	4	18	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.
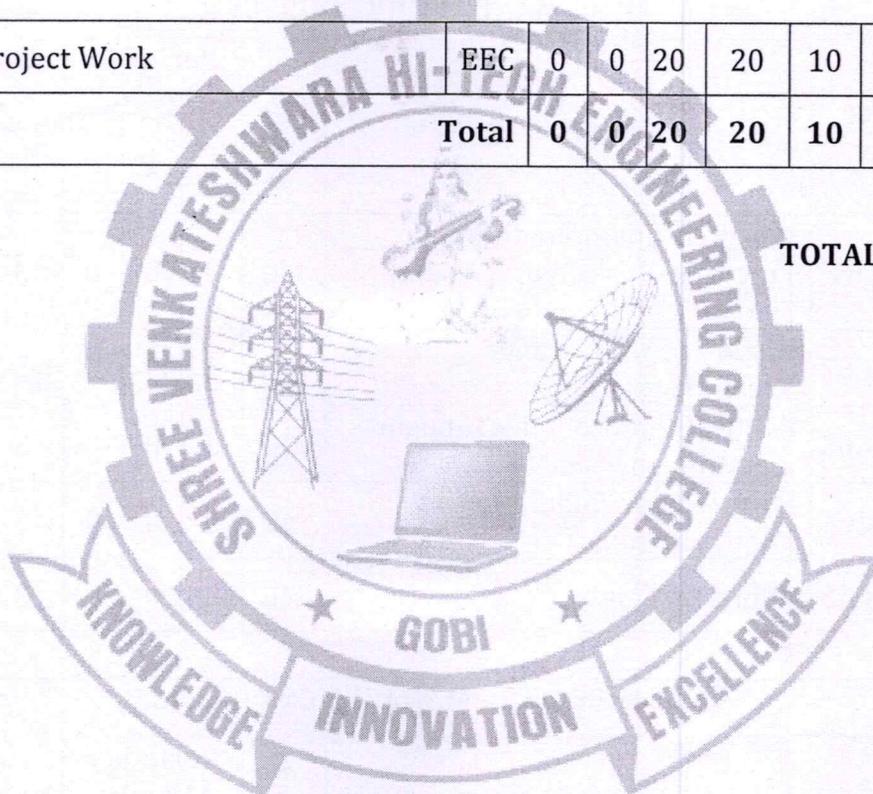
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SEMESTER VIII

S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
		Practicals									
1.	23AML81	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 I Data Science	Vertical II Full Stack Development	Vertical III Cloud Computing and Data Center Technologies	Vertical IV Cyber Security and Data Privacy	Vertical V Creative Media	Vertical VI Emerging Technologies	Vertical VII Artificial Intelligence and Machine Learning
Exploratory Data Analysis	Web Technologies	Cloud Computing	Ethical Hacking	Augmented Reality/Virtual Reality	Augmented Reality/Virtual Reality	Knowledge Engineering
Recommender Systems	App Development	Virtualization	Digital and Mobile Forensics	Multimedia and Animation	Robotic Process Automation	Soft Computing
Neural Networks and Deep Learning	Cloud Services Management	Cloud Services Management	Social Network Security	Video Creation and Editing	Neural Networks and Deep Learning	Neural Networks and Deep Learning
Text and Speech Analysis	UI and UX Design	Data Warehousing	Modern Cryptography	UI and UX Design	Cyber security	Text and Speech Analysis
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 Defined Networks	Cryptocurrency and Blockchain Technologies	Visual Effects	Cryptocurrency and Blockchain Technologies	Game Theory
Computer Vision	DevOps	Stream Processing	Network Security	Game Development	Game Development	Cognitive Science
Big Data Analytics	Principles of Programming Languages	Security and Privacy in Cloud	Security and Privacy in Cloud	Multimedia Data Compression and Storage	3D Printing and Design	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 area of specialization / 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).
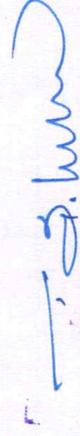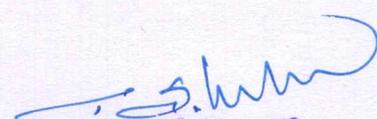
PROFESSIONAL ELECTIVE COURSES: VERTICALS

VERTICAL 1: DATA SCIENCE

S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
1.	23CSE11	Exploratory Data Analysis	PE	2	0	2	4	3	50	50	100
2.	23CSE12	Recommender Systems	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.	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.	23CSE18	Big Data Analytics	PE	2	0	2	4	3	50	50	100

VERTICAL 2: FULL STACK DEVELOPMENT

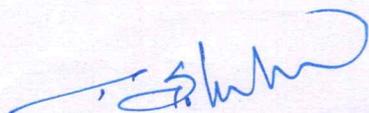| S.No	Course Code	Course Title	Category	Periods / Week			Total Contact Period	Credits	Max.Marks		
				L	T	P			CA	ES	TM
1.	23CSE21	Web Technologies	PE	2	0	2	4	3	50	50	100
2.	23CSE22	App Development	PE	2	0	2	4	3	50	50	100
3.	23CSE23	Cloud Services Management	PE	2	0	2	4	3	50	50	100
4.	23CSE24	UI and UX 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.	23CSE56	Visual Effects	PE	2	0	2	4	3	50	50	100
7.	23CSE57	Game Development	PE	2	0	2	4	3	50	50	100
8.	23CSE58	Multimedia Data Compression and Storage	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
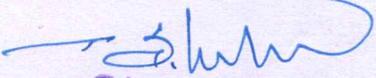
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VERTICAL 7: ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

S.No	Course Code	Course Title	Category	L	T	P	Total Contact Period	Credits	CA	ES	TM
1.	23CSE71	Knowledge Engineering	PE	2	0	2	4	3	50	50	100
2.	23CSE72	Soft Computing	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.	23CSE14	Text and Speech Analysis	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

OPEN ELECTIVES

Sl. No	Course Code	Course Title	Category	L	T	P	Total Contact Periods	Credits	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

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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
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	23AD011	Introduction to Big Data	OE	3	0	0	3	3	40	60	100
2	23AD012	Principles of Data Science	OE	3	0	0	3	3	40	60	100
3	23AD013	Data Visualization and its Applications	OE	3	0	0	3	3	40	60	100
4	23AD014	Data Warehousing and Mining	OE	3	0	0	3	3	40	60	100
5	23AD015	Principles of Cyber Security	OE	3	0	0	3	3	40	60	100
OFFERED BY DEPARTMENT INFORMATION TECHNOLOGY											
1	23IT011	Basics of Java Programming	OE	3	0	0	3	3	40	60	100
2	23IT012	Ethical Hacking	OE	3	0	0	3	3	40	60	100
3	23IT013	E-Commerce and Applications	OE	3	0	0	3	3	40	60	100
4	23IT014	Basics of Android Application Development	OE	3	0	0	3	3	40	60	100
5	23IT015	Introduction to Web Design	OE	3	0	0	3	3	40	60	100

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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

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   10
FUNDAMENTALS OF COMMUNICATION**

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
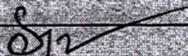
Reading - Reading Advertisements, Gadget Reviews; User Manuals.
Writing - Writing De initions; Instructions; and Product /Process Description.
Grammar - Imperatives; Adjectives; Degrees of Comparison; Present & Past Perfect Tenses.
Vocabulary- Compound Nouns, Homonyms; and Homophones, Discourse Markers (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.
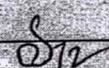
UNIT-IV **INTEGRAL CALCULUS** 9+3

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
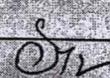
CO's – PO's MAPPING:

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	L	T	P	C
	(Common to B.E./B. Tech. all branches)	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	L T P C
	(Common to B.E./B. Tech. all branches)	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.
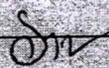
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UNIT-IV	FUELS AND COMBUSTION	9

Fuels: Introduction: Classification 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: Calorific value - higher and lower calorific values, Theoretical calculation of calorific 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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	PROBLEM SOLVING AND PYTHON PROGRAMMING	L	T	P	C
23CST11	(Common to: B.E. / B.Tech. all Branches)	3	0	0	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 அறம் - 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

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

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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 3
TO MODERN ART - SCULPTURE

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

UNIT-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 3
NATIONAL MOVEMENT AND INDIAN CULTURE

Contribution of Tamils to Indian Freedom Struggle - The Cultural Inluence 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

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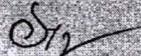
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COURSE OUTCOMES:

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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|	**PROBLEM SOLVING AND PYTHON PROGRAMMING**	**L**	**T**	**P**	**C**
23CSL11	**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
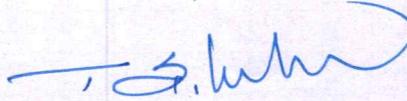
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COURSE OUTCOMES:

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.
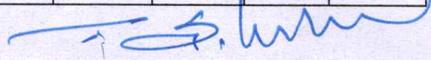
E-RESOURCES:

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

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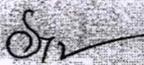
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TEXT BOOKS:

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 Textbook of Quantitative Chemical Analysis", (2009)

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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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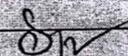
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UNIT-V	EXPRESSION	6

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

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Shree Venkateshwara Hi-Tech Engineering College (Autonomous)

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.

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| 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:

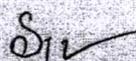- https://learnenglish.britishcouncil.org/

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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

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23MAT21	NUMERICAL METHODS AND STATISTICS	L	T	P	C
	(Common to B.E./B.Tech. all Branches)	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 and small 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

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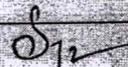
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Shree Venkateshwara Hi-Tech Engineering College (Autonomous)

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

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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 of materials
- 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.

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UNIT-V	NANODEVICES AND QUANTUM COMPUTING	9
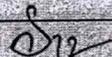
Introduction - quantum con inement – quantum structures: quantum wells, wires and dots - band gap of nanomaterials. Single electron transistor - Quantum system for information processing - quantum states – classical bits – quantum bits – CNOT gate - quantum gates – advantage of quantum computing over 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

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

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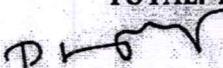
COURSE OUTCOME

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
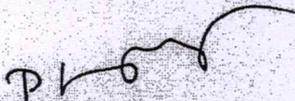
Chairman
BoS / EEE

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

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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

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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

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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

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BoS/CSE& IT

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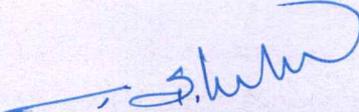
23TAT21   தமிழரும் தொழில்நுட்பமும்   L T P C
                                                                            1 0 0 1
(B.E./B.Tech- அனைத்து பாடப்பிரிவுகளுக்கும் பொதுவானது)

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 கட்டுமான்கள் & 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

அலகு - IV   வேளாண்மை மற்றும் நீர்ப்பாசனத் 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

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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**   3
                                 IRRIGATION TECHNOLOGY

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
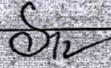
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COURSE OUTCOMES:

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

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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

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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

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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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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

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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.

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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

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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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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

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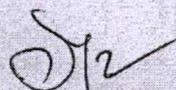
E-RESOURCES:
1. https://onlinecourses.nptel.ac.in/noc23_cs109/preview
2. https://onlinecourses.nptel.ac.in/noc23_cs22/preview
3. https://nptel.ac.in/courses/106106183

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.

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

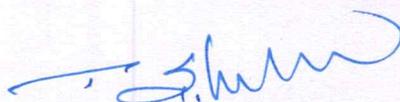| UNIT-V	DATA VISUALIZATION	9

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

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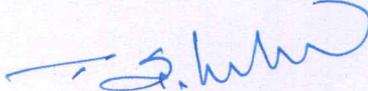
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23ITT31	DATA STRUCTURES AND ALGORITHMS	L	T	P	C
	(for B.Tech. – IT, AIDS , CS, AIML)	3	0	0	3

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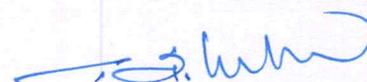
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COURSE OUTCOMES:
At the end of the course the students will be able to

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

CO's–PO's & PSO's MAPPING
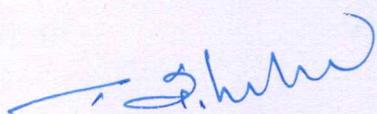
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CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	3	1	-	-	-	2	-	2	1	1	1	1
CO2	2	3	2	2	2	-	-	-	2	-	2	2	3	2	2
CO3	2	2	3	2	3	-	-	-	3	-	2	2	3	2	2
CO4	3	3	3	3	1	-	-	-	3	-	2	2	3	2	3
CO5	3	3	3	3	1	-	-	-	3	-	2	2	3	2	3
AVG	2.2	2.6	2.6	2.6	1.6	-	-	-	3	-	2	2	3	2	2

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

SVHEC-R2023

23CST33	**OBJECT ORIENTED PROGRAMMING** (for B.E./ B.Tech.–CSE, IT , CS, AIML, BME)	**L**	**T**	**P**	**C**
		3	0	0	3

COURSE OBJECTIVES:

➢ To understand Object Oriented Programming concepts and basics of Java programming language
➢ To know the principles of packages, inheritance and interfaces
➢ To develop a java application with threads and generics classes
➢ To define exceptions and use I/O streams
➢ To design and build Graphical User Interface Application using JAVAFX

UNIT-I INTRODUCTION TO OOP AND JAVA 9

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

UNIT-II INHERITANCE, PACKAGES AND INTERFACES 9

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

UNIT-III EXCEPTION HANDLING AND MULTITHREADING 9

Exception Handling basics – Multiple catch Clauses – Nested try Statements – Java's Built-in Exceptions–UserdefinedException.MultithreadedProgramming:JavaThreadModel–Creatinga Thread and Multiple Threads – Priorities – Synchronization – Inter Thread Communication-Suspending –Resuming, and Stopping Threads –Multithreading. Wrappers – Auto boxing.

UNIT-IV I/O, GENERICS, STRING HANDLING 9

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

UNIT-V JAVAFX EVENT HANDLING, CONTROLS AND COMPONENTS 9

JAVAFX Events and Controls: Event Basics – Handling Key and Mouse Events. Controls: Checkbox, Toggle Button – Radio Buttons – List View – Combo Box – Choice Box – Text Controls – Scroll Pane. Layouts – Flow Pane – H Box and V Box – Border Pane – Stack Pane – Grid Pane. Menus – Basics – Menu – Menu bars – Menu Item.

TOTAL: 45 PERIODS
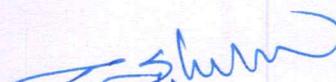
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COURSE OUTCOMES:
At the end of the course the students will be able to

CO1: Apply the concepts of classes and objects to solve simple problems

CO2: Develop programs using inheritance, packages and interfaces

CO3: Make use of exception handling mechanisms and multithreaded model to solve real world problems

CO4: Build Java applications with I/O packages, string classes ,Collections and generics concepts

CO5: IntegratetheconceptsofeventhandlingandJavaFXcomponentsandcontrolsfor Developing GUI based applications

TEXT BOOKS:

1. Herbert Schildt, "Java: The Complete Reference", 11 th Edition, McGraw Hill Education, New Delhi, 2019

2. Herbert Schildt, "Introducing JavaFX 8 Programming", 1 st Edition, McGraw Hill Education, New Delhi, 2015

REFERENCE BOOKS:

1. CayS.Horstmann,"CoreJavaFundamentals",Volume1,11thEdition,PrenticeHall,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	1	1	3	1	3	-	-	-	3	2	2	2	3	1	2
CO2	2	1	3	2	1	-	-	-	2	1	1	3	3	3	2
CO3	3	3	1	2	2	-	-	-	3	2	1	2	3	1	3
CO4	3	1	2	2	2	-	-	-	1	2	1	3	3	1	1
CO5	1	1	2	3	2	-	-	-	3	2	1	2	3	3	3
AVG	2	1	2	2	2	-	-	-	2	2	1	2	3	2	2

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

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SVHEC-R2023

23EC132	DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION	L	T	P	C
	(for BE/B.Tech- CSE, AI&DS and IT)	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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BoS/ECE

23EST31	ENTREPRENEURSHIP AND STARTUP	L	T	P	C
	(Common to: B.E / B.Tech. all Branches)	1	0	0	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, AIDS , CS, AIML)	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
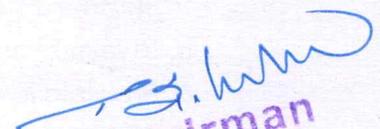
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23ITL31	**DATA STRUCTURES AND ALGORITHMS LABORATORY** (for B.Tech. – IT, AIDS , CS , AIML)	**L**	**T**	**P**	**C**
		0	0	4	2

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:

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.

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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.
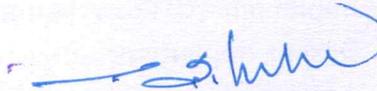
E-RESOURCES:

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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	OBJECT ORIENTED PROGRAMMING LABORATORY	**L**	**T**	**P**	**C**
23CSL33	(for B.E./ B.Tech.- CSE, IT , CS, AIML)	0	0	4	2

COURSE OBJECTIVES:

➢ To build software development skills using java programming for real- world applications.

➢ To understand and apply the concepts of classes, packages, interfaces, inheritance, exception handling and file processing.

➢ To develop applications using generic programming and event handling

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

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

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

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

5. Solve the above problem using an interface Implementing programs using Functions. (Factorial, largest number in a list, area of shape)

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

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

8. Write a program to perform file operations

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

10. Develop applications using Java FX controls, layouts and menus.

11. Develop a mini project for any application using Java concepts.

Lab Requirements: for a batch of 30 students
Operating Systems: Linux / Windows
Front End Tools: Eclipse IDE/ Net beans IDE

TOTAL: 60 PERIODS
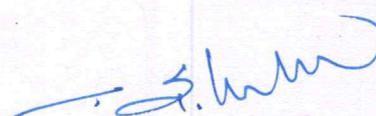
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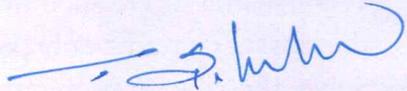SVHEC- R2023

COURSEOUTCOMES:

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

CO1: Design and develop java programs using object oriented programming concepts

CO2: Develop simple applications using object oriented concepts such as package, exceptions

CO3: Implement multithreading, and generics concepts

CO4: Create GUIs and event driven programming applications for real world problems.

CO5: Implement and deploy web applications using Java

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	2	1	-	-	-	-	1	2	2	2	1	2	3
CO2	2	1	3	1	-	-	-	-	2	3	3	2	1	3	1
CO3	2	2	1	2	1	-	-	-	1	2	1	3	2	3	2
CO4	2	2	1	3	-	-	-	-	3	1	1	1	2	1	2
CO5	1	3	3	1	3	-	-	-	1	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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SHREE VENKATESHWARA HI-TECH ENGINEERING COLLEGE
## (Autonomous)
Gobichettipalayam, Erode -638455
Regulation 2023 (UG)
Curriculum and Syllabus
B.E.-Computer Science and Engineering
(Artificial Intelligence and Machine Learning)
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.	23ADT41	Machine Learning	PC	3	0	0	3	3	40	60	100
2.	23ADT42	Data Base Design and Management	PC	3	0	0	3	3	40	60	100
3.	23ADT43	Artificial Intelligence	PC	3	0	0	3	3	40	60	100
4.	23CST42	Theory of Computation	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	-	-	-
			Total	18	0	11	29	22.5			
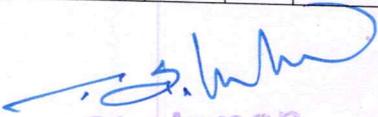
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23ADT41	MACHINE LEARNING (for B.E-AIML)	L	T	P	C
		3	0	0	3

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

UNIT-I   INTRODUCTION TO MACHINE LEARNING   9

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 backpropagation, from shallow networks to deep networks – Unit saturation (aka the vanishing gradient problem) – ReLU, hyperparameter tuning, batch normalization, regularization, dropout.

UNIT-V   DESIGN AND ANALYSIS OF MACHINE LEARNING EXPERIMENTS   8

Guidelines for machine learning experiments, Cross Validation (CV) and resampling – 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 : 45 PERIODS
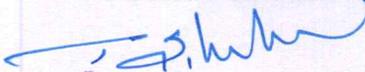
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COURSE OUTCOMES:

At the end of this 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

TEXTBOOKS:

1. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020. 2. Stephen Marsland, "Machine Learning: An Algorithmic Perspective, "Second Edition", CRC Press, 2014.

REFERENCES :

1. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.

2. Tom Mitchell, "Machine Learning", McGraw Hill, 3rd Edition, 1997.

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

4. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016

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

E-RESOURCES:

https://www.kaggle.com/discussions/general/196686

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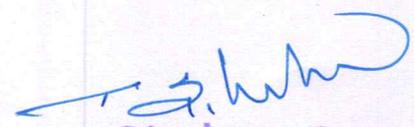
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23ADT42	DATABASE DESIGN AND MANAGEMENT	L	T	P	C
	(for B.E-AIML)	3	0	0	3

COURSE OBJECTIVES:

> ➢ To introduce database development life cycle and conceptual modelling
> ➢ 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 supertypes – user-defined routines – Collection types – Object Query Language; No-SQL: CAP theorem – Document-based: MongoDB data model and CRUD operations; Column-based: HBase data model and CRUD operations

TOTAL : 45 PERIODS

COURSE OUTCOMES

After the completion of this course, students will be able to:

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

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TEXTBOOKS:

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

REFERENCES:

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:The Complete Book", 2nd edition, Pearson. 58

5. Raghu Ramakrishnan, "Database Management Systems'', 4th Edition, Tata Mc Graw Hill, 2010.

E-RESOURCES:

https://likims.com/solutions/database-design-and-management/

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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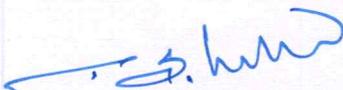
23ADT43	ARTIFICIAL INTELLIGENCE (for B.E-AIML)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

The main objectives of this course are to:
- ➤ Learn the basic AI approaches
- ➤ Develop problem solving agents
- ➤ Perform logical and probabilistic reasoning

UNIT-I	INTELLIGENT AGENTS	9

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

UNIT-II	PROBLEM SOLVING	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	GAME PLAYING AND CSP	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	LOGICAL REASONING	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	PROBABILISTIC REASONING	9

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

TOTAL : 45 PERIODS
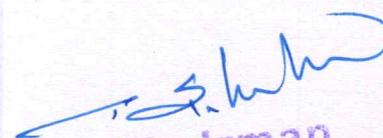
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COURSE OUTCOMES

At the end of this 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

TEXTBOOKS:

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

REFERENCES:

1. Dan W. Patterson, "Introduction to AI and ES", Pearson Education,2007

2. Kevin Night, Elaine Rich, and Nair B., "Artificial Intelligence", McGraw Hill, 2008

3. Patrick H. Winston, "Artificial Intelligence", Third Edition, Pearson Education, 2006

4. Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill Education, 2013

E-RESOURCES:

https://www.ailab.world/resources/online-resources/

CO's–PO's & PSO's MAPPING

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

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

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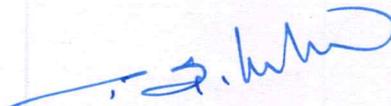
	THEORY OF COMPUTATION	L	T	P	C
23CST42		3	0	0	3

COURSE OBJECTIVES:

The main objectives of this course are to:
- To understand foundations of computation including automata theory
- To construct models of regular expressions and languages.
- To design context free grammar and push down automata
- To understand Turing machines and their capability
- To understand Undecidability and NP class problems

UNIT-I	AUTOMATA AND REGULAR EXPRESSIONS	9

Need for automata theory - Introduction to formal proof – Finite Automata (FA) – Deterministic Finite Automata (DFA) – Non-deterministic Finite Automata (NFA) – Equivalence between NFA and DFA – Finite Automata with Epsilon transitions – Equivalence of NFA and DFA- Equivalence of NFAs with and without ε-moves- Conversion of NFA into DFA – Minimization of DFAs.

UNIT-II	REGULAR EXPRESSIONS AND LANGUAGES	9

Regular expression – Regular Languages- Equivalence of Finite Automata and regular expressions – Proving languages to be not regular (Pumping Lemma) – Closure properties of regular languages

UNIT-III	CONTEXT FREE GRAMMAR AND PUSH DOWN AUTOMATA	9

Types of Grammar - Chomsky's hierarchy of languages -Context-Free Grammar (CFG) and Languages – Derivations and Parse trees – Ambiguity in grammars and languages – Push Down Automata (PDA): Definition – Moves - Instantaneous descriptions -Languages of pushdown automata – Equivalence of pushdown automata and CFG-CFG to PDA-PDA to CFG – Deterministic Pushdown Automata.

UNIT-IV	NORMAL FORMS AND TURING MACHINES	9

Normal forms for CFG – Simplification of CFG- Chomsky Normal Form (CNF) and Greibach Normal Form (GNF) – Pumping lemma for CFL – Closure properties of Context Free Languages – Turing Machine : Basic model – definition and representation – Instantaneous Description – Language acceptance by TM – TM as Computer of Integer functions – Programming techniques for Turing machines (subroutines).

UNIT-V	UNDECIDABILITY	9

Unsolvable Problems and Computable Functions –PCP-MPCP- Recursive and recursively enumerable languages – Properties - Universal Turing machine -Tractable and Intractable problems - P and NP completeness – Kruskal's algorithm – Travelling Salesman Problem- 3-CNF SAT problems.

TOTAL : 45 PERIODS
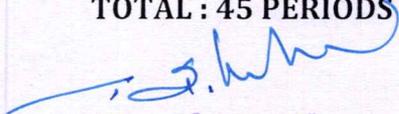
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COURSE OUTCOMES

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

CO1: Construct automata theory using Finite Automata

CO2: Write regular expressions for any pattern

CO3: Design context free grammar and Pushdown Automata 72

CO4: Design Turing machine for computational functions

CO5: Differentiate between decidable and undecidable problems

TEXTBOOKS:

1.Hopcroft J.E., Motwani R. & Ullman J.D., "Introduction to Automata Theory, Languages and Computations", 3rd Edition, Pearson Education, 2008.

2. John C Martin , "Introduction to Languages and the Theory of Computation", 4th Edition, Tata McGraw Hill, 2011.

REFERENCES:

1. Harry R Lewis and Christos H Papadimitriou , "Elements of the Theory of Computation", 2nd Edition, Prentice Hall of India, 2015.

2. Peter Linz, "An Introduction to Formal Language and Automata", 6th Edition, Jones & Bartlett, 2016.

3. K.L.P.Mishra and N.Chandrasekaran, "Theory of Computer Science: Automata Languages and Computation", 3rd Edition, Prentice Hall of India, 2006.

E-RESOURCES:

1. https://www.udemy.com/course/the-complete-theory-of-computation/

2. https://www.geeksforgeeks.org/introduction-of-theory-of-computation/

CO's–PO's & PSO's MAPPING

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

1- low,2 -medium,3- high,'-'- no correlation
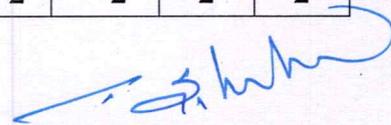
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		L	T	P	C
23CSI41	OPERATING SYSTEMS	3	0	2	4

COURSE OBJECTIVES:

The main objectives of this course are to:

➢ 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 7

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 11

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 10

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 10

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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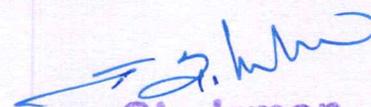
UNIT-V   **VIRTUAL MACHINES AND MOBILE OS**   **7**

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

TOTAL : 45 PERIODS

PRACTICAL EXERCISES: **30 PERIODS**

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

COURSE OUTCOMES

At the end of this 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

TEXTBOOKS:

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

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

REFERENCES:

1. Ramaz Elmasri, A. Gil Carrick, David Levine, "Operating Systems – A Spiral Approach", Tata McGraw Hill Edition, 2010.

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2. William Stallings, "Operating Systems: Internals and Design Principles", 7 th Edition, Prentice Hall, 2018. 74

3. Achyut S.Godbole, Atul Kahate, "Operating Systems", McGraw Hill Education, 2016.

E-RESOURCES:

1. http://nptel.ac.in/
2. https://www.javatpoint.com/operating-system
3. https://www.tutorialspoint.com/operating_system/

CO's–PO's & PSO's MAPPING

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

1- low,2 -medium,3- high,'-'- no correlation
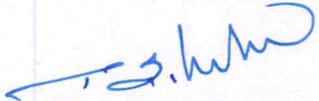
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	MACHINE LEARNING LABORATORY	L	T	P	C
23ADL41	(for B.E-AIML)	0	0	3	1.5

COURSE OBJECTIVES:

The main objectives of this course are to:
- ➢ 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 Backpropagation 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.

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

TOTAL: 60 PERIODS

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COURSE OUTCOMES

At the end of this 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.

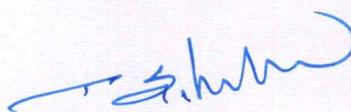CO5: Assess and compare the performance of different ML algorithms and select the suitable one based on the application

TEXTBOOKS:

1. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020. 2.

Stephen Marsland, "Machine Learning: An Algorithmic Perspective, "Second Edition", CRC Press,

2014.

REFERENCES :

1. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.

2. Tom Mitchell, "Machine Learning", McGraw Hill, 3rd Edition, 1997.

3. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, "Foundations of Machine Learning",

Second Edition, MIT Press, 2012, 2018.

4. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016

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

2019

E-RESOURCES:

https://mll.iiit.ac.in/

https://ml.utexas.edu/

CO's–PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PS03
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
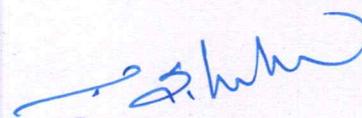
1- low,2 -medium,3- high,'-'- no correlation

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23ADL42	DATABASE DESIGN AND MANAGEMENT LABORATORY	L	T	P	C
	(for B.E-AIML)	0	0	3	1.5

COURSE OBJECTIVES:

The main objectives of this course are to:
- ➢ 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

SUGGESTIVE EXPERIMENTS

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

COURSE OUTCOMES

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

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

TOTAL : 45 PERIODS

HARDWARE:
• Standalone Desktops

SOFTWARE:
• PostgreSQL

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TEXTBOOKS:

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

REFERENCES:

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:The Complete Book", 2nd edition, Pearson. 58

5. Raghu Ramakrishnan, "Database Management Systems", 4th Edition, Tata Mc Graw Hill, 2010.

E-RESOURCES:

https://ieeexplore.ieee.org/document/5455275

CO's–PO's & PSO's MAPPING

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

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

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	L	T	P	C
ARTIFICIAL INTELLIGENCE LABORATORY				
23ADL43 (for B.E-AIML)	0	0	3	1.5

COURSE OBJECTIVES:

The main objectives of this course are to:
- ➤ 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 Minimax 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 this 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

TEXTBOOKS:

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

REFERENCES:

1. Dan W. Patterson, "Introduction to AI and ES", Pearson Education,2007

2. Kevin Night, Elaine Rich, and Nair B., "Artificial Intelligence", McGraw Hill, 2008

3. Patrick H. Winston, "Artificial Intelligence", Third Edition, Pearson Education, 2006

4. Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill Education, 2013

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E-RESOURCES:

https://www.ailab.world/resources/online-resources/

https://eller.arizona.edu/departments-research/centers-labs/artificial-intelligence/resources

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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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 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING											
1	23AMO11	Ai For Everyone	OE	3	0	0	3	3	40	60	100
2	23AMO12	Machine Learning and its Applications	OE	3	0	0	3	3	40	60	100
3	23AMO13	Quantum AI	OE	3	0	0	3	3	40	60	100
4	23AMO14	Reinforcement Learning	OE	3	0	0	3	3	40	60	100
5	23AMO15	Network Automation Using AIML	OE	3	0	0	3	3	40	60	100

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23AM011	AI FOR EVERYONE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

➢ To introduce the fundamental concepts of AI, Machine Learning, and Deep Learning along with their scope and capabilities for software requirements analysis.

➢ To familiarize students with key data terminology, workflows, and tools essential for building AI and Data Science projects, supporting effective software testing and maintenance.

➢ To develop the ability to plan, organize, and manage AI-based projects by understanding team roles and real-world implementation challenges.

➢ To create awareness of the societal, ethical, and environmental implications of AI, including issues like bias, adversarial attacks, and their impact on jobs and economies.

➢ To apply AI techniques and algorithms across various domains to address real-world problems

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

Machine Learning – What is Data-Terminology of AI – What makes an AI Company – What Machine Learning Can and Cannot do – Non – Technical Explanation of Deep Learning – Basics of Neural Networks – Examples of AI – Application domains of AI.

UNIT II   **BUILDING AI PROJECTS**   **9**

Workflow of a Machine Learning Projects – Workflow of a Data Science Projects – How to use data – How to choose an AI Project – Working with an AI Team – How to Process and Visualize Data – Technical Tools for AI Teams – Use of Python in AI related Projects

UNIT III   **BUILDING AI IN YOUR COMPANY**   **9**

Example roles of an AI Team – AI Pitfalls to avoid, Survey of major AI Application Areas – Case Study: – Smart Speaker, Self-Driving Car

UNIT IV   **AI AND SOCEITY**   **9**

A Realistic View Of AI – Discrimination / Bias– Adversarial attacks on AI – Adverse uses of AI– AI and Developing Economies – AI and Jobs

UNIT V   **APPLICATION OF AI**   **9**

AI in Medical Imaging - Fraud Detection – Personalized Recommendations - Precision Agriculture - AI Powered Personalized Learning- AI Recruitment.

TOTAL: 45 PERIODS
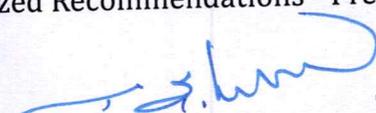
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COURSE OUTCOMES :

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

CO1: Describe the basic concepts of AI and Machine Learning

CO2: Illustrate how to build different AI projects.

CO3: Explain the working of self- driving systems.

CO4: Analyse the implications of AI technologies for sustainable and inclusive development

CO5: Apply AI techniques to any application domain.

TEXTBOOKS

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Fourth Edition, Pearson Education, 2020.

2. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, Second Edition, O'Reilly Media, 2019.

3. Ian Goodfellow, Yoshua Bengio, and Aaron Courville, Deep Learning, MIT Press, 2016.

4. Kevin P. Murphy, Machine Learning: A Probabilistic Perspective, First Edition, MIT Press, 2012.

REFERENCE BOOKS:

1. Zoltán Somogyi,The Application of Artificial Intelligence: Step-by-Step Guide from Theory to Practice, Springer, 2020.

2. Priyadarshini Mehra, Sehgal & Singh, Artificial Intelligence: Applications and Innovations, Routledge, 2021.

3. Springer, Applications of Artificial Intelligence and Machine Learning, First Edition, 2022.

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	2	2	2	-	1	1	1	-	2	1	-	2	2	2	1
2	2	2	2	-	1	1	1	-	2	1	-	2	3	3	2
3	2	2	2	-	1	1	1	-	2	2	-	1	2	3	2
4	2	2	2	-	1	1	1	-	2	2	-	2	2	2	1
5	2	2	2	-	1	1	1	-	2	1	-	1	3	3	3
AVG	2	2	2	-	1	1	1	-	2	1	-	2	2	3	2

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

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22AM012	MACHINE LEARNING AND ITS APPLICATIONS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- ➤ To understand the basics of Machine Learning including types of algorithms, processes, and applications.
- ➤ To learn supervised learning techniques like SVM, KNN, Naive Bayes, and Decision Trees for classification tasks.
- ➤ To enable students to understand and apply various regression techniques—including Linear, Polynomial, and Logistic Regression
- ➤ To explore unsupervised learning including clustering techniques like K-Means and Hierarchical Clustering for pattern discovery.
- ➤ To apply advanced unsupervised learning techniques like A priori and PCA for association rule mining and dimensionality reduction.

UNIT I   **INTRODUCTION TO MACHINE LEARNING**   **9**

Machine Learning – Need of Machine Leaning – Types of Machine Learning Algorithms – Machine Learning Process – Data Collection, Exploration, Preparation, Training, Optimization – Applications of Machine Learning.

UNIT II   **SUPERVISED LEARNING I**   **9**

Supervised Machine Learning – Types of Supervised Machine Learning Algorithms– Classification Algorithms– Support Vector Machine – KNN – Naïve bayes classifiers – Decision Tree –Application of ML– Email Spam Filtering– Fraud Detection– Recommendation Systems

UNIT III   **SUPERVISED LEARNING II**   **9**

Introduction to Regression Techniques – Linear Regression – Polynomial Regression, Logistic Regression. Application of ML – House Price Prediction, Stock Prediction

UNIT IV   **UNSUPERVISED LEARNING I**   **9**

Unsupervised Machine Learning – Clustering– K- Means Clustering–Density Based Clustering–Distribution Based Clustering – Hierarchical Clustering–Application of ML– Customer Segmentation

UNIT V   **UNSUPERVISED LEARNING II**   **9**

Association–A Priori Algorithm –Dimensionality Reduction–Principal Component Analysis–Application of ML –Market Based Analysis – Financial Data Analysis

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TOTAL: 45 PERIODS

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COURSE OUTCOMES:

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

CO1: Describe the fundamental concepts of machine learning

CO2: Illustrate the classification algorithms and its applications

CO3: Examine the concepts of regression and its applications

CO4: Illustrate the features of clustering algorithms

CO5: Describe the association and dimensionality reduction concepts.

TEXTBOOKS

1. Christopher M. Bishop, "Pattern Recognition and Machine Learning", 1st Edition, Springer, 2006.

2. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", 1st Edition, MIT Press, 2012.

3. Trevor Hastie, Robert Tibshirani, and Jerome Friedman, "The Elements of Statistical Learning: Data Mining, Inference, and Prediction", 2nd Edition, Springer, 2009.

4. C. M. Bishop, "Clustering and Classification", 1st Edition, Springer, 2006.

5. Jiawei Han, Micheline Kamber, Jian Pei, "Data Mining: Concepts and Techniques", 3rd Edition, Morgan Kaufmann, 2011.

REFERENCE BOOKS:

1. Tom M. Mitchell, Machine Learning, 1st Edition, McGraw-Hill Education, 1997.

2. Ethem Alpaydin, Introduction to Machine Learning, 4th Edition, MIT Press, 2020.

3. Ian H. Witten, Eibe Frank, Mark A. Hall, Data Mining: Practical Machine Learning Tools and Techniques, 3rd Edition, Morgan Kaufmann, 2011.

4. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, 2nd Edition, O'Reilly Media, 2019.

5. Shai Shalev-Shwartz, Shai Ben-David, Understanding Machine Learning: From Theory to Algorithms, 1st Edition, Cambridge University Press, 2014.

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	1	1	1	-	-	-		1	-	-	2	1	1
2	2	3	2	2	3	-	-	-	1	1	-	-	3	1	2
3	2	3	2	2	2	2	-	1	2	2	-	-	2	1	2
4	1	2	1	1	2	3	2	3	1	2	-	-	2	1	1
5	1	2	1	1	2	-	-	-	1	1	-	-	3	1	3
AVG	2	2	1	1	2	3	2	2	1	1	-	-	2	1	2

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

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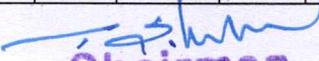
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23AMO13	NETWORK AUTOMATION USING AIML	L T P C
		3 0 0 3

COURSE OBJECTIVES:

- ➤ To understand the fundamentals of network automation and its relevance to AI and machine learning.
- ➤ To explain ML techniques for network traffic prediction, fault detection and resource optimization.
- ➤ To develop the ability to apply ML models for network monitoring, traffic prediction, and anomaly detection.
- ➤ To explore the application of ML in automating network security and managing threats in real time.
- ➤ To Enable hands-on experience with open-source tools, frameworks, and deployment strategies for building intelligent and automated networks.

UNIT I   **INTRODUCTION TO NETWORK AUTOMATION**   **9**

Evolution of network automation – Traditional vs. programmable networks – Overview of SDN, NFV– Role of automation in modern networks – Tools for automation: Ansible, Netmiko, NAPALM – Configuration management and provisioning.

UNIT II   **FUNDAMENTALS OF AI/ML IN NETWORKING**   **9**

Overview of AI/ML – Supervised, Unsupervised, and Reinforcement Learning – ML pipelines – Feature extraction from network data – Introduction to data sources in networks – Log parsing and pre-processing.

UNIT III   **NETWORK MONITORING AND TRAFFIC PREDICTION**   **9**

Traffic classification and prediction – Time series forecasting models (ARIMA, LSTM) – Anomaly detection using ML – QoS prediction – Case study: AI/ML-based bandwidth estimation.

UNIT IV   **AI/ML DRIVEN NETWORK SECURITY AUTOMATION**   **9**

Intrusion Detection Systems using ML – Threat modelling – Malware detection – Network behaviour analysis – Automating firewall rules – Ethical issues and bias in automated decision making.

UNIT V   **IMPLEMENTATION FRAMEWORKS**   **9**

Open-source tools: PyATS, Genie, Scapy, Wireshark + Python – Model deployment: Flask, Docker – Integration with cloud-native networks – AI/ML for 5G and edge networks – Real-world applications and case studies.

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TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1 : Explain the role and importance of automation in networking.

CO2 : Apply AI/ML models to network data for traffic prediction and anomaly detection.

CO3 : Use open-source tools to automate and monitor network operations.

CO4 : Evaluate the security implications of AI-based network systems.

CO5 : Design and deploy intelligent network automation workflows.

TEXT BOOKS

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 4th Edition, Pearson Education, 2020.

2. Kumar Saurabh,Machine Learning for Network Automation,First Edition,BPB Publications, 2022.

3. Kanchan Raj, Hands-On Network Programming with Python, Packt Publishing, 2019.

4. Yuxi (Hayden) Liu, Python Machine Learning by Example, 3rd Edition, Packt Publishing, 2020.

5. Adrian Canrill, Automating Networks with Ansible:From Basics to Advanced, First Edition, Leanpub,2023

REFERENCE BOOKS:

1. Thomas A. Limoncelli, Christina J. Hogan, and Strata R. Chalup, The Practice of Network Automation: Enterprise Automation with Python, Addison-Wesley Professional, 2021.

2. Timothy Winters et al., Network Programmability and Automation, First Edition, O'Relly Media, 2018.

3. Giuseppe Attardi, Machine Learning for Networking, Springer, 2021.

4. Amirsina Torfi, Machine Learning for Cybersecurity Cookbook, Packt Publishing, 2020.

5. James F. Kurose and Keith W. Ross, Computer Networking: A Top-Down Approach, 7th Edition, Pearson Education, 2017.

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	1	1	3	-	-	-	1	1	-	2	2	3	2
2	3	3	2	2	3	-	1	-	2	1	1	2	2	3	2
3	3	3	2	3	3	1	1	-	2	2	1	2	2	3	3
4	3	3	3	3	3	1	1	-	2	2	2	2	2	3	3
5	3	3	3	3	3	2	2	1	2	2	2	3	2	3	3
AVG	3	3	3	3	3	1	1	1	2	2	2	2	2	3	3

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1-Low, 2-Medium, 3-High, "-"No Correlation
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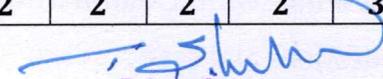
23AMO14	QUANTUM ARTIFICIAL INTELLIGENCE	L T P C
		3 0 0 3

COURSE OBJECTIVES:

- ➤ To know the background of classical computing and quantum computing.
- ➤ To study the details of quantum mechanics
- ➤ To understand entangled quantum subsystems and properties of entangled states
- ➤ To analyse the quantum information processing
- ➤ To explore the applications of quantum computing

UNIT I   QUANTUM COMPUTING BASIC CONCEPTS   9

Complex Numbers - Linear Algebra - Matrices and Operators - Global Perspectives Postulates of Quantum Mechanics – Quantum Bits - Representations of Qubits – Superpositions.

UNIT II   QUANTUM ALGORITHMS   9

Quantum parallelism - Deutsch's algorithm - The Deutsch–Jozsa algorithm - Quantum Fourier transform and its applications - Quantum Search Algorithms: Grover's Algorithm

UNIT III   STATE TRANSFORMATIONS AND ENTANGLED SUBSYSTEMS   9

Unitary Transformations - Quantum Gates - Language for Quantum Implementations - Quantum Subsystems, Properties of Entangled States - Quantum Error Correction, Graph states and codes, CSSCodes, Stabilizer Codes - Fault Tolerance and Robust Quantum Computing.

UNIT IV   QUANTUM INFORMATION PROCESSING   9

Limitations of Quantum Computing - Alternatives to the Circuit Model of Quantum Computation, Quantum Protocols, Building Quantum, Computers, Simulating Quantum Systems, Bell states - Quantum teleportation. Quantum Cryptography, no cloning theorem

UNIT V   QUANTUM AI APPLICATIONS   9

Quantum parallelism - Optimization problems - Drug discovery - Materials science - Financial modelling– Cyber security

TOTAL: 45 PERIODS
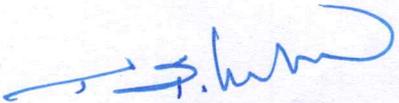
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COURSE OUTCOMES :

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

CO1: Understand the basics of quantum computing.

CO2 : Extend the computation models.

CO3 : Outline the problems that can be expected to be solved well by quantum computers

CO4 : Simulate and analyse the characteristics of Quantum Computing Systems

CO5 : Utilize the application areas

TEXT BOOKS

1. Parag K Lala, Mc Graw Hill Education, "Quantum Computing, A Beginners Introduction", First edition (1 November 2020).

2. Chris Bernhardt, The MIT Press; Reprint edition (8 September 2020), "Quantum Computing For Everyone".

REFERENCE BOOKS:

1. Michael A. Nielsen, Issac L. Chuang, "Quantum Computation and Quantum Information", TenthEdition, Cambridge University Press, 2010.

2. Scott Aaronson, "Quantum Computing Since Democritus", Cambridge University Press, 2013

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	2	-	1	2	1	1	1	2	1	2	3	2	2
2	2	3	3	-	3	1	1	1	2	2	2	2	3	3	2
3	3	3	2	2	3	2	1	2	2	2	2	2	3	3	3
4	2	2	2	2	3	3	2	3	2	2	2	2	2	3	3
5	2	2	3	2	3	1	1	2	2	2	2	2	3	3	3
AVG	2	2	2	2	3	2	1	2	2	2	2	2	3	3	3

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

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23AMO15	REINFORCEMENT LEARNING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:
➢ To understand the fundamentals of Reinforcement Learning and the process of maximizing cumulative reward.
➢ To understand how RL problems are formalized using MDPs
➢ To explore various RL techniques, including Dynamic Programming and Temporal-Difference Learning to solve RL problems
➢ To learn more advanced topics such as eligibility traces, N-step prediction and the forward and backward views of TD(λ) to refine RL algorithms
➢ To analyse the trade-offs between model-based and model-free reinforcement learning approaches.

UNIT I   INTRODUCTION TO REINFORCEMENT LEARNING   9

Definitions and Fundamentals of Reinforcement Learning – Key characteristics of RL – Applications of Reinforcement Learning – Elements of RL(Agent,Environment, States,Actions,Rewards) Maximizing cumulative reward-Trial and Error search and delayed rewards – Limitations and Scope of RL

UNIT II   MARKOV DECISION PROCESSES   9

Introduction to MDPs – Formalization of RL problems with MDPs – The Markov property value functions and optimal value functions – Beltman Equations – Unified Notation for Episodic and continuing tasks.

UNIT III   TABULAR SOLUTION METHODS   9

Dynamic Programming: Policy Evaluation, Policy Improvement, Policy Iteration, Value Iteration – Monte Carlo Methods: Action value Estimation, Monte Carlo Control,- Temporal difference learning TD(0) -Q-Learning.

UNIT IV   ELIGIBILITY TRACES   9

N-step prediction – Forward view and Backward view of TD(λ) – Implementing TD(λ) – Repalacing and Accumulating Traces – Sarsa(λ) and Q(λ).

UNIT V   PLANNING AND LEARNING   9

Model based vs Model free RL – Integrating Planning, Acting and Learning – Dimensions of Reinforcement learning methods.

TOTAL: 45 PERIODS

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COURSE OUTCOMES:

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

CO1: Understand the fundamentals of reinforcement learning and its components

CO2 : Describe the Markov Decision Process framework and the role of Beltman equations

CO3 : Apply tabular methods, Monte Carlo methods and temporal difference learning

CO4 : Implement eligibility traces and n-step prediction in RL algorithms

CO5 : Analyse the difference between model based and model free RL approaches

TEXTBOOKS

1. Miguel Morales, Grokking Deep Reinforcement Learning, Manning Publications, *2020*.
2. Phil Winder, Reinforcement Learning: Industrial Applications of Intelligent Agents, O'Relly Media 2020
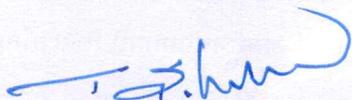
REFERENCE BOOKS:

1. Richard S.Sutton and AndrewG. Barto, Reinforcement learning: An Introduction, Second Edition, MIT Press, 2019.
2. Marco Wiering, Martijn van Otterlo(Ed),Reinforcement Learning, State-of-the-Art, Adaptation,LearningandOptimizationbookseries,ALO,volume12,Springer,2012.
3. Keng, WahLoon, Graesser, Laura, Foundations of Deep Reinforcement Learning: Theory and Practice in Python, Addison Wesley Data &Analytics Series, 2020.
4. Francois Chollet, Deep Learning with Python, Manning Publications, 2018.

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2	2	3	3	2	3	-	1	1	-	2	2	2	3	3	2
3	3	3	2	3	3	1	1	2	-	2	2	2	3	3	3
4	2	2	2	3	3	1	2	3	-	2	2	2	2	3	3
5	2	2	3	2	3	2	1	2	2	2	2	2	3	3	3
AVG	2	2	2	2	3	1	1	2	2	2	2	2	3	3	3

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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

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S.No	Code	Title									
2.	23ME012	Energy Technology	OE	3	0	0	3	3	40	60	100
3.	23ME013	Reverse Engineering	OE	3	0	0	3	3	40	60	100
4.	23ME014	Fire Safety Engineering	OE	3	0	0	3	3	40	60	100
5.	23ME015	Nano Technology	OE	3	0	0	3	3	40	60	100
6.	23ME016	Entrepreneurship Development	OE	3	0	0	3	3	40	60	100
OFFERED BY DEPARTMENT ARTIFICIAL INTELLIGENCE AND DATA SCIENCE											
1	23AD011	Introduction to Big Data	OE	3	0	0	3	3	40	60	100
2	23AD012	Principles of Data Science	OE	3	0	0	3	3	40	60	100
3	23AD013	Data Visualization and its Applications	OE	3	0	0	3	3	40	60	100
4	23AD014	Data Warehousing and Mining	OE	3	0	0	3	3	40	60	100
5	23AD015	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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OFFERED BY DEPARTMENT OF BIOTECHNOLOGY

1.	23BTO11	Biofertilizer Technology	OE	3	0	0	3	3	40	60	100
2.	23BTO12	Ecology	OE	3	0	0	3	3	40	60	100
3.	23BTO13	Biotechnology for Forensics	OE	3	0	0	3	3	40	60	100
4.	23BTO14	Microbiology and Macromolecule	OE	3	0	0	3	3	40	60	100
5.	23BT015	Biodiversity and Taxonomy	OE	3	0	0	3	3	40	60	100

OFFERED BY DEPARTMENT CSE (CYBER SECURITY)

1	23CRO11	Mobile Device Security	OE	3	0	0	3	3	40	60	100
2	23CRO12	Malware Analysis	OE	3	0	0	3	3	40	60	100
3	23CRO13	Hardware Security	OE	3	0	0	3	3	40	60	100
4	23CRO14	Web and Mobile Application Security	OE	3	0	0	3	3	40	60	100
5	23CRO15	Information Security	OE	3	0	0	3	3	40	60	100

OFFERED BY DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

1	23AMO11	Ai For Everyone	OE	3	0	0	3	3	40	60	100
2	23AMO12	Machine Learning and its Applications	OE	3	0	0	3	3	40	60	100
3	23AMO13	Quantum AI	OE	3	0	0	3	3	40	60	100
4	23AMO14	Reinforcement Learning	OE	3	0	0	3	3	40	60	100
5	23AMO15	Network Automation Using AIML	OE	3	0	0	3	3	40	60	100

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