ARUNAI
Engineering College
(An Autonomous Institution)
Tiruvannamalai

Approved by AICTE, Affiliated to Anna University, 'A' Grade

Accredited by NAAC, NBA Accredited, ISO 9001: 2015 Certified)

CURRICULUM AND SYLLABUS

B.E CSE-ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

(Regulations 2024)

HoD/BOS Chairman

Principal

ARUNAI ENGINEERING COLLEGE, TIRUVANNAMALAI

(An Autonomous Institution)

REGULATION 2024

CHOICE BASED CREDIT SYSTEM

B.E CSE -ARTIFICIAL INTELLEGENCE AND MACHINE LEARNING

PROGRAM EDUCATIONAL OBJECTIVES (PEOS)

Graduates can

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

PEO2: Conduct cutting edge research and develop solutions on problems of social relevance

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

PROGRAM OUTCOMES (POS)

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

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PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

WASHINGTON ACCORD KNOWLEDGE AND ATTITUDE PROFILE (WKS)

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9: Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

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PROGRAM SPECIFIC OUTCOMES (PSOS)

Graduates should be able to:

PSO1: Exhibit design and programming skills to build and automate business solutions using cutting edge technologies.
PSO2: Strong theoretical foundation leading to excellence and excitement towards research, to provide elegant solutions to complex problems.
PSO3: Create, select and apply the theoretical knowledge of AI and Data Analytics along with practical industrial tools and techniques to manage and solve wicked societal problems

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ARUNAI ENGINEERING COLLEGE
(AUTONOMOUS)
TIRUVANNAMALAI
REGULATIONS 2024

CHOICE BASED CREDIT SYSTEM

B. E. COMPUTER SCIENCE AND ENGINEERING (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

CURRICULUM AND SYLLABI FOR I TO VIII SEMESTERS
SEMESTER I

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	IP24101	Induction Programme		-	-	-		0
THEORY								
2	HS24101	Professional English-I	HSMC	3	0	0	3	3
3	MA24101	Matrices and Calculus	BSC	3	1	0	4	4
4	PH24101	Engineering Physics	BSC	3	0	0	3	3
5	CY24101	Engineering Chemistry	BSC	3	0	0	3	3
6	GE24101	Problem Solving and Python Programming	ESC	3	0	0	3	3
7	GE24102	Heritage of Tamils	HSMC	1	0	0	1	1
PRACTICALS								
8	GE24111	Problem Solving and Python Programming Laboratory	ESC	0	0	4	4	2
9	BS24111	Physics and Chemistry Laboratory	BSC	0	0	4	4	2
10	GE24112	English Laboratory$^{\$}$	EEC	0	0	2	2	1
			TOTAL	**16**	**1**	**10**	**27**	**22**

$ Skill Based Course

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SEMESTER II

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	HS24201	Professional English – II	HSMC	2	0	0	2	2
2	MA24201	Statistics and Numerical Methods	BSC	3	1	0	4	4
3	PH24203	Physics for Information Science	BSC	3	0	0	3	3
4	BE24201	Basic Electrical and Electronics Engineering	ESC	3	0	0	3	3
5	GE24201	Engineering Graphics	ESC	2	0	4	4	4
6	CS24201	Programming in C	PCC	3	0	0	3	3
7	GE24202	Tamils and Technology	HSMC	1	0	0	1	1
8		NCC Credit Course Level 1#	-	2	0	0	2	2#
PRACTICALS								
8	GE24211	Engineering Practices Laboratory	ESC	0	0	4	4	2
9	CS24211	Programming in C laboratory	PCC	0	0	4	4	2
10	GE24212	Communication Laboratory / Foreign Language($)	EEC	0	0	4	4	2
			TOTAL	**17**	**1**	**16**	**34**	**26**

 # NCC Credit Course level 1 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.

$ Skill Based Course

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SEMESTER III

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MA24301	Discrete Mathematics	BSC	3	1	0	4	4
2.	CS24305	Digital Principles and Computer Organization	ESC	3	0	0	3	3
3.	CS24304	Object Oriented Programming	PCC	2	0	2	4	3
4.	AD24301	Artificial Intelligence	PCC	3	0	0	3	3
5.	AD24302	Data Visualization	PCC	2	0	2	4	3
6.	IT24301	Data Structures and Algorithms	PCC	3	0	0	3	3
PRACTICALS								
7.	IT24311	Data Structures and Algorithms Laboratory	PCC	0	0	3	3	1.5
8.	AD24311	Artificial Intelligence Laboratory	PCC	0	0	3	3	1.5
			TOTAL	**16**	**1**	**10**	**27**	**22**

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SEMESTER IV

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MA24401	Probability and Statistics	BSC	3	1	0	4	4
2.	CS24403	Foundation of Data Science	PCC	3	0	0	3	3
3.	AD24402	Fundamentals of Operating Systems	PCC	3	0	0	3	3
4.	AD24403	Database Design and Management	PCC	3	0	0	3	3
5.	AM24404	Machine Learning	PCC	2	0	2	4	3
6.	GE24901	Environmental Sciences and Sustainability	BSC	2	0	0	2	2
PRACTICALS								
7.	AD24413	Database Design and Management Laboratory	PCC	0	0	3	3	1.5
8.	CS24413	Data Science Laboratory	PCC	0	0	3	3	1.5
			TOTAL	**16**	**1**	**8**	**25**	**21**

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SEMESTER V

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	AM24501	Deep Learning for Vision	PCC	3	0	0	3	3
2.	CS24501	Theory of Computation	PCC	3	0	0	3	3
3.	CS24503	Embedded Systems and IoT	ESC	3	0	0	3	3
4.		Open Elective-1	OEC	3	0	0	3	3
5.		Professional Elective-I	PEC	2	0	2	4	3
6.		Professional Elective-II	PEC	2	0	2	4	3
PRACTICALS								
7.	AD24511	Deep Learning Laboratory	PCC	0	0	4	4	2
8.	IT24511	Mobile App development Laboratory	PCC	0	0	3	3	1.5
			TOTAL	**16**	**0**	**11**	**27**	**21.5**

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SEMESTER VI

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	AM24601	Natural Language Processing	PCC	3	0	0	3	3
2.	CS24601	Object Oriented Software Engineering	PCC	3	0	0	3	3
3.		Open Elective – II	OEC	3	0	0	3	3
4.		Open Elective – III	OEC	3	0	0	3	3
5.		Professional Elective-III	PEC	2	0	2	4	3
6.		Professional Elective-IV	PEC	2	0	2	4	3
7.		Mandatory Course-I	MC	3	0	0	3	Non-Credit Course
PRACTICALS								
8.	CS24611	Case Tools Laboratory	PCC	0	0	3	3	1.5
9.	AM24612	Mini Project	EEC	0	0	4	4	2
			TOTAL	**19**	**0**	**11**	**30**	**21.5**

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SEMESTER VII

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	GE24902	Human Values and Ethics	HSMC	2	0	0	2	2
2.	CB24701	Data and Information Security	PCC	3	0	0	3	3
3.		Elective - Management	HSMC	3	0	0	3	3
4.		Professional Elective-V	PEC	2	0	2	4	3
5.		Professional Elective-VI	PEC	2	0	2	4	3
6.		Mandatory Course-II	MC	3	0	0	3	Non-Credit Course
PRACTICALS								
7.	CB24711	Data Security Laboratory	PCC	0	0	3	3	1.5
8.	AD24712	Computational Learning Laboratory	PCC	0	0	3	3	1.5
9.	AM24711	Summer Internship	EEC	0	0	0	0	2
		TOTAL		**15**	**0**	**10**	**25**	**19**

SEMESTER VIII

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1.	AM24811	Project Work	EEC	0	0	20	20	10
		TOTAL		**0**	**0**	**20**	**20**	**10**

TOTAL CREDITS: 163

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Name of the Programme: B.E CSE(Artificial Intelligence and Machine Learning)										
S.No	Subject Area	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HSMC	4	3					5		12
2	BSC	12	7		6					25
3	ESC	5	9	4		3	7.5			28.5
4	PCC		5	3	15	9.5	6	6		44.5
5	PEC			15		6	6	6		33
6	OEC					3	2			5
7	EEC	1	2					2	10	15
8	Non-Credit /(Mandatory)					√	√			
Total		22	26	22	21	21.5	21.5	19	10	163

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Vertical I AIML	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
Knowledge Engineering	App Development	Cloud Computing	Ethical Hacking	Multimedia and Animation	Augumented Reality/Virtual Reality
Soft Computing	Web Technology	Virtualization	Digital and Mobile Forensics	Video Creation and Editing	Robotic Process Automation
Text and Speech Analysis	UI and UX Design	Cloud services Management	Social Network Security	Game Theory	Neural Networks and Deep Learning
Ethics & AI	Software Testing and Automation	Data Warehousing	Modern Cryptography	Digital Marketing	Cyber Security
Image and video analytics	Web Application Security	Storage Technologies	Malware Analysis	Multimedia Data Compression and Storage	Cryptocurrency and Blockchain Technologies
Computer Vision	Devops	Software Defined Networks	Quantum Computing	Game Development	Cognitive Science
Exploratory Data Analysis	Principles of Programming Languages	Security and Privacy in Cloud	Network Security	Visual Effects	3D Printing and Design

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S. NO.	COURSE CODE	COURSETITLE	CATE GORY	PERIODS PERWEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PROFESSIONAL ELECTIVE COURSES: VERTICAL – I								
1.	CCS2405	Knowledge Engineering	PEC	2	0	2	4	3
2.	CCS2406	Soft Computing	PEC	2	0	2	4	3
3.	CCS2407	Text and Speech Analysis	PEC	2	0	2	4	3
4.	CCS2402	Ethics & AI	PEC	2	0	2	4	3
5.	CCS2436	Image and video analytics	PEC	2	0	2	4	3
6.	CCS2437	Computer Vision	PEC	2	0	2	4	3
7.	CCS2435	Exploratory Data Analysis	PEC	2	0	2	4	3
PROFESSIONAL ELECTIVE COURSES: VERTICAL – II								
8.	CCS2408	App Development	PEC	2	0	2	4	3
9.	CS24404	Web Technology	PEC	2	0	2	4	3
10.	CCS2410	UI and UX Design	PEC	2	0	2	4	3
11.	CCS2411	Software Testing and Automation	PEC	2	0	2	4	3
12.	CCS2404	Web Application Security	PEC	2	0	2	4	3
13.	CCS2412	Devops	PEC	2	0	2	4	3
14.	CCS2413	Principles of Programming Languages	PEC	2	0	2	4	3
PROFESSIONAL ELECTIVE COURSES: VERTICAL – III								
15.	CCS2403	Cloud Computing	PEC	2	0	2	4	3
16.	CCS2414	Virtualization	PEC	2	0	2	4	3
17.	CCS2409	Cloud services Management	PEC	2	0	2	4	3
18.	CCS2415	Data Warehousing	PEC	2	0	2	4	3
19.	CCS2416	Storage Technologies	PEC	2	0	2	4	3
20.	CCS2417	Software Defined Networks	PEC	2	0	2	4	3
21.	CCS2418	Security and Privacy in Cloud	PEC	2	0	2	4	3
PROFESSIONAL ELECTIVE COURSES: VERTICAL – IV								
22.	CCS2419	Ethical Hacking	PEC	2	0	2	4	3
23.	CCS2420	Digital and Mobile Forensics	PEC	2	0	2	4	3
24.	CCS2421	Social Network Security	PEC	2	0	2	4	3
25.	CCS2422	Modern Cryptography	PEC	2	0	2	4	3
26.	CCS2440	Malware Analysis	PEC	2	0	2	4	3
27.	CCS2433	Quantum Computing	PEC	2	0	2	4	3
28.	CB24602	Network Security	PEC	2	0	2	4	3
PROFESSIONAL ELECTIVE COURSES – V								

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29.	CCS2425	Multimedia and Animation	PEC	2	0	2	4	3
30.	CCS2426	Video Creation and Editing	PEC	2	0	2	4	3
31.	CCS2439	Game Theory	PEC	2	0	2	4	3
32.	CCS2427	Digital Marketing	PEC	2	0	2	4	3
33.	CCS2428	Multimedia Data Compression and Storage	PEC	2	0	2	4	3
34.	CCS2429	Game Development	PEC	2	0	2	4	3
35.	CCS2430	Visual Effects	PEC	2	0	2	4	3
PROFESSIONAL ELECTIVE COURSES – VI								
36.	CCS2424	Augmented Reality/Virtual Reality	PEC	2	0	2	4	3
37.	CCS2431	Robotic Process Automation	PEC	2	0	2	4	3
38.	CCS2401	Neural Networks and Deep Learning	PEC	2	0	2	4	3
39.	CCS2432	Cyber Security	PEC	2	0	2	4	3
40.	CCS2423	Cryptocurrency and Blockchain Technologies	PEC	2	0	2	4	3
41.	CCS2438	Cognitive Science	PEC	2	0	2	4	3
42.	CCS2434	3D Printing and Design	PEC	2	0	2	4	3

OPEN ELECTIVES

(Students shall choose the open elective courses, such that the course contents are not similar to any other course contents/title under other course categories).

OPEN ELECTIVES–I (EMERGING TECHNOLOGIES)

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	OBA2401	Digital Marketing	OEC	3	0	0	3	3
2.	OEC2405	Drone Technologies	OEC	3	0	0	3	3
3.	OCE2401	Environmental and Social Impact Assessment	OEC	3	0	0	3	3
4.	OEE2405	Introduction to Industrial Instrumentation and Control	OEC	3	0	0	3	3
5.	OHS2403	Graph Theory	OEC	3	0	0	3	3
6.	OAG2403	IoT in Agricultural System	OEC	3	0	0	3	3

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OPEN ELECTIVES–II (INDUSTRIAL)

S. NO.	COURSE CODE	COURSETITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	OME2401	Applied design thinking	OEC	3	0	0	3	3
2.	OME2402	Introduction to industrial automation systems	OEC	3	0	0	3	3
3.	OME2403	Industrial Management	OEC	3	0	0	3	3
4.	OME2404	Quality Engineering	OEC	3	0	0	3	3
5.	OME2405	Sustainable Manufacturing	OEC	3	0	0	3	3
6.	OME2406	Industrial design and rapid prototyping techniques	OEC	3	0	0	3	3
7.	OEE2401	Industrial IOT and industry 4.0	OEC	3	0	0	3	3
8.	OEC2402	Robotics and industrial Automation	OEC	3	0	0	3	3

OPEN ELECTIVES–III & IV

SL. NO.	COURSE CODE	COURSETITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	OAG2401	Urban agriculture	OEC	3	0	0	3	3
2.	OAG2402	Agriculture Entrepreneurship Development	OEC	3	0	0	3	3
3.	OBT2401	Basics of Biomolecules	OEC	3	0	0	3	3
4.	OBT2402	Basics of Microbial Technology	OEC	3	0	0	3	3
5.	OBT2403	Biotechnology for Waste Management	OEC	3	0	0	3	3
6.	OBT2404	Food Processing Technology	OEC	3	0	0	3	3
7.	OEC2403	VLSI Design	OEC	3	0	0	3	3
8	OEC2404	Remote Sensing Concepts	OEC	3	0	0	3	3
9.	OEC2405	Drone technologies	OEC	3	0	0	3	3
10.	OEE2402	Baiscs of Electric Vehicle Technology	OEC	3	0	0	3	3
11.	OEE2403	Introduction To Control Systems	OEC	3	0	0	3	3
12.	OEE2404	Integrated energy planning for sustainable development	OEC	3	0	0	3	3
13.	OHS2401	Nano technology	OEC	3	0	0	3	3
14.	OHS2402	Operations research	OEC	3	0	0	3	3
15.	OME2407	Additive Manufacturing	OEC	3	0	0	3	3

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MANDATORY COURSE - I (SOCIETY)

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	MX24101	Introduction to women gender and studies	MC	3	0	0	3	0
2.	MX24102	Elements of literature	MC	3	0	0	3	0
3.	MX24103	Disaster risk reduction and management	MC	3	0	0	3	0
4.	MX24104	History of science and technology in india	MC	3	0	0	3	0
5.	MX24105	State, nation building and politics in india	MC	3	0	0	3	0
6.	MX24106	Political and economic thought for a humane society	MC	3	0	0	3	0
7.	MX24107	Understanding Society & Culture through Literature	MC	3	0	0	3	0
8.	MX24108	Work Ethics & Social Responsibilty	MC	3	0	0	3	0
9.	MX24109	Technology & Society	MC	3	0	0	3	0
10.	MX24110	Social Innovation & Entrepreneurship	MC	3	0	0	3	0
11.	MX24111	Education & Social Change	MC	3	0	0	3	0

MANDATORY COURSE - II (HEALTH AND WELL BEING)

S.NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	MX24201	Industrial Safety	MC	3	0	0	3	0
2.	MX24202	Well Being with Traditional Practices - Yoga, Ayurveda and Siddha	MC	3	0	0	3	0

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3.	MX24203	Application of Psychology in Everyday Life	MC	3	0	0	3	0
4.	MX24204	Stress Management and Well Being	MC	3	0	0	3	0
5.	MX24205	Health and Well Being in Education	MC	3	0	0	3	0
6.	MX24206	Physical fitness & Mental Resilience	MC	3	0	0	3	0
7.	MX24207	Food, Nutrition and Health	MC	3	0	0	3	0
8.	MX24208	Life style diseases	MC	3	0	0	3	0

MANAGEMENT ELECTIVES

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1.	GE24M01	Principles of Management	HSMC	3	0	0	3	3
2.	GE24M02	Total Quality Management	HSMC	3	0	0	3	3
3.	GE24M03	Engineering Economics and Financial Accounting	HSMC	3	0	0	3	3
4.	GE24M04	Human Resource Management	HSMC	3	0	0	3	3
5.	GE24M05	Knowledge Management	HSMC	3	0	0	3	3
6.	GE24M06	Industrial Management	HSMC	3	0	0	3	3
7.	GE24M07	Foundations of entrepreneurship	HSMC	3	0	0	3	3

SEMESTER- I

Subject Code	Subject Name	Category	L	T	P	C
IP24101	**INDUCTION PROGRAMME**		**0**	**0**	**0**	**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,

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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 a 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 everyday for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, grow into engineering design later.

(iii) Universal Human Values

This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do's and dont's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing. Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It would be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.

(iv) Literary Activity

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

(v) Proficiency Modules

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

familiarity etc.

(vi) Lectures by Eminent People

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

(vii) Visits to Local Area

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

(viii) Familiarization to Dept./Branch & Innovations

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

(ix) Department Specific Activities

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

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

References:
Guide to Induction program from AICTE

Subject Code	Subject Name	Category	L	T	P	C
HS24101	PROFESSIONAL ENGLISH- I	HSMC	3	0	0	3

Course Objectives:

- To improve the communicative competence of learners
- To learn to use basic grammatic 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, definitions, essays and user manuals.

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UNIT – I	INTRODUCTION TO EFFECTIVE COMMUNICATION	1
What is effective communication? (Explain using activities) Why is communication critical for excellence during study, research and work? What are the seven C's of effective communication? What are key language skills? What is effective listening? What does it involve? What is effective speaking? What does it mean to be an excellent reader? What should you be able to do? What is effective writing? How does one develop language and communication skills? What does the course focus on? How are communication and language skills going to be enhanced during this course? What do you as a learner need to do to enhance your English language and communication skills to get the best out of this course?		
INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION		**8**
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 (prefixes& suffixes); Synonyms and Antonyms. Phrasal verbs.		
UNIT – III	**DESCRIPTION OF A PROCESS / PRODUCT**	**9**
Reading – Reading advertisements, gadget reviews; user manuals. Writing - Writing definitions; 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).		
UNIT – IV	**CLASSIFICATION AND RECOMMENDATIONS**	**9**
Reading – Newspaper articles; Journal reports –and Non Verbal Communcation (tables, pie charts etc,). Writing – Note-making / Note-taking (*Study skills to be taught, not tested); Writing recommendations; Transferring information from nonverbal (chart , graph etc, to verbal mode) Grammar – Articles; Pronouns - Possessive & Relative pronouns. Vocabulary - Collocations; Fixed / Semi fixed expressions.		
UNIT – V	**EXPRESSION**	**9**
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 Contact Hours : 45

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Course Outcomes:	At the end of the course, learners will be able
CO1:	To use appropriate words in a professional context
CO2:	To gain understanding of basic grammatical structures and use them in right context.
CO3:	To read and infer the denotative and connotative meanings of technical texts
CO4:	To write definitions, descriptions, narrations and essays on various topics

Textbooks:	
1.	English for Engineers & Technologists Orient Blackswan Private Ltd. Department of English, Anna University, (2020 edition)
2.	English for Science & Technology Cambridge University Press, 2021. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

Reference books/other materials/webresources:	
1.	Technical Communication – Principles And Practices By Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi
2.	A Course Book On Technical English By Lakshminarayanan, Scitech Publications (India) Pvt. Ltd.
3.	English For Technical Communication (With CD) By Aysha Viswamohan, Mcgraw Hill Education, ISBN : 0070264244.
4.	Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House. 5. Learning to Communicate – Dr. V. Chellammal, Allied Publishing House, New Delhi,2003.
5.	Learning to Communicate – Dr. V. Chellammal, Allied Publishing House, New Delhi,2003.

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	1	1	1	1	1	3	3	3	1	3	-	-	-	-
CO2:	1	1	1	1	1	3	3	3	1	3	-	-	-	-

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CO3:	2	3	2	3	2	3	3	3	2	3	3	-	-	-
CO4:	2	3	2	3	2	3	3	3	2	3	3	-	-	-
CO5:	2	3	3	3	-	3	3	3	2	3	-	-	-	-
Average:	1.6	2.2	1.8	2.2	1.5	3	3	3	1.6	3	3	-	-	-

Subject Code	Subject Name	Category	L	T	P	C
MA24101	MATRICES AND CALCULUS	BSC	3	1	0	4

Course Objectives:

- To develop the use of matrix algebra techniques that are 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 - Logarithmic 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, Integration of irrational functions - Improper integrals - Applications : Hydrostatic force and pressure, moments and centres of mass.

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 centres of mass, moment of inertia.

Total Contact Hours : 60

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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:	Able to 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.

Textbooks:	
1.	Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2.	Grewal.B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition , 2018.
3.	James Stewart, " Calculus: Early Transcendentals", Cengage Learning, 8th Edition, New Delhi, 2015. [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].

Reference Books/Other Materials/Web Resources:	
1.	Anton. H, Bivens. I and Davis. S, "Calculus", Wiley, 10th Edition, 2016
2.	Bali. N., Goyal. M. and Watkins. C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7thEdition, 2009.
3.	Jain . R.K. and Iyengar. S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 5thEdition, 2016.
4.	Narayanan. S. and Manicavachagom Pillai. T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
5.	Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
6.	Srimantha Pal and Bhunia. S.C, "Engineering Mathematics" Oxford University Press, 2015.
7.	Thomas. G. B., Hass. J, and Weir. M.D, "Thomas Calculus", 14th Edition, Pearson India, 2018.

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	3	3	1	1	-	-	-	2	-	2	3	-	-	-
CO2:	3	3	1	1	-	-	-	2	-	2	3	-	-	-
CO3:	3	3	1	1	-	-	-	2	-	2	3	-	-	-
CO4:	3	3	1	1	-	-	-	2	-	2	3	-	-	-
CO5:	3	3	1	1	-	-	-	2	-	2	3	-	-	-
Average:	3	3	1	1	-	-	-	2	-	2	3	-	-	-

Subject Code	Subject Name	Category	L	T	P	C
PH24101	ENGINEERING PHYSICS	BSC	3	0	0	3

Course Objectives:

- To make the students effectively to achieve an understanding of mechanics.
- To enable the students to gain knowledge of electromagnetic waves and its applications.

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• To introduce the basics of oscillations, optics and lasers.
• Equipping the students to be successfully understand the importance of quantum physics.
• To motivate the students towards the applications of quantum mechanics.

UNIT I	**MECHANICS**	**9**
Multiparticle dynamics: Center of mass (CM) – CM of continuous bodies – motion of the CM – kinetic energy of system of particles. Rotation of rigid bodies: Rotational kinematics – rotational kinetic energy and moment of inertia - theorems of M .I –moment of inertia of continuous bodies – M.I of a diatomic molecule - torque – rotational dynamics of rigid bodies – conservation of angular momentum – rotational energy state of a rigid diatomic molecule - gyroscope - torsional pendulum – double pendulum –Introduction to nonlinear oscillations.		
UNIT II	**ELECTROMAGNETIC WAVES**	**9**
The Maxwell's equations - wave equation; Plane electromagnetic waves in vacuum, Conditions on the wave field - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - polarization - Producing electromagnetic waves - Energy and momentum in EM waves: Intensity, waves from localized sources, momentum and radiation pressure - Cell-phone reception. Reflection and transmission of electromagnetic waves from a non-conducting medium- vacuum interface for normal incidence.		
UNIT III	**OSCILLATIONS, OPTICS AND LASERS**	**9**
Simple harmonic motion - resonance –analogy between electrical and mechanical oscillating systems - waves on a string - standing waves - traveling waves - Energy transfer of a wave - sound waves - Doppler effect. Reflection and refraction of light waves - total internal reflection - interference –Michelson interferometer –Theory of air wedge and experiment.Theory of laser - characteristics- Spontaneous and stimulated emission - Einstein's coefficients - population inversion - Nd-YAG laser, CO_2 laser, semiconductor laser –Basic applications of lasers in industry.		
UNIT IV	**BASIC QUANTUM MECHANICS**	**9**
Photons and light waves - Electrons and matter waves –Compton effect - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization –Free particle - particle in a infinite potential well: 1D,2D and 3D Boxes-Normalization, probabilities and the correspondence principle.		
UNIT V	**APPLIED QUANTUM MECHANICS**	**9**
The harmonic oscillator(qualitative)- Barrier penetration and quantum tunneling(qualitative)-Tunneling microscope - Resonant diode - Finite potential wells (qualitative)- Bloch's theorem for particles in a periodic potential –Basics of Kronig-Penney model and origin of energy bands.		
		Total Contact Hours : 45

Course Outcomes:	After completion of this course students should be able to:
CO1:	Understand the importance of mechanics.
CO2:	Express their knowledge in electromagnetic waves.
CO3:	Demonstrate a strong foundational knowledge in oscillations, optics and lasers.
CO4:	Understand the importance of quantum physics.
CO5:	Comprehend and apply quantum mechanical principles towards the formation of energy bands.

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Textbooks:	
1.	D.Kleppner and R.Kolenkow. An Introduction to Mechanics. McGraw Hill Education (Indian Edition), 2017.
2.	E.M.Purcell and D.J.Morin, Electricity and Magnetism, Cambridge Univ.Press, 2013.
3.	Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, Concepts of Modern Physics, McGraw- Hill (Indian Edition), 2017.

Reference books/other materials/webresources:	
1.	R.Wolfson. Essential University Physics. Volume 1 & 2. Pearson Education (Indian Edition), 2009.
2.	Paul A. Tipler, Physic – Volume 1 & 2, CBS, (Indian Edition), 2004.
3.	K.Thyagarajan and A.Ghatak. Lasers: Fundamentals and Applications, Laxmi Publications, (Indian Edition), 2019.
4.	D.Halliday, R.Resnick and J.Walker. Principles of Physics, Wiley (Indian Edition), 2015.
5.	N.Garcia, A.Damask and S.Schwarz. Physics for Computer Science Students. Springer-Verlag, 2012.

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	3	3	2	1	1	1	-	-	-	-	-	-	-	-
CO2:	3	3	2	1	2	1	-	-	-	-	-	-	-	-
CO3:	3	3	2	2	2	1	-	-	-	-	1	-	-	-
CO4:	3	3	1	1	2	1	-	-	-	-	-	-	-	-
CO5:	3	3	1	1	2	1	-	-	-	-	-	-	-	-
Average:	3	3	1.6	1.2	1.8	1	-	-	-	-	1	-	-	-

Subject Code	Subject Name	Category	L	T	P	C
CY24101	ENGINEERING CHEMISTRY	BSC	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: Definition and significance of-color, odour, turbidity, pH, hardness, alkalinity, TDS, COD and BOD, fluoride and arsenic. Municipal water treatment: primary treatment and disinfection (UV, Ozonation, break-point chlorination). 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 demineralization and zeolite process.		
UNIT– II	**NANOCHEMISTRY**	**9**
Basics: Distinction between molecules, nanomaterials and bulk materials; Size-dependent properties (optical, electrical, mechanical and magnetic); Types of nanomaterials: Definition, properties and uses of – nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.		
UNIT– III	**PHASE RULE AND COMPOSITES**	**9**
Phase rule: Introduction, definition 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 process. Composites: Introduction: Definition & Need for composites; Constitution: Matrix materials (Polymer matrix, metal matrix and ceramic matrix) and Reinforcement (fiber, particulates, flakes and whiskers). Properties and applications of: Metal matrix composites (MMC), Ceramic matrix composites and Polymer matrix composites. Hybrid composites - definition and examples.		
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; Power alcohol and biodiesel. Combustion of fuels: Introduction: Calorific value - higher and lower calorific values, Theoretical calculation of calorific value; Ignition temperature: spontaneous ignition temperature, Explosive range; Flue gas analysis - ORSAT Method. CO2 emission and carbon footprint.		
UNIT – V	**ENERGY SOURCESAND STORAGE DEVICES**	**9**
Stability of nucleus: mass defect (problems), binding energy; 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: H2-O2 fuel cell, microbial fuel cell; Supercapacitors: Storage principle, types and examples.		
		Total Contact Hours : 45

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.

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Textbooks:	
1.	P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.
2.	Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008.
3.	S.S. Dara, "A Text book of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2018

Reference Books/Other Materials/Web Resources:	
1.	B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018.
2.	O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.
3.	Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
4.	ShikhaAgarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019.
5.	O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013.

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	3	2	2	1	-	1	-	-	-	-	1	-	-	-
CO2:	2	-	-	1	-	2	-	-	-	-	-	-	-	-
CO3:	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4:	3	1	1	-	-	1	-	-	-	-	-	-	-	-
CO5:	3	1	2	1	-	2	-	-	-	-	2	-	-	-
Average:	2.8	1.3	1.6	1	-	1.5	-	-	-	-	1.5	-	-	-

Subject Code	Subject Name	Category	L	T	P	C
GE24101	PROBLEM SOLVING AND PYTHON PROGRAMMING	ESC	3	0	0	3

Course Objectives:

- To understand the basics of algorithmic problem solving.
- To learn to solve problems using Python conditionals and loops.
- To define Python functions and use function calls to solve problems.
- To use Python data structures - lists, tuples, dictionaries to represent complex data.
- To do input/output with files in Python.

UNIT– I	COMPUTATIONAL THINKING AND PROBLEM SOLVING	9

Fundamentals of Computing – Identification of Computational Problems -Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

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UNIT– II	DATA TYPES, EXPRESSIONS, STATEMENTS	9
Python interpreter and interactive mode, debugging; values and types: int, float, boolean, string , and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.		
UNIT– III	**CONTROL FLOW, FUNCTIONS, STRINGS**	**9**
Conditionals:Boolean values and operators, conditional (if), alternative (if-else),chained conditional (if-elif-else);Iteration: state, while, for, break, continue, pass; Fruitful functions: return values,parameters, local and global scope, function composition, recursion; Strings: string slices,immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.		
UNIT – IV	**LISTS, TUPLES, DICTIONARIES**	**9**
Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation.		
UNIT – V	**FILES, MODULES, PACKAGES**	**9**
Files and exceptions: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file, Voter's age validation, Marks range validation (0-100).		
	Total Contact Hours : 45	

Textbooks:	
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/Other Materials/Web Resources:	
1.	Paul Deitel and Harvey Deitel, "Python for Programmers", 1st Edition, Pearson Education, 2021.
2.	G. Venkatesh and MadhavanMukund, "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", 3rd 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.	https://www.python.org/
6.	Martin C. Brown, "Python: The Complete Reference", 4th Edition, McGraw-Hill, 2018.

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1:	3	3	3	3	2	-	-	-	-	2	2	3	3	-
CO2:	3	3	3	3	2	-	-	-	-	2	2	3	-	-
CO3:	3	3	3	3	2	-	-	-	-	2	-	3	-	-
CO4:	2	2	-	2	2	-	-	-	-	1	-	3	-	-
CO5:	1	2	-	-	1	-	-	-	-	1	-	2	-	-

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CO6:	2	2	-	-	2	-	-	-	-	1	-	2	-	-
Average:	2	3	3	3	2	-	-	-	-	2	2	3	3	-

Subject Code	Subject Name	Category	L	T	P	C
GE24102	HERITAGE OF TAMILS	HSMC	1	0	0	1

Course Objectives:

- To appreciate Tamil art, culture and literature
- To learn the history and culture of Tamil language
- To relate to various art forms and their relevance to development
- To acknowledge the rich heritage and significant achievements of the Tamilians
- To appreciate the contribution of Tamilians to nation building

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 Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.		
UNIT– II	**HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE**	**3**
Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.		
UNIT– III	**FOLK AND MARTIAL ARTS**	**3**
Therukoothu, Karagattam, VilluPattu, KaniyanKoothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.		
UNIT – IV	**THINAI CONCEPT OF TAMILS**	**3**
Flora and Fauna of Tamils &Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.		
UNIT – V	**CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE**	**3**
Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.		
	Total Contact Hours : 15	

Text- cum- Reference Books:

1.	தமிழகவரலாறு - மக்களும்பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2.	கணினித்தமிழ் - முனைவர்இள. சுந்தரம் (விகடன்பிரசுரம்).

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3.	கீழடி - வழிகாட்டும் நிழல்களில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4.	பொருனந - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு).
5.	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6.	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7.	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8.	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9.	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10.	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12.	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Subject Code	Subject Name	Category	L	T	P	C
GE24102	தமிழர் மரபு	HSMC	1	0	0	1

அலகு- 1	மொழி மற்றும் இலக்கியம்	3
இந்திய மொழிக்குடும்பங்கள்– திரொவிடமொழிகள்– தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச்சார்பற்றதன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் –தமிழ்க்காப்பியங்கள் , தமிழகத்தில் சமண-பௌத்த சமயங்களின் தாக்கம் – பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள்– சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு		
அலகு- 2	மரபு பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை சிற்பக்கலை	3
நடுகல் முதல் நவீன சிற்பங்கள் வரை– ஐம்பொன்சிலைகள்– பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள் , பொம்மைகள் – தேர்வு செய்யும்கலை– சுடுமண்சிற்பங்கள்– நாட்டுப்புறத்தெய்வங்கள்– குமரிமுனையில்திருவள்ளுவர்சிலை– இசைகருவிகள்– மிருதங்கம் , பறை , வீணை , யாழ் , நாதஸ்வரம்– தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.		
அலகு -3	நாட்டுப்புறக்கலைகள் மற்றும் வீரவிளையாட்டுகள்	3
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான்கூத்து, ஒயிலாட்டம் , தோல்பாவைக்கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின்விளையாட்டுகள்.		
அலகு -4	தமிழர்களின் திணைக்கோட்பாடுகள்	3
தமிழகத்தின் தாவரங்களும் , விலங்குகளும்– தொல்காப்பியம் மற்றும் சங்கஇலக்கியத்தில் அகம் மற்றும் புறக்கோட்பாடுகள்– தமிழர்கள் போற்றிய அறக்கோட்பாடு– சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும் கல்வியும்– சங்ககாலநகரங்களும் துறைமுகங்களும்–		

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சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி– கடல் கடந்தநாடுகளில் சோழர்களின் வெற்றி		
அலகு -5	**இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு**	3
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு– இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப்பண்பாட்டின் தாக்கம்– சுயமரியாதையை இயக்கம்– இந்திய மருத்துவத்தில் சித்தமருத்துவத்தின் பங்கு– கல்வெட்டுகள் கையழுத்துப்படிகள்– தமிழ் புத்தகங்களின் அச்சுவரலாறு		
	Total Contact Hours : 15	

Text- cum- Reference Books:	
1.	தமிழகவரலாறு – மக்களும்பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடுபாடநூல்மற்றும்கல்வியியல்பணிகள்கழகம்).
2.	கணினித்தமிழ் – முனைவர்இள. சுந்தரம் (விகடன்பிரசுரம்).
3.	கீழடி – வழிகாட்டும்நிழல்களில்சங்ககாலநகரநாகரிகம் (தொல்லியல்துறைவெளியீடு).
4.	பொருனை – ஆற்றங்கரைநாகரிகம். (தொல்லியல்துறைவெளியீடு).
5.	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6.	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7.	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8.	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9.	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10.	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12.	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Subject Code	Subject Name	Category	L	T	P	C
GE24111	**PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY**	ESC	0	0	4	2

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 such as lists, tuples, and dictionaries.
- To perform input/output operations with files in Python.

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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.

LABORATORY / PRACTICAL ACTIVITIES

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 Contact Hours :60

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Develop algorithmic solutions to simple computational problems.
CO2:	Develop and execute simple Python programs.
CO3:	Implement Python programs using conditionals and loops to solve real-world problems.
CO4:	Deploy functions to decompose a Python program.
CO5:	Process compound data using Python data structures.
CO6:	Utilize Python packages in developing software applications.

Textbooks:	
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/other materials/web resources:	
1.	Paul Deitel and Harvey Deitel, "Python for Programmers", 1st Edition, Pearson Education, 2021.
2.	G. Venkatesh and MadhavanMukund, "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", 3rd Edition, MIT Press, 2021.

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4.	Eric Matthes, "Python Crash Course: A Hands-on, Project-Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.
5.	https://www.python.org/
6.	Martin C. Brown, "Python: The Complete Reference", 4th Edition, McGraw-Hill, 2018

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1:	3	3	3	3	2	-	-	-	-	2	2	3	3	-
CO2:	3	3	3	3	2	-	-	-	-	2	2	3	-	-
CO3:	3	3	3	3	2	-	-	-	-	2	-	3	-	-
CO4:	2	2	-	2	2	-	-	-	-	1	-	3	-	-
CO5:	1	2	-	-	1	-	-	-	-	1	-	2	-	-
CO6:	2	2	-	-	2	-	-	-	-	1	-	2	-	-
Average:	**2**	**3**	**3**	**3**	**2**	-	-	-	-	**2**	**2**	**3**	**3**	-

Subject Code	Subject Name	Category	L	T	P	C
BS24111	**PHYSICS AND CHEMISTRY LABORATORY**	**BSC**	**0**	**0**	**4**	**2**

PHYSICS LABORATORY:(Any Seven Experiments)

Course Objectives:

- To learn the proper use of various kinds of physics laboratory equipment.
- To learn how data can be collected, presented and interpreted in a clear and concise manner.
- To learn problem solving skills related to physics principles and interpretation of experimental data.
- To determine error in experimental measurements and techniques used to minimize such error.
- To make the student an active participant in each part of all lab exercises.

LIST OF EXPERIMENTS:

1.	Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of regular and irregular objects.
2.	Simple harmonic oscillations of cantilever.
3.	Non-uniform bending - Determination of Young's modulus
4.	Uniform bending – Determination of Young's modulus
5.	Laser- Determination of the wavelength of the laser using grating
6.	Air wedge - Determination of thickness of a thin sheet/wire
7.	a) Optical fibre -Determination of Numerical Aperture and acceptance angle
	b) Compact disc- Determination of width of the groove using laser.
8.	Acoustic grating- Determination of velocity of ultrasonic waves in liquids.
9.	Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
10.	Post office box -Determination of Band gap of a semiconductor.
11.	Photoelectric effect
12.	Michelson Interferometer.
13.	Melde's string experiment
14.	Experiment with lattice dynamics kit.
	Total Contact Hours :30

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Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Understand the functioning of various physics laboratory equipment.
CO2:	Use graphical models to analyze laboratory data.
CO3:	Use mathematical models as a medium for quantitative reasoning and describing physical reality.
CO4:	Access, process and analyze scientific information.
CO5:	Solve problems individually and collaboratively.

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	3	2	3	1	1	-	-	-	-	-	-	-	-	-
CO2:	3	3	2	1	1	-	-	-	-	-	-	-	-	-
CO3:	3	2	3	1	1	-	-	-	-	-	-	-	-	-
CO4:	3	3	2	1	1	-	-	-	-	-	-	-	-	-
CO5:	3	2	3	1	1	-	-	-	-	-	-	-	-	-
Average:	3	2.4	2.6	1	1	-	-	-	-	-	-	-	-	-

CHEMISTRY LABORATORY:(Any seven experiments to be conducted)

Course Objectives:

- To inculcate experimental skills to test basic understanding of water quality parameters such as acidity, alkalinity, hardness, dissolved oxygen (DO), chloride, and copper.
- To induce the students to familiarize with electroanalytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.
- To demonstrate the analysis of metals and alloys.
- To demonstrate the synthesis of nanoparticles.

Laboratory / Practical Activities:

1. Preparation of (Na_2CO_3) as a primary standard and Estimation of acidity of a water sample using the prepared primary standard.
2. Determination of types and amount of alkalinity in a water sample.
3. Determination of total, temporary, and permanent hardness of water by EDTA method.
4. Determination of DO content of a water sample by Winkler's method.
5. Determination of chloride content of a water sample by Argentometric method.
6. Estimation of copper content in the given solution by Iodometry.
7. Estimation of total dissolved solids (TDS) of a water sample by gravimetry.
8. Determination of strength of given hydrochloric acid using a pH meter.
9. Determination of strength of acids in a mixture using a conductivity meter.
10. Conductometric titration of barium chloride against sodium sulphate (precipitation titration).
11. Estimation of iron content in a given solution using a potentiometer.
12. Estimation of sodium or potassium present in water using a flame photometer.
13. Preparation of nanoparticles (TiO_2 / ZnO / CuO) by Sol-Gel method.
14. Estimation of nickel in steel.
15. Proximate analysis of coal.

Total Contact Hours : 30

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Course Outcomes:	Upon completion of the course,the students should be able to:
CO1:	To analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO.
CO2:	To determine the amount of metal ions through volumetric and spectroscopic techniques
CO3:	To analyse and determine the composition of alloys.
CO4:	To learn simple method of synthesis of nanoparticles
CO5:	To quantitatively analyse the impurities in solution by electroanalytical techniques

Textbooks:	
1.	J. Mendham.,R.C. Denney, J.D. Barnes, M. Thomas and B. Sivasankar, Vogfel's Textbook of Qualitative Chemical Anaysis, 2009.

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	3	-	1	-	-	2	-	-	-	-	2	-	-	-
CO2:	3	1	2	-	-	1	-	-	-	-	1	-	-	-
CO3:	3	2	1	1	-	-	-	-	-	-	-	-	-	-
CO4:	2	1	2	-	-	2	-	-	-	-	-	-	-	-
CO5:	2	1	2	-	1	2	-	-	-	-	1	-	-	-
Average:	2.6	1.3	1.6	1	1	1.4	-	-	-	-	1.3	-	-	-

Subject Code	Subject Name	Category	L	T	P	C
GE24112	ENGLISH LABORATORY	EEC	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 that are relevant to authentic contexts.
- To use language efficiently in expressing their opinions via various media.

UNIT– I	INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION	6

Listening for general information-specific details- conversation: Introduction to classmates - 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

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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 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		
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- understanding a website- describing processes		
		Total Contact Hours :30

Course Outcomes:	At the end of the course,learners will be able
CO1:	To listen to and comprehend general as well as complex academic information
CO2:	To listen to and understand different points of view in a discussion
CO3:	To speak fluently and accurately in formal and informal communicative contexts
CO4:	To describe products and processes and explain their uses and purposes clearly and accurately
CO5:	To express their opinions effectively in both formal and informal discussions

	CO-PO Mapping											**CO-PSO Mapping**		
PO & PSO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1:	3	3	3	3	1	3	3	3	3	3	3	-	-	-
CO2:	3	3	3	3	1	3	3	3	3	3	3	-	-	-
CO3:	3	3	3	3	1	3	3	3	3	3	3	-	-	-
CO4:	3	3	3	3	1	3	3	3	3	3	3	-	-	-
CO5:	3	3	3	3	1	3	3	3	3	3	3	-	-	-
Average:	**3**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**-**

SEMESTER II

Subject Code	**Subject Name**	**Category**	**L**	**T**	**P**	**C**
HS24201	**PROFESSIONAL ENGLISH - II**	**HSMC**	**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

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UNIT – I	**MAKING COMPARISONS**	**6**
Reading - Reading advertisements, user manuals, brochures; Writing – Professional emails, Email etiquette - Compare and Contrast Essay; Grammar – Mixed Tenses, Prepositional phrases		
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, Infinitive 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	**REPORTING OF EVENTS AND RESEARCH**	**6**
Reading –Newspaper articles; Writing – Recommendations, Transcoding, Accident Report, Survey Report Grammar – Reported Speech, Modals Vocabulary – Conjunctions- use of prepositions		
UNIT – V	**THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY**	**6**
Reading – Company profiles, Statement of Purpose, (SOP), an excerpt of interview with professionals; Writing – Job / Internship application – Cover letter & Resume; Grammar – Numerical adjectives, Relative Clauses.		
		Total Contact Hours : 30

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	To compare and contrast products and ideas in technical texts.
CO2:	To identify and report cause and effects in events, industrial processes through technical texts
CO3:	To analyse problems in order to arrive at feasible solutions and communicate them in the written format.
CO4:	To present their ideas and opinions in a planned and logical manner
CO5:	To draft effective resumes in the context of job search.

Textbooks:	
1.	English for Engineers &Technologists(2020edition)Orient Blackswan P rivate Ltd. Department of English, Anna University
2.	English for Science & Technology Cambridge University Press 2021
3.	Authored by Dr. Veena Selvam, Dr.Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

Reference Books/Other Materials/Web Resources:	
1.	Raman. Meenakshi, Sharma. Sangeeta (2019). Professional English. Oxford university press. New Delhi.
2.	Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, NewDelhi.
3.	Learning to Communicate – Dr. V. Chellammal. Allied Publishers, New Delhi, 2003
4.	Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata

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	McGraw Hill & Co. Ltd., 2001, New Delhi.
5.	Developing Communication Skills by Krishna Mohan, Meera Bannerji- Macmillan India Ltd. 1990, Delhi.

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	3	3	3	3	3	3	3	2	3	3	3	-	-	-
CO2:	3	3	3	3	3	3	3	2	3	3	3	-	-	-
CO3:	3	3	3	3	3	3	3	2	3	3	3	-	-	-
CO4:	3	3	3	3	2	3	3	2	3	3	3	-	-	-
CO5:	-	-	-	-	-	-	-	3	3	3	3	-	-	-
Average:	3	3	3	3	2.75	3	3	2.2	3	3	3	-	-	-

Subject Code	Subject Name	Category	L	T	P	C
MA24201	STATISTICS AND NUMERICAL METHODS	BSC	3	1	0	4

Course Objectives:

- This course aims at providing the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
- 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 solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

UNIT – I	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 – II	DESIGN OF EXPERIMENTS	9+3

One way and two way classifications - Completely randomized design – Randomized block design – Latin square design - 22 factorial design.

UNIT – III	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 - Eigenvalues of a matrix by Power method and Jacobi's method for symmetric matrices.

UNIT – IV	INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION	9+3

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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 – V	**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.		
		Total Contact Hours : 60

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Apply the concept of testing of hypothesis for small and large samples in real life problems.
CO2:	Apply the basic concepts of classifications of design of experiments in the field of agriculture.
CO3:	Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.
CO4:	Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.
CO5:	Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.

Textbooks:	
1.	Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
2.	Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.

Reference Books/Other Materials/Web Resources:	
1.	Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2.	Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
3.	Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 7th Edition, 2007.
4.	Gupta S.C. and Kapoor V. K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12th Edition, 2020.
5.	Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outlines on Probability and Statistics ", Tata McGraw Hill Edition, 4th Edition, 2012.
6.	Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", 9th Edition, Pearson Education, Asia, 2010.

	CO-PO Mapping											**CO-PSO Mapping**		
PO & PSO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1:	3	3	1	1	1	-	-	2	-	2	3	-	-	-
CO2:	3	3	1	1	1	-	-	2	-	2	3	-	-	-

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CO3:	3	3	1	1	1	-	-	2	-	2	3	-	-	-
CO4:	3	3	1	1	1	-	-	2	-	2	3	-	-	-
CO5:	3	3	1	1	1	-	-	2	-	2	3	-	-	-
Average:	**3**	**3**	**1**	**1**	**1**	-	-	**2**	-	**2**	**3**	-	-	-

Subject Code	Subject Name	Category	L	T	P	C
PH24203	**PHYSICS FOR INFORMATION SCIENCE**	**BSC**	**3**	**0**	**0**	**3**

Course Objectives:

- To make the students understand the importance in studying electrical properties ofmaterials
- To enable the students to gain knowledge in semiconductor physics
- To instill knowledge on magnetic properties of materials.
- To establish a sound grasp of knowledge on different optical properties of materials, optical displays and applications
- To inculcate an idea of significance of nano structures, quantum confinement, 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 – Particle in a three dimensional box – degenerate states – Fermi- Dirac statistics – Density of energy states – Electron in periodic potential – Energy bands in solids – tight binding approximation - Electron effective mass — concept of hole

UNIT – II	**SEMI CONDUCTOR 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 carrier concentration with temperature – variation of Fermi level with temperature and impurity concentration – Carrier transport in Semiconductor: random motion, drift, mobility and diffusion – 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 classification: diamagnetism — para magnetism — ferromagnetism — antiferro magnetism – ferri magnetism – Ferromagnetism: origin and exchange interaction- saturation magnetization and Curie temperature – Domain Theory- M versus H behaviour – Hardand soft magnetic materials – examples and uses-– Magnetic principle in computer data storage – Magnetic hard disc (GMR sensor).

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UNIT – IV	OPTICAL PROPERTIES OF MATERIALS	9
Classification 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 storagetechniques.		
UNIT – V	**NANODEVICES AND QUANTUM COMPUTING**	**9**
Introduction - quantum confinement – quantum structures: quantum wells, wires and dots — band gap of nanomaterials. Tunneling – Single electron phenomena: Coulomb blockade - resonant-tunneling diode – single electron transistor – quantum cellular automata - Quantum system for information processing - quantum states – classical bits – quantum bits or qubits – CNOT gate - multiple qubits – Bloch sphere – quantum gates – advantage of quantum computing over classical computing		
		Total Contact Hours : 45

Course Outcomes:	Upon completion of the course students should 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 various devices
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 quantum computing

Text Books:	
1.	Jasprit Singh, "Semiconductor Devices: Basic Principles", Wiley (Indian Edition), 2007
2.	S.O. Kasap. Principles of Electronic Materials and Devices, McGraw-Hill Education (Indian Edition), 2020
3.	Parag K. Lala, Quantum Computing: A Beginner's Introduction, McGraw-Hill Education (Indian Edition), 2020

Reference books/other materials/web resources:	
1.	Charles Kittel, Introduction to Solid State Physics, Wiley India Edition, 2019.
2.	Y.B.Band and Y.Avishai, Quantum Mechanics with Applications to Nanotechnology and Information Science, Academic Press, 2013.
3.	V.V.Mitin, V.A. Kochelap and M.A.Stroscio, Introduction to Nanoelectronics, Cambridge Univ.Press, 2008.
4.	G.W. Hanson, Fundamentals of Nanoelectronics, Pearson Education (Indian Edition) 2009.
5.	B.Rogers, J.Adams and S.Pennathur, Nanotechnology: Understanding Small Systems, CRC Press, 2014.

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	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2:	3	1	2	-	-	-	-	-	-	-	-	-	-	-
CO3:	3	-	-	1	2	1	-	-	-	-	-	-	-	-
CO4:	3	-	2	1	3	-	-	-	-	-	-	-	-	-
CO5:	3	2	2	2	2	1	-	-	-	-	2	-	-	-
Average:	3	1.3	2	1.3	2.3	1	-	-	-	-	2	-	-	-

Subject Code	Subject Name	Category	L	T	P	C
BE24201	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	ESC	3	0	0	3

Course Objectives:

- To introduce the basics of electric circuits and analysis
- To impart knowledge in the basics of working principles and application of electrical machines
- To introduce analog devices and their characteristics
- To educate on the fundamental concepts of digital electronics
- To introduce the functional elements and working of measuring instruments

UNIT – I	ELECTRICAL CIRCUITS	9

DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm's Law - Kirchhoff's Laws –Independent and Dependent Sources – Simple problems- Nodal Analysis, Mesh analysis with Independent sources only (Steady state) Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor – Steady state analysis of RLC circuits (Simple problems only)

UNIT – II	ELECTRICAL MACHINES	9

Construction and Working principle- DC Separately and Self excited Generators, EMF equation, Types and Applications. Working Principle of DC motors, Torque Equation, Types and Applications. Construction, Working principle and Applications of Transformer, Three phase Alternator, Synchronous motor and Three Phase Induction Motor.

UNIT – III	ANALOG ELECTRONICS	9

Resistor, Inductor and Capacitor in Electronic Circuits- Semiconductor Materials: Silicon &Germanium – PN Junction Diodes, Zener Diode –Characteristics Applications – Bipolar Junction Transistor-Biasing, JFET, SCR, MOSFET,IGBT – Types, I-V Characteristics and Applications, Rectifier and Inverters

UNIT – IV	DIGITAL ELECTRONICS	9

Review of number systems, binary codes, error detection and correction codes, Combinational logic - representation of logic functions-SOP and POS forms, K-map representations - minimization using K maps (Simple Problems only).

UNIT – V	MEASUREMENTS AND INSTRUMENTATION	9

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Functional elements of an instrument, Standards and calibration, Operating Principle, types -Moving Coil and Moving Iron meters, Measurement of three phase power, Energy Meter, Instrument Transformers-CT and PT, DSO- Block diagram- Data acquisition.
Total Contact Hours : 45

Course Outcomes:	After completing this course, the students will be able to
CO1:	Compute the electric circuit parameters for simple problems
CO2:	Explain the working principle and applications of electrical machines
CO3:	Analyze the characteristics of analog electronic devices
CO4:	Explain the basic concepts of digital electronics
CO5:	Explain the operating principles of measuring instruments

Textbooks:	
1.	Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, Mc Graw Hill Education, 2020
2.	S.K.Bhattacharya "Basic Electrical and Electronics Engineering", Pearson Education, Second Edition, 2017
3.	Sedha R.S., "A textbook book of Applied Electronics", S. Chand & Co., 2008
4.	James A .Svoboda, Richard C. Dorf, "Dorf's Introduction to Electric Circuits", Wiley, 2018.
5.	A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Mesurements& Instrumentation', Dhanpat Rai and Co, 2015.

Reference Books/Other Materials/Web Resources:	
1.	Kothari DP and I.J Nagrath, "Basic Electrical Engineering", Fourth Edition, McGraw Hill Education, 2019.
2.	Thomas L. Floyd, 'Digital Fundamentals', 11th Edition, Pearson Education, 2017
3.	Albert Malvino, David Bates, 'Electronic Principles, McGraw Hill Education; 7th edition, 2017.
4.	Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, 2002.
5.	H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010

PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	2	2	1	-	-	-	1	-	-	-	2	1	2	-
CO2:	2	2	1	-	-	-	1	-	-	-	2	1	2	-
CO3:	2	1	1	-	-	-	1	-	-	-	2	1	2	-
CO4:	2	2	1	-	-	-	1	-	-	-	2	1	2	-
CO5:	2	2	1	-	-	-	1	-	-	-	2	1	2	-
Average:	**2**	**1.8**	**1**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**2**	**1**	**2**	**-**

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Subject Code	Subject Name	Category	L	T	P	C
GE24201	ENGINEERING GRAPHICS	HSMC	2	0	4	4

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

- Drawing engineering curves.
- Drawing a freehand sketch of simple objects.
- Drawing orthographic projection of solids and section of solids.
- Drawing development of solids.
- 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	PLANECURVES	6+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	**PROJECTIONOFPOINTS,LINESANDPLANESURFACE**	**6+12**
Orthographic projection- principles-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	**PROJECTIONOFSOLIDSANDFREEHANDSKETCHING**	**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. Visualization concepts and Free Hand sketching: Visualization principles —Representation of Three Dimensional objects — Layout of views- Freehand sketching of multiple views from pictorial views of objects. Practicing three dimensional modeling of simple objects by CAD Software (Not for examination)		
UNIT– IV	**PROJECTION OFSECTIONED SOLIDSAND DEVELOPMENTOF SURFACES**	**6+12**
Sectioning of above solids in simple vertical position when the cutting plane is inclined to 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. Practicing three dimensional modeling of simple objects by CAD Software (Not for examination)		
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. Practicing three dimensional modeling of isometric projection of simple objects by CAD software(Not for examination)		
	Total Contact Hours :(L=30+P=60) 90	

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Course Outcomes:	On Successful completion of this course, students should be able to
CO1:	Use BIS conventions and specifications for engineering drawing.
CO2:	Construct the conic curves,involutes and cycloid
CO3:	Solve practical problems involving projection of lines
CO4:	Draw the orthographic,isometric and perspective projections of simple solids.
CO5:	Draw the development of simple solids.

Textbooks:	
1.	Bhatt N.D. and Panchal V.M.,"Engineering Drawing", CharotarPublishing House,53rdEdition,2019
2.	NatrajanK.V.,"ATextBookofEngineering Graphics",DhanalakshmiPublishers, Chennai, 2018.
3.	Parthasarathy,N.S.andVela Murali,"EngineeringDrawing",Oxford University Press,2015

Reference Books/Other Materials/Web Resources:	
1.	Basant Agarwal and Agarwal C.M., "Engineering Drawing", McGraw Hill, 2nd Edition, 2019.
2.	GopalakrishnaK.R.,"EngineeringDrawing"(Vol.I&IIcombined),SubhasPublications,Bangalore,27thEdition,2017.
3.	Luzzader,Warren.J.andDuff,JohnM.,"FundamentalsofEngineeringDrawingwithanintroduction toInteractiveComputerGraphicsforDesignandProduction,EasternEconomyEdition,Prentice Hall ofIndia Pvt. Ltd, NewDelhi,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.
6.	Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.

Publication of Bureau of Indian Standards:

1. IS 10711 — 2001: Technical products Documentation — Size and layout of drawing sheets.
2. IS 9609 (Parts 0 & 1) — 2001: Technical products Documentation — Lettering.
3. IS 10714 (Part 20) — 2001 & SP 46 — 2003: Lines for technical drawings.
4. IS 11669 — 1986 & SP 46 —2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) — 2001: Technical drawings — Projection Methods.

Special points applicable to University Examinations on Engineering Graphics:
There will be five questions, each of either or type covering all units of the syllabus

1. All questions will carry equal marks of 20 each making a total of 100.
2. The answer paper shall consist of drawing sheets of A3 size only.
3. The students will be permitted to use appropriate scale to fit a solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	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	-

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CO5:	3	1	2	-	2	-	-	-	3	-	2	2	2	-
Average:	3	1	2	-	2	-	-	-	3	-	2	2	2	-

Subject Code	Subject Name	Category	L	T	P	C
CS24201	PROGRAMMING IN C	PCC	3	0	0	3

Course Objectives:

- To understand the constructs of C Language.
- 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**	**9**
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**	**9**
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**	**9**
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**	**9**
Files – Types of file processing: Sequential access, Random access – Sequential access file - Random access file - Command line arguments.		
	Total Contact Hours : 45	

Course Outcomes:	Upon completion of the course, students should be able to:
CO1:	Demonstrate knowledge on C Programming constructs
CO2:	Develop simple applications in C using basic constructs
CO3:	Design and implement applications using arrays and strings
CO4:	Develop and implement modular applications in C using functions.
CO5:	Develop applications in C using structures and pointers.

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CO6:	Design applications using sequential and random access file processing.

Textbooks:	
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/Other Materials/Web Resources:	
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.

	CO-PO Mapping											**CO-PSO Mapping**		
PO & PSO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1:	1	2	2	1	2	1	1	2	-	3	2	1	2	-
CO2:	2	2	2	1	2	1	1	2	-	3	3	2	2	-
CO3:	2	3	2	1	2	1	1	2	-	3	2	2	2	-
CO4:	3	2	2	1	23	1	1	2	-	3	3	2	2	-
CO5:	2	3	3	1	2	1	1	2	-	3	2	2	3	-
CO6:	2	2	3	2	1	2	1-	2	1	2	2	2	2	-
Average:	**2**	**2**	**2**	**1**	**2**	**1**	**1**	**2**	-	**3**	**2**	**2**	**2**	-

Subject Code	**Subject Name**	**Category**	**L**	**T**	**P**	**C**
GE24202	**TAMILS AND TECHNOLOGY**	**HSMC**	**1**	**0**	**0**	**1**

UNIT – I	**WEAVING AND CERAMIC TECHNOLOGY**	**3**
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti 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)- ThirumalaiNayakar 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		

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as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.		
UNIT – IV	**AGRICULTURE AND IRRIGATION TECHNOLOGY**	**3**
Dam, Tank, ponds, Sluice, Significance of KumizhiThoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.		
UNIT – V	**SCIENTIFIC TAMIL & TAMIL COMPUTING**	**3**
Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.		
	Total Contact Hours :15	

Text-cum-Reference Books	
1.	Dr. K.K. Pillay, "தமிழகவரலாறு – மக்களும்பண்பாடும்", தமிழ்நாடுபாடநூல்மற்றும்கல்வியியல்பணிகள்கழகம்.
2.	இல. சுந்தரம், "கணினித்தமிழ்", விகடன்பிரசுரம்.
3.	அறுவைத்துறை – தொல்லியல்துறை, "கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம்", தமிழ்நாடு தொல்லியல் துறை & தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம் (தொல்லியல்துறைவெளியீடு).
4.	அறுவைத்துறை – தொல்லியல்துறை, "பொருணை – ஆற்றங்கரை நாகரிகம்", தமிழ்நாடு தொல்லியல் துறை.
5.	Dr. K.K. Pillay, "Social Life of Tamils", TNTB & ESC and RMRL (Joint Publication), [In Print].
6.	Dr. S. Singaravelu, "Social Life of the Tamils – The Classical Period", International Institute of Tamil Studies,
7.	Dr. S.V. Subramanian &Dr. K.D. Thirunavukkarasu, "Historical Heritage of the Tamils", International Institute of Tamil Studies
8.	Dr. M. Valarmathi, "The Contributions of the Tamils to Indian Culture", International Institute of Tamil Studies
9.	Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, "Keeladi – Sangam City Civilization on the banks of river Vaigai", Joint Publication,
10.	Dr. K.K. Pillay, "Studies in the History of India with Special Reference to Tamil Nadu", Self Published by the Author,
11.	Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, "Porunai Civilization", Joint Publication,
12.	R. Balakrishnan, "Journey of Civilization: Indus to Vaigai", RojaMuthiah Research Library (RMRL),

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Subject Code	Subject Name	Category	L	T	P	C
GE24202	தமிழரும்தொழில்நுட்பமும்	HSMC	1	0	0	1

அலகு- I	நெசவு மற்றும் பானைத் தொழில்நுட்பம்:	3

சங்க காலத்தில் நெசவுத் தொழில் – பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள்.

அலகு -II	வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்	3

சங்க காலததில வடிவமைபபு மறறும கடடுமானஙகள & சங்க காலததில வீடடுப பொருட்களில் வடிவமைப்பு- சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்துப் 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	உற்பத்திதொழில்நுட்பம்	3

கப்பல் கட்டும் 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	வேளாண்மைமற்றும்நீர்ப்பாசனதொழில்நுட்பம்	3

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

அலகு -V	அறிவியல்தமிழ்மற்றும்கணினித்தமிழ்	3

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

Total Contact Hours : 15

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TEXT-CUM-REFERENCE BOOKS:	
1.	தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2.	கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3.	கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4.	பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5.	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6.	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies
7.	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies)
8.	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9.	Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: 36 Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10.	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12.	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book

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Subject Code	Subject Name	Category	L	T	P	C
	NCC Credit Course Level 1* (ARMY WING) NCC Credit Course Level – I	**HSMC**	**2**	**0**	**0**	**2**

NCC GENERAL		**6**
NCC 1	Aims, Objectives & Organization of NCC	1
NCC 2	Incentives	2
NCC 3	Duties of NCC Cadet	1
NCC 4	NCC Camps: Types & Conduct	2
NATIONAL INTEGRATION AND AWARENESS		**4**
NI 1	National Integration: Importance & Necessity	1
NI 2	Factors Affecting National Integration	1
NI 3	Unity in Diversity & Role of NCC in Nation Building	1
NI 4	Threats to National Security	1
PERSONALITY DEVELOPMENT		**7**
PD 1	Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving	2
PD 2	Communication Skills	3
PD 3	Group Discussion: Stress & Emotions	2
LEADERSHIP		**5**
L 1	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code	3
L 2	Case Studies: Shivaji, Jhasi Ki Rani	2
SOCIAL SERVICE AND COMMUNITY DEVELOPMENT		**8**
SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1
	Total Contact Hours :30	

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Subject Code	Subject Name	Category	L	T	P	C
	NCC Credit Course Level 1* (NAVAL WING) NCC Credit Course Level – I	**HSMC**	**2**	**0**	**0**	**2**

NCC GENERAL		**6**
NCC 1	Aims, Objectives & Organization of NCC	1
NCC 2	Incentives	2
NCC 3	Duties of NCC Cadet	1
NCC 4	NCC Camps: Types & Conduct	2
NATIONAL INTEGRATION AND AWARENESS		**4**
NI 1	National Integration: Importance & Necessity	1
NI 2	Factors Affecting National Integration	1
NI 3	Unity in Diversity & Role of NCC in Nation Building	1
NI 4	Threats to National Security	1
PERSONALITY DEVELOPMENT		**7**
PD 1	Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving	2
PD 2	Communication Skills	3
PD 3	Group Discussion: Stress & Emotions	2
LEADERSHIP		**5**
L 1	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code	3
L 2	Case Studies: Shivaji, Jhasi Ki Rani	2
SOCIAL SERVICE AND COMMUNITY DEVELOPMENT		**8**
SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1
	Total Contact Hours :30	

Subject Code	Subject Name	Category	L	T	P	C
	NCC Credit Course Level 1* (AIR FORCE WING) NCC Credit Course Level - I	**HSMC**	**2**	**0**	**0**	**2**

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NCC GENERAL		**6**
NCC 1	Aims, Objectives & Organization of NCC	1
NCC 2	Incentives	2
NCC 3	Duties of NCC Cadet	1
NCC 4	NCC Camps: Types & Conduct	2
NATIONAL INTEGRATION AND AWARENESS		**4**
NI 1	National Integration: Importance & Necessity	1
NI 2	Factors Affecting National Integration	1
NI 3	Unity in Diversity & Role of NCC in Nation Building	1
NI 4	Threats to National Security	1
PERSONALITY DEVELOPMENT		**7**
PD 1	Self-Awareness, Empathy, Critical & Creative Thinking, Decision Making and Problem Solving	2
PD 2	Communication Skills	3
PD 3	Group Discussion: Stress & Emotions	2
LEADERSHIP		**5**
L 1	Leadership Capsule: Traits, Indicators, Motivation, Moral Values, Honour Code	3
L 2	Case Studies: Shivaji, Jhasi Ki Rani	2
SOCIAL SERVICE AND COMMUNITY DEVELOPMENT		**8**
SS 1	Basics, Rural Development Programmes, NGOs, Contribution of Youth	3
SS 4	Protection of Children and Women Safety	1
SS 5	Road / Rail Travel Safety	1
SS 6	New Initiatives	2
SS 7	Cyber and Mobile Security Awareness	1
	Total Contact Hours :30	

Subject Code	Subject Name	Category	L	T	P	C
GE24211	ENGINEERING PRACTICES LABORATORY	ESC	0	0	4	2

Course Objectives:
The main learning objective of this course is to provide hands on training to the students in:

- Drawing pipeline plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planning; making joints in wood materials used in common household wood work
- Wiring various electrical joints in common household electrical wirework.
- Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts ;Assembling simple mechanical assembly of common household equipments; Making a tray out of metal sheet using sheet metal work

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- Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.

GROUP – A (CIVIL & ELECTRICAL)

PART – I	CIVIL ENGINEERINGPRACTICES	15

PLUMBING WORK:

a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.
b) Preparing plumbing line sketches.
c) Laying pipe connection to the suction side of a pump
d) Laying pipe connection to the delivery side of a pump.
e) Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK:

a) Sawing,
b) Planing and
c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.

Wood Work Study:

a) Studying joints in door panels and wooden furniture
b) Studying common industrial trusses using models.

PART – II	ELECTRICAL ENGINEERINGPRACTICES	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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GROUP – B (MECHANICAL AND ELECTRONICS)

PART – III	MECHANICAL ENGINEERINGPRACTICES	15

WELDING WORK:

a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.
b) Practicing gas welding.

BASIC MACHINING WORK:

a) (simple)Turning.
b) (simple)Drilling.
c) (simple)Tapping.

ASSEMBLY WORK:

a) Assembling a centrifugal pump.
b) Assembling a household mixer.
c) Assembling an air-conditioner.

SHEET METAL WORK:

a) Making of a square tray

FOUNDRY WORK:

a) Demonstrating basic foundry operations.

PART – IV	ELECTRONIC ENGINEERING PRACTICES	15

SOLDERING WORK:

a) Soldering simple electronic circuits and checking continuity.

ELECTRONICASSEMBLY AND TESTINGWORK:

a) Assembling and testing electronic components on a small PCB.

ELECTRONIC EQUIPMENT STUDY:

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

Total Contact Hours : 60

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.
CO2:	Wire various electrical joints in common household electrical wire work.

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CO3:	Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments; Make a tray out of metal sheet using sheet metal work.
CO4:	Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1:	3	2	-	-	-	1	-	-	-	-	2	2	1	1
CO2:	3	2	-	-	-	1	-	-	-	-	2	2	1	1
CO3:	3	2	-	-	-	1	-	-	-	-	2	2	1	1
CO4:	3	2	-	-	-	1	-	-	-	-	2	2	1	1
Average:	**3**	**2**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**2**	**2**	**1**	**1**

Subject Code	**Subject Name**	**Category**	**L**	**T**	**P**	**C**
CS24211	**PROGRAMMING IN C LABORATORY**	**PCC**	**0**	**0**	**4**	**2**

Course Objectives:

- To familiarise 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 Contact Hours :60

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Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Demonstrate knowledge on C programming constructs.
CO2:	Develop programs in C using basic constructs.
CO3:	Develop programs in C using arrays.
CO4:	Develop applications in C using strings, pointers, functions.
CO5:	Develop applications in C using structures.
CO6:	Develop applications in C using file processing.

Textbooks:	
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/Other Materials/Web Resources:	
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.

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	1	3	3	1	1	1	-	2	1	2	2	2	2	-
CO2:	2	3	3	2	1	1	-	2	1	2	2	2	3	-
CO3:	2	2	2	1	1	2	-	2	-	2	2	2	2	-
CO4:	2	2	2	2	1	2	-	3	-	3	3	3	2	-
CO5:	2	2	3	2	3	2	-	3	-	3	3	3	3	-
CO6:	2	2	3	2	1	2	-	2	1	2	2	2	2	-
Average:	2	2	3	2	1	2	-	2	1	2	2	2	2	-

Subject Code	Subject Name	Category	L	T	P	C
GE24212	COMMUNICATION LABORATORY	EEC	0	0	4	2

Course Objectives:

- To identify and apply group discussion skills to participate effectively in professional discussions.
- To analyse concepts and problems and deliver clear, concise, and effective presentations.

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• To communicate proficiently through both formal and informal writing.
• To use appropriate language structures to write emails, reports, and essays.
• To give instructions and recommendations that are clear, contextually appropriate, and purposeful.

UNIT – I	**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	**12**
Speaking: discussing news stories-talking about frequency-talking about travel problems- discussing travel procedures- talking about travel problems- making arrangements-describing arrangements-discussing plans and decisions- discussing purposes and reasons- understanding common technology terms-Writing: - writing different types of emails.	
UNIT – III	**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	**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.	
UNIT – V	**12**
Speaking: 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 Contact Hours :60

Course Outcomes:	Upon completion of the course students should be 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:	Write emails, letters and effective job applications.
CO4:	Write critical reports to convey data and information with clarity and precision
CO5:	Give appropriate instructions and recommendations for safe execution of tasks

	CO-PO Mapping											**CO-PSO Mapping**		
PO & PSO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1:	2	3	3	3	1	3	3	3	3	3	3	-	-	-
CO2:	2	3	3	3	1	3	3	3	3	3	3	-	-	-
CO3:	2	2	3	3	1	3	3	3	3	3	3	-	-	-
CO4:	3	3	3	3	3	3	3	3	3	3	3	-	-	-
CO5:	3	3	3	3	3	3	3	3	3	3	3	-	-	-
Average:	**2.4**	**2.8**	**3**	**3**	**1.8**	**3**	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**-**

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SEMESTER -III

Subject Code	Subject Name	Category	L	T	P	C
MA24301	DISCRETE MATHEMATICS	BSC	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 – 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 – 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 – Homomorphism's – Normal subgroup and cosets – Lagrange's theorem		
UNIT – V	**LATTICES AND BOOLEAN ALGEBRA**	**9+3**
Partial ordering – Posets – Lattices as posets – Properties of lattices - Lattices as algebraic systems – Sub lattices – Direct product and homomorphism – Some special lattices – Boolean algebra		
		Total Contact Hours : 60

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Have knowledge of the concepts needed to test the logic of a program
CO2:	Have an understanding in identifying structures on many levels.
CO3:	Be aware of a class of functions which transform a finite set into another finite set which relates to input and output functions in computer science
CO4:	Be aware of the counting principles
CO5:	Be exposed to concepts and properties of algebraic structures such as groups, rings and fields.

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Textbooks:	
1.	Rosen. K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw 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 McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011. 66

Reference books/other materials/webresources:	
1.	Grimaldi. R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 5 th Edition, 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

	CO-PO Mapping											CO-PSO Mapping		
PO& PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	3	3	2	-	-	-	-	-	-	-	2	-	-	-
CO2:	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3:	-	3	2	-	-	2	-	-	-	3	-	-	-	-
CO4:	-	2	2	2	-	-	-	-	-	-	-	-	-	-
CO5:	-	2	2	2	-	-	-	-	-	2	-	-	-	-
Average:	3	2.6	2	2	-	2	-	-	-	2.5	2	-	-	-

Subject Code	Subject Name	Category	L	T	P	C
CS24305	DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION	ESC	3	0	0	3

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 path unit, control unit for processor and to familiarize with the hazards.
- To understand the concepts of various memories and I/O interfacing.

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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	**PROCESSOR**	**9**
Instruction Execution – Building a Data Path – 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 Contact Hours : 45

Course Outcomes:	Upon completion of the course students should 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 .

Textbooks:

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

Reference books/other materials/webresources:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky,Naraig Manjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw-Hill, 2012.
2. William Stallings,"ComputerOrganizationandArchitecture– DesigningforPerformance",TenthEdition,PearsonEducation,2016.
3. M.MorrisMano,"DigitalLogicandComputerDesign",PearsonEducation,2016.

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	CO-PO Mapping											CO-PSO Mapping		
PO& PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	3	3	3	3	3	2	1	1	1	1	2	2	3	3
CO2:	3	3	3	3	2	1	1	1	1	1	2	1	2	2
CO3:	3	3	3	3	2	2	1	1	1	1	2	2	3	1
CO4:	3	3	3	3	1	1	1	1	1	1	1	1	3	1
CO5:	3	3	3	3	1	2	1	1	1	1	1	1	2	1
Average:	3	3	3	3	1	2	1	1	1	1	1	1	2	1

Subject Code	Subject Name	Category	L	T	P	C
CS24304	OBJECT ORIENTED PROGRAMMING	PCC	2	0	2	3

Course Objectives:

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

UNIT – I	INTRODUCTION TO OOP AND JAVA	6

Overview of OOP – Object oriented programming paradigms – Features of Object-Oriented Programming – 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

UNIT – II	INHERITANCE AND INTERFACES	6

Overloading Methods – Inheritance: Basics– Types of Inheritance - Super keyword- Method Overriding – Abstract Classes – final with Inheritance. Interfaces Strings: Basic String class and methods

UNIT – III	PACKAGES, EXCEPTION HANDLING AND MULTITHREADING	8

Packages and Member Access – Importing Packages. Exception handling basics – Multiple catch Clauses – Nested try Statements – Java's Built-in Exceptions – User defined Exception - Multithreaded Programming: Java Thread Model–Creating a Thread and Multiple Threads – Priorities – Synchronization – Suspending –Resuming, and Stopping Threads

UNIT – IV	I/O, NETWORKING	5

I/O Basics – Reading and Writing Console I/O – Reading and Writing Files. Java Networking: Basics of networking in Java - Sockets and server sockets

UNIT – V	JAVAFX EVENT HANDLING, CONTROLS	5

JAVAFX Events and Controls: Event Basics – Handling Key and Mouse Events. Controls: Checkbox – Radio Buttons – ListView – Combo Box – Text Controls. Layouts – FlowPane – HBox and VBox – Border Pane – Stack Pane – GridPane. Menus Basics – Menu bars – Menu Item.

Total Contact Hours :30

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LIST OF EXERCISES	
1. Solve problems by using sequential search, binary search, and quadratic sorting algorithms (selection, insertion)	
2. Develop stack and queue data structures using classes and objects.	
3. Develop a java application with an Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club funds. Generate pay slips for the employees with their gross and net salary.	
4. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named printArea(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method printArea( ) that prints the area of the given shape.	
5. Solve the above problem using an interface.	
6. Implement exception handling and creation of user defined exceptions.	
7. Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.	
8. Write a program to perform file operations.	
9. Develop applications to demonstrate the features of generics classes.	
10. Simple chatting using Socket and ServerSocket	
11. Develop applications using JavaFX controls, layouts and menus	
12. Develop a mini project for any application using Java concepts.	
	Total Contact Hours :30

Course Outcomes:	Upon completion of the course students should 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 & Networking.
CO5:	Integrate the concepts of event handling and JavaFX components and controls for developing GUI based applications.

Textbooks:	
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

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Reference books/other materials/webresources:	
1.	Cay S. Horstmann, "Core Java Fundamentals", Volume 1, 11 th Edition, Prentice Hall, 2018.

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	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
Average:	2	1	2	2	2	-	-	2	2	1	2	3	2	2

Subject Code	Subject Name	Category	L	T	P	C
AD24301	ARTIFICIAL INTELLIGENCE	PCC	3	0	0	3

Course Objectives:

- To learn the basic AI approaches.
- To develop problem solving agents.
- To explore strategic decision-making through game theory and CSP techniques.
- To implement logical reasoning and inferences
- To develop solutions using probabilistic approaches to handle uncertainty.

UNIT – I	INTRODUCTION TO INTELLIGENT SYSTEMS	9
Introduction to AI-Agents and Environments-nature of environments-structure of agents. Problem solving agents-search algorithms-uninformed search strategies.		
UNIT – II	**HEURISTIC AND LOCAL SEARCH IN AI**	**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 Contact Hours : 45	

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Course Outcomes:	Upon completion of the course students should 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.	StuartRussellandPeterNorvig,"ArtificialIntelligence–AModernApproach",Fourth Edition,PearsonEducation,2021

Reference books/other materials/webresources:	
1.	DanW. Patterson, "Introduction to AI and ES",PearsonEducation,2007
2.	KevinNight, Elaine Rich ,and NairB., "Artificial Intelligence",McGrawHill,2008
3.	PatrickH. Winston,"Artificial Intelligence",Third Edition ,Pearson Education,2006
4.	DeepakKhemani,"ArtificialIntelligence",TataMcGrawHillEducation,2013. http://nptel.ac.in/

	CO-PO Mapping											CO-PSO Mapping		
PO& PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	3	2	2	2	2	1	1	1	1	1	2	2	2	2
CO2:	3	3	3	3	3	1	0	1	1	2	2	3	2	3
CO3:	3	3	3	3	3	1	0	1	1	2	2	3	3	3
CO4:	3	3	3	3	3	1	1	1	1	2	3	3	3	3
CO5:	3	3	3	3	3	2	1	1	2	2	3	3	3	3
Average:	3.0	2.8	2.8	2.8	2.8	1.2	0.6	1.0	1.2	1.8	2.4	2.8	2.6	2.8

Subject Code	Subject Name	Category	L	T	P	C
AD24302	DATA VISUALIZATION	PCC	2	0	2	3

Course Objectives:

- To give overview of descriptive and inferential statistics.
- To provide basics of R and Python.
- To manipulate and visualize data using R, python and Watson Studio.
- To focus on plots using Matplotlib and seaborn.
- To analyze data using various visualization tools.
- To create maps in python using folium.

UNIT – I	INTRODUCTION TO STATISTICS	6
Data collection methods – Descriptive Statistics: Mean, Median, Mode – InferentialStatistics: Random Variables, Probability Distribution		
UNIT – II	VISUALIZATION USING R	6

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Descriptive data analysis using R – Data manipulation with R (dplyr, data. table, reshape2 package, tidyr package, Lubridate package) - Data Visualization with R (working with ggplot2)		
UNIT – III	**WATSON STUDIO**	**6**
Adding data to data refinery – Preprocessing &Visualization of data in Watson Studio.		
UNIT – IV	**DATA ANALYSIS USING PYTHON**	**6**
Basics of Python , Numpy Library – Arrays creation , Indexing , Slicing , Aggregation , Reshaping, Pandas Library – Series , DataFrame , using csv &excel files , Data cleaning & manipulation ,Merging & Joining.		
UNIT – V	**VISUALIZATION USING PYTHON**	**6**
Data Visualization tools in python – Basic plots using Matplotlib - Advanced Visualization tools using Matplotlib –Sea born functionalities – Spatial visualization and analysis in python in folium		
		Total Contact Hours : 30

LIST OF EXPERIMENTS
1. Do the data manipulation operations for iris and mtcars dataset using dplyr package and obtain the results for following functions: i. filter ii. select iii. arrange iv. summarise v. mutate
2. Create a data frame and do the following operations using tidyr package i. gather ii. spread iii. separate iv. unite
3. Do the following operations for any external dataset using data. table package i. Select a subset row ii. Select a column with particular values iii. Select columns with multiple values iv. Select a column to return a vector v. Select multiple columns vi. Returns the sum and standard deviation vii. Sum of selected columns
4. Do the following visualizations for any external csv file i. Line graph ii. Bar graph iii. Histogram iv. Scatter plot v. Pie chart

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5. Do the following Data analysis for your own Data set using pandas package. i. Make the first column as index ii. Select single column and print the data iii. Select multiple columns and print the data iv. Select single column and print the last five elements of the data. v. Select multiple rows and print the first five elements of the data vi. Select multiple rows and columns from the data set and print it. vii. Select all the rows and some columns (more than two) from the data set and print it. viii. Print the same data set again and delete the first column from the data set and print it. ix. Change the 1st, 2nd and 3rd columns name and print it
6. Consider any csv file and do the following visualization using matplot lib package i. Line graph /with style ii. Bar Graph iii. Histogram iv. Scatter plot v. Pie chart
7. Merge the two data sets (any two csv files) and perform the following join i. operations ii. Natural join iii. Full outer join iv. Left outer join v. Right outer join
8.Do the EDA process for loan prediction data set
9.Data analytics and visualization using IBM Watson studio
10.Do the following operations for your own data using pandas i. Descriptive data analytics using pandas ii. Print the data based on particular year, particular month and particular data iii. Filter the data based on conditions (any conditions) iv. Select any two columns and do the pandas sort operations (ascending and descending)
Total Contact Hours :30

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Differentiate descriptive and inferential statistics.
CO2:	Use R to do statistics and to visualize data.
CO3:	Visualize analyzed data using IBM Watson Studio.
CO4:	Familiar with python scripts used for visualization.
CO5:	Use advance visualization tool and sea born functionalities.

Textbooks:	
1.	IBM -CE Data Visualization Using R, Python and Watson studio

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Reference books/other materials/webresources:	
1.	Fundamentals of Data Visualization by Claus O Wilke 2019.

	CO-PO Mapping											CO-PSO Mapping		
PO& PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	3	1	3	3	-	-	-	-	2	3	3	2	1	1
CO2:	2	2	1	1	1	-	-	-	2	2	3	3	2	2
CO3:	2	1	2	1	-	-	-	-	2	1	1	1	2	1
CO4:	2	1	2	2	-	-	-	-	2	1	2	1	3	3
CO5:	3	2	2	1	1	-	-	-	3	2	1	2	2	1
Average:	2	1	2	2	1	-	-	-	2	2	2	2	2	2

Subject Code	Subject Name	Category	L	T	P	C
IT24301	DATA STRUCTURES AND ALGORITHMS	PCC	3	0	0	3

Course Objectives:

- To understand the concepts of ADTs.
- To design and implement linear data structures.
- To develop and analyze efficient sorting ,searching and hashing algorithms.
- To apply and evaluate tree data structures.
- To explore graph data structures and algorithms.

UNIT – I	ABSTRACT DATA TYPES	9

Abstract Data Types (ADTs) – ADTs and classes – Basics of OOPS concepts – inheritance – namespaces – Introduction to analysis of algorithms – asymptotic notations – recursion – analyzing recursive algorithms.

UNIT – II	LINEAR STRUCTURES	9

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

UNIT – III	SORTING AND SEARCHING TECHNIQUES	9

Bubble sort – selection sort – insertion sort – merge sort – quick sort – analysis of sorting algorithms – linear search – binary search –hashing –hash functions -collision handling strategies– rehashing.

UNIT – IV	TREE STRUCTURES	9

Tree ADT-Binary Tree ADT-tree traversals-binary search trees-AVL trees-heaps- B trees-B+trees.

UNIT – V	GRAPH STRUCTURES	9

Graph ADT-representation of graph-graph traversals-DAG-topological ordering-greedy algorithms-dynamic programming-shortest paths-minimum spanning trees:Prims-Kruskal algorithm.

Total Contact Hours : 45

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Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Explain Abstract Data Types (ADTs) and their role in algorithm design.
CO2:	Design, implement, and analyze linear data structures, such as lists, queues, and stacks, according to the needs of different applications.
CO3:	Apply and evaluate sorting and searching techniques, including hashing and collision resolution strategies
CO4:	Design, implement, and analyze efficient tree structures to meet requirements such as searching, indexing, and sorting.
CO5:	Model problems as graph problems and implement efficient graph algorithms to solve them.

Textbooks:	
1.	MichaelT.Goodrich, RobertoTamassia, and MichaelH.Goldwasser,"DataStructures& Algorithms in Python", An Indian Adaptation, John Wiley & Sons Inc., 2021.

Reference books/other materials/webresources:	
1.	Lee,KentD.,Hubbard,Steve,"DataStructuresandAlgorithmswithPython"Springer Edition 2015.
2.	RanceD.Necaise,"DataStructuresandAlgorithmsUsingPython",JohnWiley&Sons, 2011.
3.	Aho,Hopcroft,andUllman,"DataStructuresandAlgorithms",PearsonEducation,1983
4.	ThomasH.Cormen, CharlesE.Leiserson, RonaldL.Rivest, and CliffordStein,"Introduction to Algorithms", Second Edition, McGraw Hill, 2002.
5.	MarkAllenWeiss,"DataStructuresandAlgorithmAnalysisinC++",FourthEdition, Pearson Education, 2014

	CO-PO Mapping											CO-PSO Mapping		
PO& PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	3	2	1	1	2	1	1	1	1	1	2	3	2	2
CO2:	3	3	2	2	3	1	1	2	2	2	3	3	3	2
CO3:	3	3	2	2	3	1	1	2	2	2	3	3	3	3
CO4:	3	2	2	2	3	1	2	2	2	2	3	3	2	2
CO5:	3	2	2	2	3	2	2	2	2	2	3	3	3	3
Average:	2.33	2.67	3	2.33	3	1.2	1.4	1.8	1.8	1.8	2.8	3	2.6	2.4

Subject Code	Subject Name	Category	L	T	P	C
AD24311	ARTIFICIAL INTELLIGENCE LABORATORY	PCC	0	0	3	1.5

- 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

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LIST OF EXPERIMENTS
1.Implementation of a Model-Based Agent
2.Implementation of Greedy Best-First Search Algorithm
3.Implementation of Hill Climbing Algorithm for Local Search
4.Implementation of Memory Bounded A* Algorithm
5. Implementation of Alpha Beta Tree search.
6.Solving 8-Queens Problem using Backtracking
7.Implementation of Tic-Tac-Toe AI using Mini-max Algorithm
8.Implementation of Forward and Backward Chaining in AI
9.Implementation of First-Order Logic (FOL) Inference System
10.Implementation of Probabilistic Reasoning using Bayesian Networks
Total Contact Hours : 45

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Understand and build a agent to solve simple problems
CO2:	Design and implement search strategies
CO3:	Implement game-playing strategies and constraint satisfaction techniques for AI-based decision-making.
CO4:	Develop and apply logical reasoning methods for knowledge inference in AI systems.
CO5:	Implement probabilistic reasoning techniques to handle uncertainty in AI applications.

	CO-PO Mapping											CO-PSO Mapping		
PO& PSO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1:	3	2	2	2	3	2	1	1	1	1	2	3	2	3
CO2:	3	2	2	2	3	2	1	1	1	1	2	3	3	3
CO3:	3	3	2	2	3	2	1	1	1	1	2	3	3	3
CO4:	3	3	2	3	3	2	2	1	1	1	2	3	3	3
CO5:	3	3	2	3	3	2	2	1	1	1	2	3	3	3
Average:	3	2.6	2	2.4	3	2	1.4	1	1	1	2	3	2.8	3

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Subject Code	Subject Name	Category	L	T	P	C
IT24311	DATA STRUCTURES AND ALGORITHMS LABORATORY	PCC	0	0	3	1.5

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
- To design and implement graph traversal algorithms

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 ADT
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 Contact Hours : 45

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Explain Abstract Data Types (ADTs) and their role in algorithm design.
CO2:	Design, implement, and analyze linear data structures, such as lists, queues, and stacks, according to the needs of different applications.
CO3:	Apply and evaluate sorting and searching techniques, including hashing and collision resolution strategies
CO4:	Design, implement, and analyze efficient tree structures to meet requirements such as searching, indexing, and sorting.
CO5:	Model problems as graph problems and implement efficient graph algorithms to solve them.

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	CO-PO Mapping											CO-PSO Mapping		
PO& PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	3	2	1	1	2	–	–	1	1	–	2	3	2	2
CO2:	3	3	3	2	3	–	–	1	1	1	2	3	3	3
CO3:	3	3	2	2	3	–	–	1	1	1	2	3	3	3
CO4:	3	3	3	2	3	–	–	1	1	1	2	3	3	3
CO5:	3	3	3	2	3	–	–	1	1	1	2	3	3	3
Average:	3.0	2.8	2.4	1.8	2.8	–	–	1.0	1.0	0.8	2.0	3.0	2.8	2.8

SEMESTER-IV

Subject Code:	Subject Name	Category	L	T	P	C
MA24401	PROBABILITY AND STATISTICS	BSC	3	1	0	4

Course objectives:

- To introduce the basic concepts of probability and random variables.
- To introduce the basic concepts of Special distribution.
- To introduce the basic concepts of two dimensional random variables.
- To acquaint the knowledge of non parametric test.
- To introduce the basic concepts of classifications of design of experiments which plays very important roles in the field of agriculture and statistical quality control.

UNIT – I	PROBABILITY AND RANDOM VARIABLES	9+3

Axioms of porbability - Conditional Probability - Baye's Theorem – One dimensional Discreate and Continous Random variables - Moments – Moment generating functions

UNIT – II	SPECIAL DISTRIBUTIONS	9+3

Discrete distributions : Binomial, Poisson, Geometric – Continuous distributions: Uniform, Exponential and Normal distribution.

UNIT – III	TWO DIMENSIONAL RANDOM VARIABLES	9+3

Two dimensional random variables: Joint distribution - Marginal and Conditional distributions - Covariance – Correlation co-efficients – Regression lines.

UNIT – IV	NON PARAMETRIC TESTS	9+3

Introduction - The sign test - The Signal - Rank test - Rank sum tests - The U-test - The H-test - Tests based on Runs - Test of randomness - The Kolmogorov Tests.

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UNIT – V	STATISTICAL QUALITY CONTROL	9+3
Control charts for measurements(X and R charts) - Control charts for attributes (p,c,np charts) - Tolreance Limits - Acceptance Sampling.		
		Total Contact Hours : 60

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Understand the basic concepts of Probabilitys and Random variables and apply in Engineering applications.
CO2:	Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
CO3:	Apply the concept of Two dimensional random variable in Engineering Disciplines
CO4:	Use the concept of non parametric testing for Non-Normal population.
CO5:	Apply the basic concepts of classifications of design of experiments in the field of agricalture and statistical quality control

Textbooks:	
1.	Johnson. R.A., Miller. I.RandFreund . J.E, " Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia,9th Edition, 2016.
2.	Milton. J. S. and Arnold.J.C., "Introduction to Probability and Statistics", Tata Mc GrawHill, 4th Edition, 2007.
3	John E.Freund,"MathematicalStatistics", Prentice Hall,5th Edition, 1992.

Reference books/other materials/web resources:	
1.	Gupta. S.C. and Kapoor. V. K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12th Edition, 2020.
2.	Devore. J.L., "Probability and Statistics for Engineering and the Sciences",Cengage Learning, New Delhi, 8th Edition, 2014.
3.	Ross. S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 5th Edition, Elsevier, 2014.
4.	Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 4th Edition, 2012.
5.	Walpole.R.E.,Myers.R.H.,Myers.S.L.and Ye.K.,"Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 9th Edition, 2010.

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	CO-PO Mapping											CO-PSO Mapping		
PO& PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	3	3	-	-	-	-	-	-	2	-	2	-	-	-
CO2:	3	3	-	-	-	-	-	-	2	-	2	-	-	-
CO3:	3	3	-	-	-	-	-	-	2	-	2	-	-	-
CO4:	3	3	3	2	-	-	-	-	2	-	2	-	-	-
CO5:	3	3	2	2	-	-	-	-	2	-	2	-	-	-
Average:	3	3	2.5	2	-	-	-	-	2	-	2	-	-	-

Subject Code	Subject Name	Category	L	T	P	C
CS24403	FOUNDATION OF DATA SCIENCE	PCC	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

Introduction to Data Science 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.

UNIT – II	DESCRIBING DATA	9

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

UNIT – 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.

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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 Basemap – Visualization with Seaborn.		
		Total Contact Hours : 45

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Apply the data science process.
CO2:	Understand different types of data description for datascience process
CO3:	Gain knowledge on relationships between data.
CO4:	Use the Python Libraries for DataWrangling.
CO5:	Apply visualization Libraries in Python to interpret and explore data.

Textbooks:

1. David Cielen, ArnoD.B.Meysman,and MohamedAli,"Introducing DataScience", Manning Publications, 2016.(first two chapters for UnitI).
2. RobertS.WitteandJohnS.Witte,"Statistics",EleventhEdition,WileyPublications,2017.
3. JakeVanderPlas,"PythonDataScienceHandbook",O'Reilly,2016.

Reference books/other materials/webresources:

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

	CO-PO Mapping											CO-PSO Mapping		
PO& PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	2	2	1	2	2	-	-	1	1	1	2	1	2	-
CO2:	2	1	-	1	1	-	-	2	1	1	2	-	2	-
CO3:	2	2	1	2	2	1	1	1	2	1	3	1	2	-

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CO4:	3	2	2	1	2	-	-	1	1	2	2	1	3	-
CO5:	2	2	1	2	2	-	-	1	1	1	2	2	2	-
Average:	2	2	1	2	2	1	1	1	1	1	2	1	2	-

Subject Code	Subject Name	Category	L	T	P	C
AD24402	FUNDAMENTALS OF OPERATING SYSTEMS	PCC	3	0	0	3

Course Objectives:

- To understand the basics and functions of operating systems
- To understand the processes and analyze the CPU scheduling algorithms
- To understand the concepts of deadlock and process synchronization
- To be familiar with I/O management and File systems.
- To be familiar with the basics of virtual machines and analyze various memory management schemes.

UNIT – I	**Operating System**	**9**
Operating System-Introduction, Operating system services Structures-Simple Batch, Multi-programmed, Time-shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, and Operating System services-System Call.		
UNIT – II	**Process and CPU Scheduling**	**9**
Processes – Process Concept – Process Scheduling – Operations on Processes – Inter-process Communication- Threads-Scheduling Criteria-Scheduling Algorithms-Multiple – Processor Scheduling.		
UNIT – III	**Deadlocks and process synchronization**	**9**
Deadlocks - System Model- Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery from Deadlock. The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors.		
UNIT – IV	**Disk Management and file system operations.**	**9**
Disk Scheduling Algorithms-FCFS,SSTF, SCAN,C-SCAN File System Interface and Operations -Access methods, Directory Structure, Protection, File System Structure, Allocation methods, kernel support for files.		
UNIT – V	**Memory Management and Virtual Machines**	**9**
Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Demand Paging, Page Replacement, Page Replacement Algorithms-Types of virtual machines and their implementations		
		Total Contact Hours : 45

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Explain the fundamental concepts of operating systems
CO2:	Analyze the various CPU scheduling algorithms
CO3:	Explain deadlock prevention,avoidance algorithms and process synchronization
CO4:	Explain the functionality of file systems I/O systems
CO5:	Compare and contrast various memory management schemes

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Textbooks:	
1.	Abraham Silberschatz ,Peter Baer Galvin and Greg Gagne, "OperatingSystemConcepts",9th Edition,John Wiley and Sons Inc.,2018
2.	AndrewSTanenbaum,"ModernOperatingSystems",Pearson,4thEdition,NewDelhi,2016

Reference books/other materials/webresources:	
1.	Ramaz Elmasri ,A. GilCarrick, David Levine, "Operating Systems–A Spiral Approach",Tata McGrawHill Edition,2010
2.	William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, Prentice Hall, 2018
3.	AchyutS. Godbole,Atul Kahate,"Operating Systems",McGrawHillEducation,2016

	CO-PO Mapping											CO-PSO Mapping		
PO& PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	3	1	1	1	-	-	-	-	1	1	1	2	1	2
CO2:	2	3	1	3	1	-	-	-	3	2	2	3	3	1
CO3:	2	2	3	3	2	-	-	-	3	1	1	1	1	1
CO4:	2	2	1	2	1	-	-	-	1	3	2	1	1	2
CO5:	2	3	3	2	1	-	-	-	3	1	2	3	1	2
Average:	2	2	2	2	1	-	-	-	2	2	2	2	1	2

Subject Code	Subject Name	Category	L	T	P	C
AD24403	DATABASE DESIGN AND MANAGEMENT	PCC	3	0	0	3

Course Objectives:

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

UNIT – I	CONCEPTUAL DATA MODELING	8

Database environment–Database system development life cycle–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 : Domain, Key, Referential, Check, Implementation of Constraints in SQL—SQL Data manipulation : Inserting, Modifying, Deleting, Querying, Joins–SQL Data definition : Creating and Managing Databases, Defining Tables and Data Types, Implementing Constraints, Indexing for Performance Optimization–Views—SQL programming.

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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**
Transactionconcepts–properties–Schedules–Serializability–ConcurrencyControl–Two-phase locking techniques. Programmatic SQL: Embedded SQL, Dynamic SQL, Advanced SQL-Programming in MYSQL.		
UNIT – V	**OBJECT RELATIONAL AND NO-SQL DATABASES**	**9**
Mapping EER to ODBschema –Object identifier – referencetypes –rowtypes – UDTs –Subtypes and supertypes–user-definedroutines–Collectiontypes–ObjectQueryLanguage;No-SQL:CAP theorem – Document-based: MongoDB data model and CRUD operations; Column-based: Hbase data model and CRUD operations		
		Total Contact Hours : 45

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Understand the database development life cycle and apply conceptual modeling
CO2:	Apply SQL and programming in SQL to create, manipulate and query the database
CO3:	Apply the conceptual-to relational mapping and normalization to design relational database
CO4:	Determine the serializability of any non-serial schedule using concurrency techniques
CO5:	Apply the data model and querying in Object-relational and No-SQL databases.

Textbooks:	
1.	Thomas M. Connolly,Carolyn E. Begg, Database Systems – A Practical Approach toDesign, Implementation, and Management, Sixth Edition, Global Edition, Pearson Education, 2015.

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2.	RamezElmasri,ShamkantB.Navathe,FundamentalsofDatabaseSystems,7th Edition, Pearson, 2017.

Reference books/other materials/webresources:	
1.	Toby Teorey, Sam Light stone, Tom Nadeau, H.V.Jagadish, "DATABASEMODELING 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,SSudharshan, "Database System Concepts",6th Edition, Tata Mc GrawHill, 2011.
4.	Hector Garcia- Molina, Jeffrey D Ullman, Jennifer Widom, "Database Systems :The Complete Book", 2nd edition, Pearson.
5.	Raghu Ramakrishnan,"Database Management Systems",4thEdition,TataMcGrawHill,2010.

	CO-PO Mapping											CO-PSO Mapping		
PO& PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	3	2	2	1	2	-	-	-	-	-	2	3	2	3
CO2:	3	3	2	2	3	-	-	-	-	-	2	3	3	3
CO3:	3	3	3	2	3	-	-	-	-	-	2	3	2	3
CO4:	3	3	2	3	3	-	-	-	-	-	2	3	3	3
CO5:	3	2	2	2	3	-	-	-	-	-	3	3	3	3
Average:	3	2.6	2.2	2.2	2.8						2.2	3	2.6	3

Subject Code	Subject Name	Category	L	T	P	C
AM24404	MACHINE LEARNING	PCC	2	0	2	3

Course Objectives:

- Understand the necessity of machine learning for addressing diverse problem-solving scenarios.

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• Study various machine learning algorithms, including supervised, semi-supervised, and unsupervised learning techniques
• Explore emerging approaches and advancements in machine learning.
• Leverage Watson Studio for a collaborative environment equipped with tools to address business challenges effectively
• Utilize tools in Watson Studio to analyze and visualize data, cleanse and prepare data, ingest streaming data, and develop and train machine learning models

UNIT – I	**INTRODUCTION TO MACHINE LEARNING**	**6**
Machine learning Introduction-Types of Machine learning -Supervised, Unsupervised, and reinforcement-Over fitting and Regression-Classification-Clustering-Examples		
UNIT – II	**INTRODUCTION TO IBM CLOUD**	**6**
Introduction to IBM Cloud- Resources-IBM Cloud Infrastructure- Security-IBM Cloud Foundry-Cloud Park for data- IBM Cloud vs Amazon Cloud - Cloud Native Storage and Data Service		
UNIT – III	**INTRODUCTION TO WASTON STUDIO**	**6**
Introduction to Watson Studio- Project creation- Storage- Access control-Prebuilt Watson application-Watson Solutions- Catalog and govern data		
UNIT – IV	**MACHINE LEARNING IN WATSON**	**6**
Watson Knowledge Studio and Watson Knowledge catalog-Watson Discovery Services-Watson Auto AI-Watson Open Scale- Watson API		
UNIT – V	**NATURAL LANGUAGE PROCESSING**	**6**
NLP Introduction-Natural Language Understanding (NLU)-Conversational AI-Building blocks of chat bot-Watson Assistant-Speech to Text -Text to speech.		
	Total Contact Hours : 30	

LIST OF EXPERIMENTS
1. Implement a Linear Regression model to predict house prices using a dataset.
2.Train a K-Nearest Neighbors (KNN) classifier on the Iris dataset and evaluate its accuracy
3.Perform sentiment analysis on a given text using IBM Watson Natural Language Understanding (NLU).
4. Deploy a Flask web application on IBM Cloud Foundry.
5. Apply K-Means clustering to segment customers based on their purchasing behavior.
6. Convert an audio file to text using IBM Watson Speech-to-Text API.
7.Build a basic Chabot using IBM Watson Assistant and integrate it into a Python application
8. Train a Convolutional Neural Network (CNN) to classify images from the MNIST dataset.
9. Implement Logistic Regression for spam email detection using a text dataset.
10. Use IBM Watson Natural Language Understanding (NLU) to extract named entities from a given text.
Total Contact Hours : 30

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	Analyze various methods and theories in the filed of ML

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CO2:	Gain an understanding of the fundamental principles and techniques of ML
CO3:	Utilize Watson Studio to streamline the process from experimentation to deployment, enhance data exploration and accelerate model development and training
CO4:	Demonstrate the creation and application of AI models.
CO5:	Analyse and evaluate the performance of the AI models

Textbooks:	
1.	IBM Courseware

Reference books/other materials/webresources:	
1.	EthemAlpaydin,"IntroductiontoMachineLearning",MITPress,FourthEdition,2020
2.	StephenMarsland,"MachineLearning:AnAlgorithmicPerspective,"SecondEdition", CRCPress, 2014.

	CO-PO Mapping											CO-PSO Mapping		
PO& PSO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1:	2	1	2	1	-	-	-	-	3	3	2	2	2	1
CO2:	1	3	3	1	2	-	-	-	2	2	2	3	1	1
CO3:	2	1	3	3	2	-	-	-	1	1	1	1	2	1
CO4:	2	3	3	2	1	-	-	-	3	2	3	1	2	1
CO5:	1	1	3	3	1	-	-	-	3	1	1	3	3	2
Average:	2	2	3	2	2	-	-	-	2	2	2	2	2	1

Subject Code	**Subject Name**	**Category**	**L**	**T**	**P**	**C**
GE24901	**ENVIRONMENTAL SCIENCES AND SUSTAINABILITY**	**BSC**	**2**	**0**	**0**	**2**

Course Objectives:

- To study the interrelationship between living organism and environment.
- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth's interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT – I	**ENVIRONMENT AND BIODIVERSITY**	**6**

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Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ.		
UNIT – II	**ENVIRONMENTAL POLLUTION**	**6**
Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system (OHASMS). Environmental protection, Environmental protection acts.		
UNIT – III	**NATURAL RESOURCES**	**6**
Forest resources: Use and over-exploitation, deforestation, case studies. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. New Renewable Energy Sources: Hydrogen energy, Solar energy, wind energy, Tidal energy, Ocean thermal energy and Geothermal energy. Role of an individual in conservation of natural resources.		
UNIT – IV	**SUSTAINABILITY PRACTICES**	**6**
Zero waste and R concept, Circular economy, Material Life cycle assessment, Environmental Impact Assessment, ISO 14000 Series, Green buildings. Water conservation, rain water harvesting. Issues and possible solutions – climate change, global warming. Concept of Carbon Credit and Carbon Footprint. Development and GDP.Environmental management in industry-A, case study.		
UNIT – V	**SOCIAL ISSUES AND POPULATION**	**6**
Population growth, variation among nations – population explosion – family welfare programme – environment and human health–human rights–value education–HIV/AIDS–women and child welfare – role of information technology in environment and human health – Case studies. Urban problems related to energy.		
		Total Contact Hours : 30

Course Outcomes:	Upon completion of the course students should be able to:
CO1:	To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.
CO2:	To identify causes effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.
CO3:	To apply knowledge on the conservation of natural resources by keeping the sustainable development as a main goal.
CO4:	To identify the importance of Development as a standard of living otherwise that leads to serious environmental disasters.
CO5:	To demonstrate the knowledge about human population and its drastic change which will eventually lead to unsustainable development.

Textbooks:

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1.	AnubhaKaushikandC.P.Kaushik's"PerspectivesinEnvironmentalStudies",6thEdition, New Age International Publishers ,2018.
2.	Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, NewDelhi, 2016.
3.	GilbertM.Masters,'Introduction toEnvironmentalEngineeringandScience',2nd edition, Pearson Education, 2004.
4.	Allen, D.T.and Shonnard, D.R.,SustainabilityEngineering: Concepts, Designand Case Studies, Prentice Hall.
5.	Environment Impact Assessment Guidelines, Notification of Government of India, 2006.
6.	Mackenthun,K.M.,Basic Concepts in Environmental Management, Lewis Publication, London, 1998.

Reference books/other materials/webresources:	
1.	R.K.Trivedi,'Handbook of Environmental Laws,Rules,Guidelines,Compliances and Standards', Vol. I and II, Enviro Media. 38 . edition 2010.
2.	Cunningham, W.P.Cooper, T.H.Gorhani,'Environmental Encyclopedia',JaicoPubl., House, Mumbai, 2001.
3.	DharmendraS.Sengar, 'Environmental law', Prentice hall of India PVT.LTD, New Delhi, 2007.
4.	Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2015.
5.	Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.

	CO-PO Mapping											CO-PSO Mapping		
PO& PSO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1:	-	-	-	-	-	2	3	-	-	2	-	-	-	-
CO2:	2	-	-	-	-	2	3	-	-	2	-	-	-	-
CO3:	2	-	-	-	-	2	3	-	-	2	-	-	-	-
CO4:	-	-	-	-	-	2	3	-	-	2	-	-	-	-
CO5:	-	-	-	-	-	-	3	-	-	2	-	-	-	-
Average:	2	1	-	-	-	2	3	-	-	2	-	-	-	-

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Subject Code	Subject Name	Category	L	T	P	C
AD24413	DATABASE DESIGN AND MANAGEMENT LABORATORY	PCC	0	0	3	1.5

- 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

LIST OF EXPERIMENTS

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

Total Contact Hours:45

Course Outcomes:	Upon completion of the course students should 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 applications for real-time problems
CO5:	Design and query object-relational databases

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	CO-PO Mapping											CO-PSO Mapping		
PO& PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	3	2	1	1	2	1	–	1	1	1	2	3	2	2
CO2:	3	3	3	2	3	1	–	1	1	1	2	3	3	3
CO3:	3	3	2	2	3	1	–	1	1	1	2	3	3	3
CO4:	3	3	3	2	3	1	–	1	2	2	2	3	3	3
CO5:	3	3	3	2	3	1	–	1	2	2	2	3	3	3
Average:	3	2.8	2.4	1.8	2.8	1	–	1	1	1.4	2	3	2.8	2.8

Subject Code	Subject Name	Category	L	T	P	C
CS24413	DATA SCIENCE LABORATORY	PCC	0	0	3	1.5

- 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

Total Contact Hours :45

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Course Outcomes:	At the end of this 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.

	CO-PO Mapping											CO-PSO Mapping		
PO & PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1:	3	2	1	1	-	-	-	-	1	3	3	1	3	2
CO2:	3	2	2	3	1	-	-	-	3	1	3	1	3	3
CO3:	3	2	1	3	1	-	-	-	2	1	1	3	2	3
CO4:	2	3	1	3	-	-	-	-	2	3	2	3	3	1
CO5:	1	2	3	1	1	-	-	-	2	1	3	1	3	3
Average:	2	2	2	2	1	-	-	-	2	2	2	2	3	2

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