

Sri Sivasubramaniya Nadar College of Engineering

(An Autonomous Institution, Affiliated to Anna University, Chennai)



Regulation 2021

Curriculum and Syllabi for
B. Tech. Information Technology

SSN COLLEGE OF ENGINEERING
(An Autonomous Institution, Affiliated to Anna University
Chennai)
B.E./ B.Tech. Degree Program
Department of Information Technology
(R2021)

VISION of the Institute

To be a world class institution for technical education and scientific research for public good.

MISSION of the Institute

1. Make a positive difference to society through education.
2. Empower students from across socio economic strata.
3. Be a centre of excellence in education in emerging technologies in accordance with industry and industrial trends.
4. Build world class research capabilities on par with the finest in the world and broaden students' horizons beyond classroom education.
5. Nurture talent and entrepreneurship and enable all-round personality development in students.

VISION of the Department

To be an outstanding center for IT education and research for betterment of society.

MISSION of the Department

1. Impart sound knowledge of IT domains to the students.
2. Nurture students to contribute to dynamic industrial needs.
3. Empower faculty with the knowledge in the emerging areas of IT.
4. Promote sustained research to build information systems for the benefit of society

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Graduates of the B.Tech. Information Technology program will be able to

PEO1: Apply domain knowledge and skills of information technology to succeed in professional careers and/or higher studies

PEO2: Design and implement hardware and/or software-related engineering projects applying the principles and practices of computing, grounded in mathematics and science, to meet industrial & societal demands and/or productively engage in research

PEO3: Function in multi-disciplinary teams, by creatively solving problems and communicating effectively

PEO4: Contribute to society, by functioning ethically and responsibly, and involving in professional and social activities for sustainable developments

PROGRAM OUTCOMES (POs)

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

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

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

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

PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

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

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

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

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

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

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

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

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: Understand, analyse, and design software intensive systems by applying knowledge of mathematical and algorithmic techniques, solution processes and architectures, and integrating modules that address larger social and professional concerns and are deployable in a production environment.

PSO2: Design, develop and deploy smart software intensive solutions based on cumulative knowledge acquired in thrust areas such as artificial intelligence, IoT, data analytics, cloud computing and cyber security, and by selecting appropriate IT tools, to create sustainable and scalable IT solutions to complex engineering problems.

PEOs Mapping with POS and PSOs

PEO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
PEO1	3	3	3	2	3	1	1	1	2	2	2	3	3	3
PEO2	3	3	3	3	3	1	1	1	2	2	2	3	3	3
PEO3	1	1	1					2	3	3	3	2	2	2
PEO4						3	3	3	2	2	1	1	1	1

CO-PO-PSO Mapping

[illegible]

Course	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
Automata Theory and Compiler Design	2.8	1.8 3	1.8						3	3	2	1.66	3	
Network Programming Laboratory	2	1.3 3		2	1								1	
Digital Systems and Microprocessor Laboratory	3	2	1	1					2				2.6	
SEMESTER V														
Principles of Software Engineering and Practices	1	1.4	1	1		3			1	1.5	1.33		2.4	
Data Analytics and Visualization	3	2.2 5	2	3	2				1	3		3	3	3
Principles of Operating Systems	3	2	1									1	1	
Artificial Intelligence	2.6 6	2	1.6 6										2.66	2
Software Development Project - II	1.3 3	1.6 6	1.4	1.75	1				1.66	2.5	1.25	3	2.75	1.4
Operating Systems Practices Laboratory	2.8	2.6	1.8						2	2.25		1.8	3	
SEMESTER VI														
Pattern Recognition and Machine Learning	3	2	1.7 5	1	1				3	3		2	2.75	2.25
Web Programming	1.8 3	1.8	1		1	3			1			1	1.6	1.5
Internet of Things and C programming	2.2 5	1.6	1		1.5	2			2	2		2	1.8	3
Mobile Application Development Laboratory	3	2.3 3	1.6 6		3			2		1		1	2.33	2
SEMESTER VII														
Network and Communication Security	1.6	3	1.2			3		3					2.6	2
Cloud and Distributed Computing	2	2	1	1	1.66							1	1	2
Industrial Training /Internship*	3	2.5	2	2.6	3	3	3	3	1.71	3	3	3	2.6	3
Project Work – Phase 1	2	3	1.6 6	3	2	3	3		1	3	3	2.66	3	2.2
SEMESTER VIII														
Project Phase II	3	2.5	2	2.6	3	3	3	3	1.71	3	3	3	2.6	3
PROFESSIONAL ELECTIVES														
Information Theory and Applications	3	1.2 5		1									2	
Optimization Techniques for Machine Learning	2.7 5	1.5	1	1									2	2
Data Warehousing and Data Mining	2	2.5	2.7 5		2.25								2.75	2
Cyber Security	1.2 5	2.2 5	1		2							1	1	2
Sensors and Actuators	2	2.2 5	1	1						2		1	1.5	2
Software Architecture and Principles	1.6 6	2	2	1			2		1.5	1.5	1.25	2	1	
Computer Graphics and Multimedia	2	1		1	1.83					1			1	
Electronic Devices and Circuits	2.2	2	1	1						2		1	1	

Course	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
Signals, Systems and Applications	3	1	1	1						2		1	1.25	
Advanced Artificial Intelligence Techniques	2.8	1.4	1	1.8	1.75								1.6	2
Business Analytics	2	2	1	2	2		2	2		2		1	1.4	2
Software Quality Assurance	1.3 3	1.4	1	1	1.25								1	1
Block Chain Technologies	3	2.5	2	1.5	2.33		2	2		2		1	2	2.25
Control Systems	3	2	1	1						2		1	1	
Introduction to AR/VR/MR/XR	3	1.6 6	1.5	2	1.66	2						2	2.33	
Deep Learning Concepts and Architectures	1.8	2	1	2	1	2				2		1	1	2
Bio-inspired Optimization Techniques	1.6 6			1	1					3		2	2	3
Big Data Management	2	1.5	1	1	1.5					1		1	2	2
Software Project Management	1.8	1.3 3	1	1.66	1							1	1	2
Information Privacy	1.3 3	1.5	1.2 5		1	3	2	3					1.5	2.33
Software Defined Networks	1	1	1	1	1							1	1	2
Video: Editing, Production, and Cinematography	1	1.4	2	1.6	3	3			2			1	1	
Natural Language Processing	2	2	2	3	2					2		3	2	2
Image Processing and Computer Vision	3	3	2	3	3								2.4	2
Healthcare Analytics	2	1.6 6	2	2	2							1	1.33	2
Microservices and DevOps	1.2	2	1.8	1	1.6						1.4	1.5		2
Cyber Forensics and Information Security	2	1	1		3	3				2		1		2
IOT Architectures and Applications	2.2	2.4	1	2	3				1	2.2		1	1.8	3
3D Modeling, Rendering, Animation, and Motion Graphics	1	2		2	2								1	
Text Analysis	2.66	2.6	3	3	2	2				2		3	2.33	2
Image and Video Analysis	3	3	2	3	3								2.4	2
Social Network Analysis	2	2	1	2	1					2				2
Full Stack Development	1.2 5	1.5	1.3 3	1	2.33						2.5			2.66
Ethical Hacking	2	1	1		2	3		3				1		2
Real Time Embedded Systems	3	3	3	3	3								3	3
Emerging Technologies for AR/VR/MR/XR	3	1.5	1.3 3	1.66	2.5	2				1		2	2.25	
Reinforcement Learning	3	2	1.7 5	1	1				3	3		2	2.75	2.25
Speech Technology	3	2	1.6 6	2	3				1	3		3	2.5	2.5
Forensic Analytics	2	1.5	2	1	2							1	1.75	2
Human Computer Interaction	1.6	1	1.6						1	1.2	1		1.6	
FinTech Security	2	1	1		2	2.8		3		2		1		2
Mobile Autonomous	3	3	3	3	3		2						3	3

Course	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
Robots														
User Experience and Interaction Design for AR/VR/MR/XR	1.2 5	1.3 3	1	1	2.33							1	1.25	
OPEN ELECTIVES														
Fundamentals of AR and VR	3	1.6 6	1.5	2	1.66	2						2	2.33	
Databases and Applications Development	2	1.5	1.3 3		2				2				1	1
Introduction to Artificial Intelligence	2.2	1.8	1	1.5	1								2	2
Introduction to Data Structures and Algorithms	2	1.7 5	1										2	
Introduction to Object-Oriented Programming and Patterns	2	2.6	1.6	1									1	
Introduction to Data Science	2.8	1.2	1	2	1.25							1	1.6	2
Introduction to Cyber Security	1.1 6	1.6	1		1.83		2	3					1.16	2
Introduction to Software Engineering	1	1.4	1	1		3			1	1.4	1.25		2.5	
IoT Architectures and Programming	2.2	2	1.6	2.33	3	3	2				1	1	2.2	2.8
Introduction to Deep Learning	2				1				2	2		1		2
Introduction to Machine Learning	1.8	1			1					3		2	2	3
Web services and DevOps	1	2.3 3	1.4	1.8	1.4			1.5	1.33		1	1	1	2
Management I Electives														
Principles of management					3				2	2	2	1		
Total quality management					2	3	2	2	1		1	1		
Work ethics, Corporate social responsibility and Governance						3	2	3	1	1	3	2		
Humanities I Electives														
Language and Communication									2	3		2	1	1
Fundamentals of Linguistics									2	3		2	1	1
Film Appreciation									2	3		2	1	1
Human relations at work						2		2	3	2		2	1	1
Application of Psychology in everyday life						2		2	3	2		2	1	1
Understanding Society and Culture through Literature									2	3		2	1	1

SUSTAINABLE DEVELOPMENT GOALS (SDG)

SDG		Description
SDG1	No Poverty	End poverty in all its forms everywhere
SDG 2	Zero Hunger	End hunger, achieve food security and improved nutrition, and promote sustainable agriculture
SDG 3	Good health and well being	Ensure healthy lives and promote well-being for all at all ages
SDG 4	Quality education	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
SDG 5	Gender Equality	Achieve gender equality and empower all women and girls
SDG 6	Clean water and sanitation	Ensure availability and sustainable management of water and sanitation for all
SDG 7	Affordable and clean energy	Ensure access to affordable, reliable, sustainable and modern energy for all
SDG 8	Decent work and Economic Growth	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
SDG 9	Industry, Innovation and Infrastructure	Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation
SDG 10	Reducing Inequality	Reduce income inequality within and among countries
SDG 11	Sustainable cities and communities	Make cities and human settlements inclusive, safe, resilient, and sustainable
SDG 12	Responsible consumption and production	Ensure sustainable consumption and production patterns
SDG 13	Climate action	Take urgent action to combat climate change and its impacts by regulating emissions and promoting developments in renewable energy
SDG 14	Life below water	Conserve and sustainably use the oceans, seas and marine resources for sustainable development
SDG 15	Life on Land	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
SDG 16	Peace, justice and strong Institutions	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
SDG 17	Partnerships for the goals	Strengthen the means of implementation and revitalize the global partnership for sustainable development

MAPPING OF SUBJECT RELEVANT TO SDG

[illegible]

	Sustainable Development Goals																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
/ Indian Constitution																	
Advanced Data Structures and Algorithm Analysis				✓					✓								
Data Communication and Networks				✓					✓		✓						
Automata Theory and Compiler Design				✓					✓								
Network Programming Laboratory				✓					✓								
Digital Systems and Microprocessor Laboratory				✓					✓								
Principles of Software Engineering and Practices				✓													
Data Analytics and Visualization				✓					✓								
Principles of Operating Systems				✓													
Artificial Intelligence				✓					✓		✓						
Software Development Project – II				✓					✓								
Operating Systems Practices Laboratory				✓					✓								
Pattern Recognition and Machine Learning				✓					✓								
Web Programming				✓													
Internet of Things and C programming				✓		✓											
Mobile Application Development Laboratory				✓					✓								
Network and Communication Security				✓	✓				✓		✓						
Cloud and Distributed Computing				✓					✓		✓						
Industrial Training /Internship*				✓													✓
Project Work – Phase 1				✓	✓			✓	✓		✓				✓		
Project Phase II				✓	✓			✓	✓		✓				✓		
Information Theory and Applications				✓					✓								
Optimization Techniques for Machine Learning				✓					✓		✓						
Data Warehousing and Data Mining				✓					✓		✓						
Cyber Security				✓	✓						✓						

	Sustainable Development Goals																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Sensors and Actuators				✓					✓		✓						
Software Architecture and Principles				✓							✓						
Computer Graphics and Multimedia				✓													
Electronic Devices and Circuits				✓			✓				✓	✓					
Signals, Systems and Applications				✓							✓						
Advanced Artificial Intelligence Techniques				✓							✓						
Business Analytics				✓													
Software Quality Assurance				✓					✓		✓						
Block Chain Technologies				✓					✓		✓						
Control Systems				✓					✓		✓						
Introduction to AR/VR/MR/XR				✓							✓						
Deep Learning Concepts and Architectures				✓							✓						
Bio-inspired Optimization Techniques				✓													
Big Data Management				✓					✓		✓						
Software Project Management				✓													
Information Privacy				✓	✓				✓		✓						
Software Defined Networks				✓					✓								
Video: Editing, Production, and Cinematography				✓							✓						
Natural Language Processing				✓							✓						
Image Processing and Computer Vision				✓					✓		✓						
Healthcare Analytics				✓					✓		✓						
Microservices and DevOps				✓													
Cyber Forensics and Information Security				✓	✓				✓		✓						
IOT Architectures and Applications				✓		✓			✓		✓						
3D Modeling, Rendering, Animation, and Motion Graphics				✓							✓						

	Sustainable Development Goals																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Text Analysis				✓													
Image and Video Analysis				✓					✓		✓				✓		
Social Network Analysis				✓	✓				✓		✓	✓					
Full Stack Development				✓							✓						
Ethical Hacking				✓	✓				✓								
Real Time Embedded Systems				✓					✓		✓						
Emerging Technologies for AR/VR/MR/XR				✓					✓		✓						
Reinforcement Learning				✓					✓		✓						
Speech Technology				✓					✓								
Forensic Analytics				✓	✓				✓		✓						
Human Computer Interaction				✓					✓		✓						
FinTech Security				✓					✓		✓						
Mobile Autonomous Robots				✓					✓		✓						
User Experience and Interaction Design for AR/VR/MR/XR				✓					✓		✓						
Language and Communication				✓				✓									
Fundamentals of Linguistics				✓				✓									
Film Appreciation																	
Human relations at work				✓	✓			✓			✓						
Application of Psychology in everyday life				✓							✓						
Understanding Society and Culture through Literature				✓							✓						
Principles of management			✓	✓	✓												
Total quality management			✓	✓	✓				✓								
Work ethics, Corporate social responsibility an Governance	✓	✓	✓	✓	✓			✓		✓							

I to VIII semesters Curriculum (Choice Based Credit System)

SEMESTER I									
S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	EL	C
THEORY									
1	UEN2176	Technical English	HS	4	2	0	2	0	3
2	UMA2176	Matrices and Calculus	BS	4	3	1	0	0	4
3	UPH2176	Engineering Physics	BS	3	3	0	0	0	3
4	UCY2176	Engineering Chemistry	BS	3	3	0	0	0	3
5	UGE2176	Problem Solving and Programming in Python	ES	3	3	0	0	0	3
6	UGE2177	Engineering Graphics	ES	5	1	0	4	0	3
7	UGA2176	Heritage of Tamils	HS	1	1	0	0	0	1
PRACTICALS									
8	UGE2197	Programming in Python Laboratory	ES	3	0	0	3	0	1.5
9	UGS2197	Physics and Chemistry Laboratory	BS	3	0	0	3	0	1.5
TOTAL				29	16	1	12	0	23

SEMESTER II									
S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	EL	C
THEORY									
1	UMA2276	Complex Functions and Laplace Transforms	BS	4	3	1	0	0	4
2	UEE2276	Basic Electrical and Electronics Engineering	ES	3	3	0	0	0	3
3	UIT2201	Programming and Data Structures	ES	5	3	0	2	0	4
4	ACY2276	Environmental Science	MC*	3	3	0	0	0	0
5		Humanities I Elective	HS	4	2	0	2	0	3
6	UPH2251	Physics for Information Science and Technology	BS	3	3	0	0	0	3
7	UGA2276	Tamils and Technology	HS	1	1	0	0	0	1
PRACTICALS									
8	UGE2297	Design Thinking and Engineering Practices Laboratory	ES	3	0	0	3	0	1.5
9	UIT2211	Software Development Project – I	ES	3	0	0	3	0	1.5
TOTAL				29	18	1	8	0	21

*Non credit

SEMESTER III									
S. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	EL	C
THEORY									
1	UMA2377	Discrete Mathematics	BS	4	3	1	0	0	4
2	UHS2376	Universal Human Values 2: Understanding Harmony	HS	4	2	0	2	0	3
3	UIT2301	Programming and Design Patterns	ES	3	3	0	0	0	3
4	UIT2302	Database Technology	PC	3	3	0	0	0	3
5	UIT2304	Digital Logic and Computer Organization	PC	3	3	0	0	0	3
6	UIT2305	Introduction to Digital Communication	ES	3	3	0	0	0	3
PRACTICALS									
7	UIT2311	Database Technology Laboratory	PC	3	0	0	3	0	1.5
8	UIT2312	Programming and Design Patterns Laboratory	ES	3	0	0	3	0	1.5
TOTAL				26	17	1	8	0	22

SEMESTER IV									
S. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	EL	C
THEORY									
1	UMA2476	Probability and Statistics	BS	4	3	1	0	0	4
2	UIT2401	Microprocessor and Microcontroller	PC	3	3	0	0	0	3
3	AHS2476	Indian Constitution	MC*	3	3	0	0	0	0
4	UIT2402	Advanced Data Structures and Algorithm Analysis	PC	8	3	0	2	3	5
5	UIT2403	Data Communication and Networks	PC	3	3	0	0	0	3
6	UIT2404	Automata Theory and Compiler Design	PC	3	3	0	0	0	3
PRACTICALS									
7	UIT2411	Network Programming Laboratory	PC	3	0	0	3	0	1.5
8	UIT2412	Digital Systems and Microprocessor Laboratory	PC	3	0	0	3	0	1.5
TOTAL				30	18	1	8	3	21

*Non credit

SEMESTER V									
S. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	EL	C
THEORY									
1	UIT2501	Principles of Software Engineering and Practices	PC	3	3	0	0	0	3
2	UIT2502	Data Analytics and Visualization	PC	5	3	0	2	0	4
3	UIT2503	Principles of Operating Systems	PC	3	3	0	0	0	3
4	UIT2504	Artificial Intelligence	PC	3	3	0	0	0	3
5		Professional Elective I	PE	3	3	0	0	0	3
6		Management Elective	HS	3	3	0	0	0	3
PRACTICALS									
7	UIT2511	Software Development Project – II	PC	3	0	0	3	0	1.5
8	UIT2512	Operating Systems Practices Laboratory	PC	3	0	0	3	0	1.5
TOTAL				26	18	0	8	0	22

SEMESTER VI									
S. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	EL	C
THEORY									
1	UIT2601	Pattern Recognition and Machine Learning	PC	5	3	0	2	0	4
2	UIT2602	Web Programming	PC	8	3	0	2	3	5
3	UIT2603	Internet of Things and C programming	PC	5	3	0	2	0	4
4		Professional Elective II	PE	3	3	0	0	0	3
5		Open Elective I	OE	3	3	0	0	0	3
PRACTICALS									
6	UIT2611	Mobile Application Development Laboratory	PC	4	0	0	4	0	2
TOTAL				28	15	0	10	3	21

SEMESTER VII									
S. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	EL	C
THEORY									
1	UIT2701	Network and Communication Security	PC	3	3	0	0	0	3
2	UIT2702	Cloud and Distributed Computing	PC	4	2	0	2	0	3
3		Professional Elective III	PE	3	3	0	0	0	3
4		Professional Elective IV	PE	3	3	0	0	0	3
5		Professional Elective V	PE	3	3	0	0	0	3
PRACTICALS									
7	UIT2718	Project Work – Phase 1	EEC	9	0	0	0	9	3
8	UIT2716	Industrial Training /Internship*	EEC	0	0	0	0	0	2
TOTAL				25	14	0	2	9	20

* The students will undergo 4 weeks Industrial training / Internship during previous vacation.

SEMESTER VIII									
S. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	EL	C
THEORY									
1		Professional Elective VI	PE	3	3	0	0	0	3
2		Open Elective II	OE	3	3	0	0	0	3
PRACTICALS									
3	UIT2818	Project Work – Phase 2	EEC	24	0	0	0	24	8
TOTAL				30	6	0	0	24	14

Total No of Credits: 164

Summary

Semester	HS	BS	ES	PC	PE	OE	EEC	MC*	TOTAL
I	4	11.5	7.5						23
II	4	7	10					0	21
III	3	4	7.5	7.5					22
IV		4		17				0	21
V	3			16	3				22
VI				15	3	3			21
VII				6	9		5		20
VIII					3	3	8		14
Total	14	26.5	25	61.5	18	6	13	0	164

*Non credit

HSMC – Electives –Humanities I (II semester)

S. No.	COURSE CODE	COURSE TITLE	CONTACT PERIODS	L	T	P	C
1	UEN2241	Language and Communication	3	3	0	0	3
2	UEN2242	Fundamentals of Linguistics	3	3	0	0	3
3	UHS2243	Film Appreciation	3	3	0	0	3
4	UHS2241	Human relations at work	3	3	0	0	3
5	UHS2245	Application of Psychology in everyday life	3	3	0	0	3
6	UEN2243	Understanding Society and Culture through Literature	3	3	0	0	3

HSMC – Electives –Management (V semester)

S. No.	COURSE CODE	COURSE TITLE	CONTACT PERIODS	L	T	P	C
1	UBA2541	Principles of Management	3	3	0	0	3
2	UBA2542	Total quality Management	3	3	0	0	3
3	UBA2543	Work Ethics, Corporate Social Responsibility, and Governance	3	3	0	0	3

Professional Elective I (V semester)

S. No.	COURSE CODE	COURSE TITLE	CONTACT PERIODS	L	T	P	C
1	UIT2521	Information Theory and Applications	3	3	0	0	3
2	UIT2522	Optimization Techniques for Machine Learning	3	3	0	0	3
3	UIT2523	Data Warehousing and Data Mining	3	3	0	0	3
4	UIT2524	Cyber Security	3	3	0	0	3
5	UIT2525	Sensors and Actuators	3	3	0	0	3
6	UIT2526	Software Architecture and Principles	3	3	0	0	3
7	UIT2527	Computer Graphics and Multimedia	4	2	0	2	3
8	UEE2303	Electronic Devices and Circuits	3	3	0	0	3

Professional Elective II (VI semester)

S. No.	COURSE CODE	COURSE TITLE	CONTACT PERIODS	L	T	P	C
1	UIT2621	Signals, Systems and Applications	3	3	0	0	3
2	UIT2622	Advanced Artificial Intelligence Techniques	4	2F	0	2	3
3	UIT2623	Business Analytics	4	2	0	2	3
4	UIT2624	Software Quality Assurance	3	3	0	0	3
5	UIT2625	Block Chain Technologies	3	3	0	0	3
6	UIT2626	Control Systems	3	3	0	0	3
7	UIT2627	Introduction to AR/VR/MR/XR	3	3	0	0	3

Professional Elective III (VII semester)

S. No.	COURSE CODE	COURSE TITLE	CONTACT PERIODS	L	T	P	C
1	UIT2721	Deep Learning Concepts and Architectures	4	2	0	2	3
2	UIT2722	Bio-inspired Optimization Techniques	4	2	0	2	3
3	UIT2723	Big Data Management	4	2	0	2	3
4	UIT2724	Software Project Management	3	3	0	0	3
5	UIT2725	Information Privacy	3	3	0	0	3
6	UIT2726	Software Defined Networks	3	3	0	0	3
7	UIT2727	Video: Editing, Production, and Cinematography	4	2	0	2	3

Professional Elective IV (VII semester)

S. No.	COURSE CODE	COURSE TITLE	CONTACT PERIODS	L	T	P	C
1	UIT2728	Natural Language Processing	4	2	0	2	3
2	UIT2729	Image Processing and Computer Vision	4	2	0	2	3
3	UIT2731	Healthcare Analytics	4	2	0	2	3
4	UIT2732	Microservices and DevOps	4	2	0	2	3
5	UIT2733	Cyber Forensics and Information Security	4	2	0	2	3
6	UIT2734	IOT Architectures and Applications	4	2	0	2	3
7	UIT2735	3D Modeling, Rendering, Animation, and Motion Graphics	4	2	0	2	3

Professional Elective V (VII semester)

S. No.	COURSE CODE	COURSE TITLE	CONTACT PERIODS	L	T	P	C
1	UIT2736	Text Analysis	4	2	0	2	3
2	UIT2737	Image and Video Analysis	4	2	0	2	3
3	UIT2738	Social Network Analysis	4	2	0	2	3
4	UIT2739	Full Stack Development	4	2	0	2	3
5	UIT2741	Ethical Hacking	4	2	0	2	3
6	UIT2742	Real Time Embedded Systems	4	2	0	2	3
7	UIT2743	Emerging Technologies for AR/VR/MR/XR	4	2	0	2	3

Professional Elective VI (VIII semester)

S. No.	COURSE CODE	COURSE TITLE	CONTACT PERIODS	L	T	P	C
1	UIT2821	Reinforcement Learning	4	2	0	2	3
2	UIT2822	Speech Technology	4	2	0	2	3
3	UIT2823	Forensic Analytics	4	2	0	2	3
4	UIT2824	Human Computer Interaction	4	2	0	2	3
5	UIT2825	FinTech Security	4	2	0	2	3
6	UIT2826	Mobile Autonomous Robots	4	2	0	2	3
7	UIT2827	User Experience and Interaction Design for AR/VR/MR/XR	4	2	0	2	3

Appendix: Elective Baskets

I. Artificial Intelligence and Machine Learning Technologies

(This will be offered as Honours Track as well)

- 1) Information Theory and Applications(UIT2521-3)
- 2) Optimization Techniques for Machine Learning(UIT2522-3)
- 3) Signals, Systems and Applications (UIT2621 – 3)
- 4) Advanced Artificial Intelligence Techniques (UIT2622 – 3)
- 5) Bio-inspired Optimization Techniques (UIT2722 – 3) lit5
- 6) Deep Learning Concepts and Architectures (UIT2721 – 3) lit5
- 7) Natural Language Processing (UIT2728 – 3) - lit5
- 8) Text Analysis (UIT2736 – 3) – lit5
- 9) Image Processing and Computer Vision (UIT2729 – 3) - lit5
- 10) Image and Video Analysis (UIT2737 – 3) – lit5
- 11) Reinforcement Learning (UIT2821 – 3) – lit5
- 12) Speech Technology (UIT2822 – 3) – lit5

II. Internet of Things

- 1) Electronic Devices and Circuits (UEE2303 – 3)
- 2) Sensors and Actuators (UIT2525 – 3)
- 3) Control Systems (UIT2626 – 3)
- 4) Software Defined Networks (UIT2726 – 3)
- 5) IoT Architectures and Applications (UIT2734 – 3)
- 6) Real Time Embedded Systems (UIT2742 – 3) lit5
- 7) Mobile Autonomous Robots (UIT2826 – 3) lit5

III. Data Management and Analysis

- 1) Data Warehousing and Data Mining (UIT2523 – 3)
- 2) Business Analytics (UIT2623 – 3) lit5
- 3) Big Data Management (UIT2723 – 3) lit5
- 4) Healthcare Analytics (UIT2731 – 3) lit5
- 5) Social Network Analysis (UIT2738 – 3) lit5
- 6) Forensic Analytics (UIT2823 – 3) lit5

IV. Engineering Scalable Systems

- 1) Software Architecture and Principles(UIT2526-3)
- 2) Software Quality Assurance(UIT2624-3)
- 3) Software Project Management(UIT2724-3)
- 4) Microservices and DevOps(UIT2732-3) lit5s
- 5) Full Stack Development(UIT2739-3) lit5
- 6) Human Computer Interaction(UIT2824-3) lit5

V. Information Security

- 1) Cyber Security(UIT2524-3)
- 2) Block Chain Technologies(UIT2625-3)
- 3) Information Privacy(UIT2725-3)
- 4) Cyber Forensics and Information Security(UIT2733-3) lit5
- 5) Ethical Hacking(UIT2741-3) lit5
- 6) Fintech Security(UIT2825-3) lit5

VI. Augmented/Virtual/Mixed/Extended Reality

- 1) Computer Graphics and Multimedia(UIT2527-3) lit5
- 2) Introduction to AR/VR/MR/XR(UIT2627 3)
- 3) Video: Editing, Production, and Cinematography(UIT2727-3) lit5
- 4) 3D Modeling, Rendering, Animation, and Motion Graphics(UIT2735 -3) lit5
- 5) Emerging Technologies for AR/VR/MR/XR(UIT2743-3) lit5

COURSECODE	COURSETITLE	L	T	P	C
UEN2176	TECHNICAL ENGLISH	2	0	2	3

OBJECTIVES:

- To enhance competence in reading comprehension for Science and Technology.
- To improve the writing proficiency specific to proposals, reports, and letters.
- To develop speaking skills for technical presentations, GDs and public speaking.
- To strengthen the listening skills of the students to enable them to listen and comprehend lectures and talks.
- To strengthen the grammatical competency

UNIT 1 BASICS OF COMMUNICATION 9

Language development:	Subject-Verb Agreement, Tenses(simple), Conjunctions, Numerical adjective
Vocabulary development:	Root words–Prefixes & Suffixes, Standard abbreviations
Reading:	Comprehension of short technical texts-skimming and scanning,
Writing:	Describing an object, the process of an event/experiment and others, Paragraph Writing.
Listening:	Listening for taking notes and seeking clarifications (classroom lectures/ted talks etc.),
Speaking:	Self-introduction and introducing others/short conversations informal and informal contexts

UNIT 2 MAKING PRESENTATIONS 9

Language development:	The pronouns-antecedent agreement, Tenses-continuous, If conditionals, Adverbs
Vocabulary development:	Collocations and fixed expressions, Avoidance of Jargons
Reading:	Comprehension of longer texts–(Interpretative and Critical levels of meaning),
Writing:	Writing definitions (single sentence and extended), Expository and Persuasive Essays,
Listening:	Listening Comprehension Tasks,
Speaking:	Making technical presentations

UNIT 3 LISTENING TO SPEAK 9

Language development:	Prepositions, Tenses-perfect, Articles, Embedded sentences,
Vocabulary development:	Compound words, Formal and informal vocabulary,
Reading:	Reading reviews, advertisements, SOPs for higher studies
Writing:	Writing instruction and recommendations, formal and informal letters/emails, Writing SOPs
Listening:	Listening to longer technical talks and discussion
Speaking:	Demonstrating working mechanisms

UNIT 4 READING FOR SPEAKING**9**

Language development:	Reported speech, Active and Passive voices, Framing 'Wh' and 'Yes' or 'No' questions,
Vocabulary development:	Technical vocabulary, Verbal analogies,
Reading:	Reading industrial case studies, interpreting technical text and making notes
Writing:	Interpreting charts and graphs, writing blogs and vlogs
Listening:	Listening to telephonic conversations and online interviews
Speaking:	Participating in group discussions

UNIT5 PROFESSIONAL NEEDS**9**

Language development:	Phrasal verbs, clauses, compound and complex sentences
Vocabulary development:	Single-word substitutes, Vocabulary retention strategies,
Reading:	Reading for IELTS, GER, TOEFL
Writing:	Writing proposals and- reports, writing minutes of the meeting,
Listening:	Listening Skills for Proficiency Tests like IELTS
Speaking:	Job Interviews (face to face and online)–basics

TOTAL HOURS: 45**TEXTBOOK:**

- Praveen Sam,D.and Shoba N,A., Course in Technical English, Cambridge University Press, NewDelhi,2020.

REFERENCES:

- Sudharshana, N.P., and Saveetha, C., English for Technical Communication, Cambridge University Press, New Delhi,2016.
- Raman, Meenakshi, Sharma, and Sangeetha, Technical Communication Principles and practice, Oxford University Press, New Delhi,2014.
- Kumar, Suresh,E.,EngineeringEnglish,OrientBlackswan,Hyderabad,2015.
- BoothL. Diana, Project Work, Oxford University Press,2014.
- Grussendorf, Marion, English for Presentations, Oxford UniversityPress,2007.
- Means,L.Thomas and Elaine Langlois, English & Communication For + Colleges, Cengage Learning, USA, 2007.

COURSEOUTCOMES:

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

CO 1: To read and comprehend texts (technical)effectively.

CO 2: To write proposals, reports, emails, letters, SOPs meeting professional expectations.

CO 3: To Improve Vocabulary (use of right collocations, idioms and phrases etc).

CO 4: To enhance their grammatical competency for writing and speaking.

CO 5: To improve their ability to listen and comprehend at deeper levels.

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

COURSE CODE	COURSE TITLE	L	T	P	C
UMA2176	MATRICES AND CALCULUS (Common to all B.E./B. Tech. degree programs)	3	1	0	4

OBJECTIVES:

The objective of this course is to enable the student to

- To reduce quadratic form to canonical form of a matrix and identify its nature
- To analyse the convergence of infinite series
- To study the concept of evolute and envelope
- To find the extreme values for a function of two variables
- To compute area of closed surface and volume of solids using multiple integrals

UNIT I MATRICES

12

Characteristic equation - Eigenvalues and Eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors, Cayley-Hamilton Theorem – statement and applications, Diagonalization of matrices – Similarity transformation - Quadratic form - Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II SEQUENCES AND SERIES

12

Sequences - Definition and examples, Series - Types of Convergence, Series of positive terms, Tests of convergence - Comparison test, Integral test and D'Alembert's ratio test, Alternating series – Leibnitz's test, Series of positive and negative terms, Absolute and conditional convergence.

UNIT III APPLICATIONS OF DIFFERENTIAL CALCULUS

12

Curvature, radius of curvature - Cartesian and parametric co-ordinates – Centre of curvature – Circle of curvature in Cartesian form, Evolutes, Envelopes (including two parameter family), Evolute as envelope of normal.

UNIT IV FUNCTIONS OF SEVERAL VARIABLES

12

Partial derivatives – Total derivative – Differentiation of implicit functions – Jacobian and its properties – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT V MULTIPLE INTEGRALS

12

Double integrals in Cartesian and polar coordinates – Change of order of integration, Area enclosed by plane curves – Change of variables in double integrals, Triple integrals.

TOTAL HOURS: 60

TEXTBOOKS:

1. Grewal B.S, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2018.
2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, Inc., 10th Edition, 2016.

REFERENCES:

1. Bali N. P and Manish Goyal, "A Text book of Engineering Mathematics", Ninth Edition, Laxmi Publications Pvt Ltd., 2016.
2. James Stewart, Calculus: Early Transcendental, Cengage Learning, New Delhi, 7th Edition, 2013.
3. Dass, H.K., and Er. Rajnish Verma, "Higher Engineering Mathematics", S. Chand Private Ltd., 2011.
4. Srimanta Pal and Subodh C. Bhunia, Engineering Mathematics, Oxford University Press, 2015.

COURSE OUTCOMES

On successful completion of this course, the student will be able to

CO1: Reduce quadratic form to canonical form by orthogonal transformation and identify the nature of the quadratic form

CO2: Analyse the convergence of a given infinite series

CO3: Find evolute of a given curve and envelope of family of curves

CO4: Find the extrema of function of two variables

CO5: Evaluate the double and triple integrals

CO6: Application of extreme points of functions and multiple integrals in engineering Problems

CO – PO Mapping

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										
CO2	3	2										
CO3	3	2										
CO4	3	2										
CO5	3	2										
CO6	3	2										1

COURSECODE	COURSE TITLE	L	T	P	C
UPH2176	ENGINEERING PHYSICS (Common to all B.E./B.Tech. programs)	3	0	0	3

OBJECTIVES:

Enable the students to

- Comprehend and identify different crystal structures and their imperfections.
- Explain the elastic and thermal properties of materials and understand their significance.
- Develop an understanding of quantum mechanical phenomena and their applications.
- Provide an overview of the characteristics of sound, architectural acoustics and the production, detection and applications of ultrasound.
- Explain the origin of laser action, production of laser, fiber optics and their applications.

UNIT I CRYSTAL PHYSICS**9**

Single crystalline, polycrystalline and amorphous materials– single crystals - Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – Diamond and graphite structures (qualitative treatment) - Crystal Imperfections – Point, line (Edge and Screw dislocations –Burger vectors) Surface (stacking faults) and Volume defects.

UNIT II PROPERTIES OF MATTER AND THERMAL PHYSICS

9

Properties of matter: Elasticity- Hooke's law - Relationship between three moduli of elasticity– stress -strain diagram– Poisson's ratio –Factors affecting elasticity– Torsional stress & deformations – Twisting couple – Torsion pendulum - theory and experiment–bending of beams-bending moment– cantilever: theory and experiment–uniform and non-uniform bending: theory and experiment-I-shaped girders.

Thermal Physics: Modes of heat transfer – thermal conduction, convection and radiation – Newton's law of cooling - thermal conductivity- Lee's disc method for bad conductor – Radial heat flow – Rubber tube method – conduction through compound media (series and parallel) – Formation of ice on ponds.

UNIT III ACOUSTICS AND ULTRASONICS

9

Acoustics: Classification and characteristics of Sound - decibel - Weber–Fechner law – Sabine's formula - derivation using growth and decay method —factors affecting acoustics of buildings and their remedies - Methods of determination of Absorption Coefficient. **Ultrasonics:** Production of ultrasonics by Magnetostriction and piezoelectric methods – acoustic grating -Non Destructive Testing – pulse echo system through transmission and reflection modes - A, B and C – scan displays.

UNIT IV QUANTUM PHYSICS

9

Black body radiation – Planck's theory (derivation) – Deduction of Wien's displacement law and Rayleigh – Jeans' Law from Planck's theory – Compton Effect. Theory and experimental verification – Properties of Matter waves – wave particle duality - Schrödinger's wave equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one dimensional box and extension to three dimensional box – Degeneracy of electron energy states - Scanning electron microscope - Transmission electron microscope.

UNIT V PHOTONICS AND FIBRE OPTICS

9

Photonics: Spontaneous and stimulated emission- Population inversion -Einstein's A and B coefficients – Conditions for Laser action - Types of lasers – Nd: YAG, & CO₂ lasers-Basics of diode lasers-Industrial and Medical Applications. **Fibre optics:** Principle and propagation of light in optical fibres – Numerical aperture and Acceptance angle - Types of optical fibres (material, refractive index, mode) –Losses in fibers - attenuation, dispersion, bending - Fibre Optical Communication system (Block diagram) - Active and passive fibre sensors. - pressure and displacement.

TOTAL HOURS: 45

TEXTBOOKS:

1. Gaur, R.K., and Gupta, S.L., Engineering Physics, Dhanpat Rai Publishers, 2012.
2. Serway, R.A., & Jewett, J.W., Physics for Scientists and Engineers, Cengage Learning, 2010.

REFERENCES:

1. Halliday, D., Resnick, R. & Walker, J. Principles of Physics, Wiley, 2015.
2. Tipler, P.A. & Mosca, G. Physics for Scientists and Engineers with Modern Physics, WH Freeman, 2007.
3. Avadhanulu, M. N., Kshirsagar, P. G, A textbook of Engineering Physics, S. Chand & Co. Ltd., Ninth Revised Edition, 2012.

COURSE OUTCOMES:

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

- CO1: Analyze crystal structures and the influence of imperfections on their properties.
- CO2: Demonstrate and explain the general concepts of elastic and thermal properties of materials.
- CO3: Explain quantum mechanical theories to correlate with experimental results and their applications to material diagnostics.
- CO4: Analyze the applications of acoustics and ultrasonics to engineering and medical disciplines.
- CO5: Elucidate the principle and working of lasers and optical fibers, and their applications in the field of industry, medicine and telecommunication.

CO-PO Mapping:

Course Code & Name: UPH2176 ENGINEERING PHYSICS		PO's											
		1	2	3	4	5	6	7	8	9	10	11	12
CO1	Analyze crystal structures and the influence of imperfections on their properties.	3	2		1	1	-	2	-	-	2	-	-
CO2	Demonstrate and explain the general concepts of elastic and thermal properties of materials.	3	2		1	1	-	2	-	-	2	-	-
CO3	Explain quantum mechanical theories to correlate with experimental results and their applications to material diagnostics.	3	2		1	1	-	2	-	-	2	-	-
CO4	Analyze the applications of acoustics and ultrasonics to engineering and medical disciplines	3	2		1	1	-	2	-	-	2	-	-
CO5	Elucidate the principle and working of lasers and optical fibers, and their applications in the field of industry, medicine and telecommunication	3	2		1	1	-	2	-	-	2	-	-

COURSECODE	COURSE TITLE	L	T	P	C
UCY2176	ENGINEERING CHEMISTRY (Common to all B.E./B. Tech degree Programs)	3	0	0	3

OBJECTIVES:

- To impart knowledge to the students on the basic concepts of chemistry and properties of materials for various engineering applications

UNIT I ATOMIC AND MOLECULAR NANO CHEMISTRY**9**

Atoms- Atomic orbitals, Molecules- Molecular orbitals. Nanoparticles and its uniqueness. Distinction between molecules, nanoparticles and bulk materials. Classification of nanoparticles. Size dependent Properties-Thermal, Optical, Chemical, Electronic and Mechanical. Synthesis of nanomaterials - bottom-up and top-down approaches-Techniques- Colloidal, hydrothermal, electrodeposition, chemical vapour deposition, laser ablation. Objectives of surface modification of nanoparticles. Synthesis and applications - Carbon Nano Tubes (CNT) - Gold nanoparticle

UNIT II ELECTROCHEMISTRY**9**

Conductivity of electrolytes - factors influencing conductivity- Conductometric titration and its applications - estimation of strong acid, estimation of mixture of strong and weak acids and estimation of BaCl₂. Electrochemical cell-redox reaction-origin of electrode potential, Types of electrodes, Measurement of electrode potential and emf of the electrochemical cell -reference electrode- saturated calomel electrode and Ag/AgCl electrode - Ion selective electrode-glass electrode measurement of pH -Potentiometric titrations- estimation of ferrous ion and estimation of strong acid. Problems based on all the above concepts.

9

UNIT IV PHASE EQUILIBRIA

9

UNIT V SYNTHESIS AND APPLICATIONS OF INDUSTRIAL POLYMERS

9

TOTALHOURS: 45

1. Engineering Chemistry' by Jain P.C. and Monika Jain, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2015
2. Engineering Chemistry by S.S.Dara, S.Chand & Co.Ltd, New Delhi ,2011

1. T. Pradeep- NANO: The Essentials: Understanding Nanoscience and Nanotechnology, McGraw Hill Education; 2017(1st edition)
2. Gurdeep Raj, Phase Rule, GOEL Publishing House, Meerut, 2011.
3. R. Gopalan, K. Rangarajan, P.S. Subramanian. “Elements of Analytical Chemistry” Sultan Chand & Sons, 2003.
4. F.W. Billmayer, Textbook of Polymer Science, 3rd Edition, Wiley. N.Y. 1991.

On successful completion of this course, the students will be able to demonstrate understanding on

CO1: Apply the Principles of Electrochemistry for Qualitative Analysis

CO2: Detect/Identify various types of corrosion under severe to normal corrosive environments and provide appropriate solution.

CO3: Construct phase diagram of one and two component system and analyse its properties for application purposes.

CO4: Explain the synthesis, properties and applications of industrially important engineering materials

[illegible]

CO4	3									2		1		
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COURSECODE	COURSE TITLE	L	T	P	C
UGE2176	PROBLEM SOLVING AND PROGRAMMING IN PYTHON (Common to all B.E./B. Tech degree Programs)	3	0	0	3

OBJECTIVES:

- To learn algorithmic problem-solving techniques.
- To learn the fundamentals of python programming.
- To compose programs in Python using conditions, iterations and decompose a problem into functions
- To construct programs in Python sequenced data type.
- To develop python programs using advanced constructs like dictionaries and files.

UNIT I ALGORITHMIC PROBLEM SOLVING 9

Logical and Algorithmic Thinking: Logical Thinking – Algorithmic Thinking; Problem Solving and Decomposition: Defining the Problem – Devising the Solution – Decomposition; Effective building blocks: Basic Algorithmic Constructs (pseudo code, flow chart, programming language) – Program State.

UNIT II DATA, EXPRESSION, STATEMENT, CONDITIONAL 9

Data and types: int, float, boolean, string, list; variables, expressions, statements, simultaneous assignment, precedence of operators; comments; in-built modules and functions; Conditional: boolean values and operators, conditional (if), alternative (if-else), case analysis (if-elif-else).

UNIT III ITERATION, FUNCTION, STRINGS 9

Iteration: while, for, break, continue, pass; Functions: function definition, function call, flow of execution, parameters and arguments, return values, local and global scope, recursion; Strings: string slices, immutability, string functions and methods, string module.

UNIT IV LISTS, TUPLES 9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters, nested lists, list comprehension; Tuples: tuple assignment, tuple as return value, tuple operations.

UNIT V DICTIONARIES, FILES 9

Dictionaries: operations and methods, looping and dictionaries, reverse lookup, dictionaries and lists; Files: Text files, reading and writing files, format operator, file names and paths; command line arguments.

TOTAL HOURS:45

COURSE OUTCOMES:

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

- CO 1: Solve programming problems and express solutions in pseudo code.
- CO 2: Develop simple programs using basic constructs.
- CO 3: Construct programs using conditions and iterations decompose a problem into functions.
- CO 4: Make use of strings, lists, tuples and dictionaries data structures.
- CO 5: Perform Input/Output Operations using files.

TEXT BOOKS:

1. Karl Beecher, "Computational Thinking – A beginner's Guide to Problem Solving and Programming", British Computer Society (BCS), 2017.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition, Green Tea Press, Shroff/O'Reilly Publishers, 2015 (<http://greenteapress.com/wp/think-python/>)

REFERENCES:

1. John V Guttag, "Introduction to Computation and Programming Using Python", 3rd edition, MIT Press, 2021.
2. Ashok Namdev Kamthane, Amit Ashok Kamthane, "Programming and Problem Solving with Python", McGraw Hill Education (India) Private Limited, 2018.
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016.
4. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.
5. Kenneth A. Lambert, "Fundamentals of Python: First Programs", 2nd Edition, CENGAGE Learning, 2018.

CO-PO Mapping:

UGE2176 PROBLEM SOLVING AND PROGRAMMING IN PYTHON		PO's											
		1	2	3	4	5	6	7	8	9	10	11	12
CO1	Solve programming problems and express solutions in pseudo code.	2	1	-	-	-	-	-	-	-	-	-	-
CO2	Develop simple programs using basic constructs	2	2	-	-	-	-	-	-	-	-	-	-
CO3	Construct programs using conditions and iterations decompose a problem into functions.	2	3	2	1	-	-	-	-	-	-	-	-
CO4	Make use of strings, lists, tuples, and dictionaries data structures.	2	3	2	1	-	-	-	-	-	-	-	-
CO5	Perform Input/Output Operations using files.	2	2	2	1	-	-	-	-	-	-	-	-

COURSECODE	COURSE TITLE	L	T	P	C
UGE2177	ENGINEERING GRAPHICS (Common to all B.E./B. Tech degree Programs)	1	0	4	3

OBJECTIVES:

- To develop the graphic skills for communication of concepts, ideas and design of engineering products.
- To expose them to existing national standards related to technical drawings

CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATIONS):

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

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

Orthographic projection principles - Principal planes - First angle projection - Layout of views - 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.

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method.

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

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.

1. Natarajan, K.V., A Textbook of Engineering Graphics, Dhanalakshmi Publishers, Chennai, 33rd Edition, 2020. [ISBN:9788190414089]
2. Venugopal, K. and Prabhu Raja, V., Engineering Graphics, New Age International (P) Limited, 15th Edition, 2018. [ISBN :9789386649249]

1. Bhatt, N.D., Engineering Drawing, Charotar Publishing House, 53rd Edition, 2014. [ISBN: 9789380358963]
2. Basant Agarwal, and Agarwal, C.M., Engineering Drawing, McGraw Hill, 3rd Edition, 2019. [ISBN: 9789353167448]
3. Gopalakrishna, K.R., Engineering Drawing (Vol. I & II Combined), Subhas Publications, 27th Edition, 2017. [ISBN: 9789383214235]
4. Luzzader J Warren, and Jon M Duff, Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Pearson Education, 11th Edition, 2005. [ISBN :9789332549982]

1. IS 10711 – 2001: Technical products Documentation – Size and lay out 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.
1. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

1. There will be five questions, each of either-or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.

3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day.

COURSE OUTCOMES:

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

CO1: Draw Plane curves and perform Free hand sketching of three - dimensional objects.(BL: L3)

CO2: Draw the Orthographic projections of points, lines and plane surfaces. (BL: L3)

CO3: Draw the Projections of solids. (BL: L3)

CO4: Draw the Projections of sectioned solids and Development of surfaces. (BL: L3)

CO5: Draw the Isometric and Perspective projections of solids. (BL: L3)

CO-PO Mapping:

Course Code & Name: UGE2177ENGINEERING GRAPHICS		PO's											
		1	2	3	4	5	6	7	8	9	10	11	12
CO1	Draw Plane curves and perform Free hand sketching of three - dimensional objects.	3	2	2	-	-	2	-	-	-	3	-	-
CO2	Draw the Orthographic projections of points, lines and plane surfaces.	3	2	2	-	-	2	-	-	-	3	-	-
CO3	Draw the Projections of solids.	3	2	2	-	-	2	-	-	-	3	-	-
CO4	Draw the Projections of sectioned solids and Development of surfaces.	3	2	2	-	-	2		-	-	3	-	-
CO5	Draw the Isometric and Perspective projections of solids.	3	2	2	-	-	2	-	-	-	3	-	-

COURSECODE	COURSE TITLE	L	T	P	C
UGE 2197	PROGRAMMING IN PYTHON LABORATORY (Common to all B.E./B. Tech degree Programs)	3	0	0	1.5

OBJECTIVES:

- To write, test, and debug simple Python programs.
- To apply conditions and loops to solve problems using python.
- To implement programs using functions
- To write programs using different data types such as strings, lists tuples and dictionaries
- To perform read and write operations into the files.

SUGGESTIVE EXERCISES:

1. Use Linux shell commands, use Python in interactive mode, and an editor
2. Write simple programs (area of a geometric shape, simple interest, solve quadratic equation, net salary).
3. Write programs using conditional statements (leap year, maximum of 2 numbers, maximum of 3 numbers, simple calculator, grade of the total mark).
4. Develop programs using loops and nested loops (gcd, prime number, integer division, sum of digits of an integer, multiplication table, sum of a series, print patterns, square root using Newton's method).
5. Develop programs using functions (sine and cosine series, Pythagorean triplets).
6. Develop programs using recursion (efficient power of a number, factorial, Fibonacci number).
7. Develop programs using strings (palindrome, finding substring) without using in-built functions.
8. Develop programs using lists and tuples (linear search, binary search, selection sort, insertion sort, quicksort).
9. Develop programs using nested lists (matrix manipulations).
10. Develop simple programs using dictionaries (frequency histogram, nested dictionary).
11. Develop programs using Files (read and write files).
12. Develop programs to perform any task by reading arguments from command line.
13. Implement a simple application using appropriate datatypes and files

TOTAL HOURS: 45

COURSE OUTCOMES:

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

CO 1: Write, test, and debug simple Python programs.

CO 2: Build Python programs with conditionals and loops.

CO 3: Solve a problem using functions in python programming.

CO 4: Construct python programs using compound data like lists, tuples, and dictionaries.

CO 5: Build a simple application in teams using files and appropriate datatypes by applying the best programming practices.

Course Code & Name: UGE 2197 PROGRAMMING IN PYTHON LABORATORY		PO's											
		1	2	3	4	5	6	7	8	9	10	11	12
CO1	Write, test, and debug simple Python programs	2	2	-	-	-	-	-	1	-	-	-	-
CO2	Build Python programs with conditionals and loops.	3	3	-	1	-	-	-	1	-	-	-	-
CO3	Solve a problem using functions in python programming.	3	3	-	1	-	-	-	1	-	-	-	-
CO4	Construct python programs using compound data like lists, tuples, and	3	3	-	1	-	-	-	1	-	-	-	-

	dictionaries.												
CO5	Build a simple application in teams using files and appropriate datatypes by applying the best programming practices.	3	3	-	2	-	-	-	1	3	2	-	-

COURSE CODE	COURSE TITLE	L	T	P	C
UGA2176	HERITAGE OF TAMILS	1	0	0	1

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, Villu Pattu, Kaniyan Koothu, 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 ULTURE

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 : 15 PERIODS

TEXT – CUM – REFERENCE BOOKS

1. Social Life of Tamils (Dr. K.K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
2. Social Life of the Tamils - The Classical Period (Dr. S. Singaravelu) (Published by: International Institute of Tamil Studies.
3. Historical Heritage of the Tamils (Dr. S.V. Subaramanian, Dr. K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).

4. The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies.)
5. 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)
6. Studies in the History of India with Special Reference to Tamil Nadu (Dr. K.K. Pillay) (Published by: The Author)
7. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
8. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) – Reference Book.

COURSECODE	COURSE TITLE	L	T	P	C
UGS2197	PHYSICS AND CHEMISTRY LABORATORY	3	0	0	1.5

A. PHYSICS LABORATORY

COURSE OBJECTIVE:

The objective of this course is to enable the students to

- Obtain basic Knowledge about physics concepts applied in optics, thermal physics and properties of matter.

LIST OF EXPERIMENTS

(A minimum of 5 experiments to be performed from the given list)

1. Determination of the Young's modulus of the material of the given beam by Non-uniform bending method.
2. Determination of the rigidity modulus of the material of the given wire using torsion pendulum.
3. Determination of the wavelength of the mercury spectra using Spectrometer and grating.
4. Determination of the dispersive power of a prism using Spectrometer.
5. Determination of the grating element/wavelength, and particle size/ wavelength using a laser.
6. Determination of the Numerical and the acceptance angle of an optical fiber.
7. Determination of the thickness of a thin wire using interference fringes.
8. Determination of the coefficient of viscosity of the given liquid using Poiseuille's method.
9. Determination of the band gap energy of a semiconductor.
10. Determination of the coefficient of thermal conductivity of the given bad conductor using Lee's disc.

COURSE OUTCOMES

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

CO1: Apply principles of elasticity, optics, viscosity, thermal and band gap determination for engineering applications.

CO-PO/PSO MAPPING

[illegible]

B. CHEMISTRY LABORATORY

OBJEC

TIVE:

To impart hands on training for all the possible concepts learned in Engineering Chemistry Course

List of Experiments

(A minimum of 6 experiments to be performed from the given list)

1. Estimation of ferrous ion by potentiometric titration
2. Estimation of strong acid using pH meter.
3. Estimation of strong acid by conductometric titration
4. Estimation of mixture of strong and weak acids using conductometer
5. Estimation of BaCl_2 by conductometric titration
6. Determination of degree of polymerization of a water-soluble polymer by Viscosity method
7. Determination of equivalent conductance of a strong electrolyte at infinite dilution
8. Determination of weak acid using weak base by conductometric titration.
9. Determination of rate of corrosion by weight loss method

Total Hours: 45

TEXTBOOK:

Manual Prepared by Faculty of Chemistry Department, SSNCE

REFERENCE:

1. Practical Physical Chemistry, B.Viswanath and P.S.Raghavan, ViVa Books Pvt. Ltd., New Delhi, 2012.

COURSE OUTCOMES:

Upon successful completion of this course, the students will be able to

CO2: To understand the principles and procedures of pHmetry, potentiometry and conductometry

CO-PO mapping

[illegible]

COURSE CODE	COURSE TITLE	L	T	P	C
UMA2276	COMPLEX FUNCTIONS AND LAPLACE TRANSFORMS (Common to all Second semester B.E/B.Tech)	3	1	0	4

OBJECTIVES:

The objective of this course is to enable the student to

- Applying C-R equations in the construction of Analytic Functions.
- Study the methods of Complex Integration, finding Taylor's and Laurent's Series expansions.
- Find the Laplace Transforms and inverse transforms for standard functions.
- Solve Differential Equations using different techniques.
- Evaluate Line, Surface and Volume integrals.

UNIT I ANALYTIC FUNCTIONS

12

Analytic functions – necessary and sufficient conditions, Cauchy-Riemann equations in Cartesian and polar form (with proof) – Properties - harmonic functions, Construction of analytic function, conformal mapping - some standard transformations – $w = z + c$, cz , $\frac{1}{z}$, z^2 , bilinear transformation.

UNIT II COMPLEX INTEGRATION

12

Line integral - Cauchy's integral theorem – Cauchy's integral formula, Taylor's and Laurent's series, Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour (except the poles on the real axis).

UNIT III LAPLACE TRANSFORMS

12

Definition, properties, existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function, shifting theorems, Transforms of derivatives and integrals, Initial and final value theorems, Periodic functions, Inverse transforms – Convolution theorem.

UNIT IV ORDINARY DIFFERENTIAL EQUATIONS

12

Solution of second and higher order linear differential equation with constant coefficients ($f(x) = e^{mx}$, $\sin mx$, $\cos mx$, x^n , $f(x)e^{mx}$, $f(x)\sin mx$), Method of variation of parameters, Simultaneous linear equations with constant coefficients of first order, Solving linear second order ordinary differential equations with constant coefficients using Laplace transforms.

UNIT V VECTOR CALCULUS

12

Gradient and directional derivative – Divergence and curl – Vector identities – Irrotational and Solenoidal vector fields, Line integral over a plane curve, Surface integral - Area of a curved surface, Volume integral, Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

TOTAL HOURS: 60

TEXT BOOKS:

1. Grewal, B.S., Higher Engineering Mathematics, 44th Edition, Khanna Publishers, 2018.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, Inc., 2016.

REFERENCE BOOKS:

1. Bali, N.P., Goyal, M., Watkins, C., Advanced Engineering Mathematics, Laxmi Publications Pvt. Limited, 2007.
2. Boyce, W.E., and DiPrima, R.C., Elementary Differential Equations and Boundary Value Problems, 11th Edition, Global Edition, Wiley, 2017.
3. George B. Thomas Jr., Maurice D. Weir, Joel R. Hass, Thomas' Calculus: Early Transcendental, 13th Edition, Pearson Education, 2014.
4. O'Neil. P. V., Advanced Engineering Mathematics, 7th Edition, Cengage Learning India Pvt., Ltd, New Delhi, 2012.
5. Howard Anton, Irl C. Bivens, Stephen Davis, Calculus Early Transcendentals, 11th Edition, Global Edition, John Wiley & Sons, Inc., 2017.
6. Srimanta Pal and Subodh C. Bhunia, Engineering Mathematics, Oxford University Press, 2015.
7. Srivastava, A.C., and Srivastava, P.K., Engineering Mathematics Volume I and II, PHI learning Pvt. Ltd, 2011.

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

CO1: solve problems in Analytic functions and construction of analytic functions using C-R equations
 CO2: solve problems using integration techniques, find Taylor's and Laurent's Series expansions
 CO3: obtain the Laplace Transforms and inverse transforms of standard functions.
 CO4: solve Differential Equations using different techniques
 CO5: evaluate Line, Surface and Volume integrals
 CO6: application of Complex integration, Laplace transforms, Ordinary differential equations, and vector calculus in engineering problems

CO-PO Mapping:

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										
CO2	3	2										
CO3	3	2										
CO4	3	2										
CO5	3	2										
CO6	3	2										1

COURSE CODE	COURSE TITLE	L	T	P	C
UEE2276	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	3	0	0	3

OBJECTIVES:

- To learn the basic concepts of electric circuits.
- To know the operation of various electrical machines.
- To study the concepts of utilization of electrical power.
- To comprehend the working principle of electronic devices and its applications.
- To grasp the working principle of various sensors and transducers.

UNIT I ELECTRICAL CIRCUITS**9**

DC Circuits: Ohm's Law- Kirchhoff's laws - Mesh current and Node voltage methods (Analysis with only independent source). Network theorems - Superposition theorem, Thevenins theorem and Norton theorem. AC circuit: Waveforms and RMS value, Phasor diagram, Power, Power factor. Three phase supply – Star connection, Delta connection –Balanced Loads - Power in three-phase systems.

UNIT II ELECTRICAL MACHINES**9**

Construction, Principle of Operation, Basic Equations and Applications - DC Generators, DC Motors, Single Phase Transformer, Single phase Induction Motor, Three phase Induction Motor, Three phase Alternator, Stepper and BLDC motors.

UNIT III UTILIZATION OF ELECTRICAL POWER**9**

Renewable energy sources- wind and Solar panels. Illumination by lamps- Sodium Vapour, Mercury vapour, Fluorescent tube. Batteries-NiCd, Pb Acid and Li ion Charge and Discharge Characteristics. Protection- Earthing, Fuses. Energy Tariff calculation for domestic loads.

UNIT IV ELECTRONIC DEVICES AND APPLICATIONS**9**

Operation of PN junction diodes, VI characteristics, Zener diode, BJT- CB, CE, CC configurations, input and output characteristics, MOSFET. Half wave and full wave rectifier, capacitive filters, zener voltage regulator, Operational amplifiers, Ideal Op-Amp characteristics, Inverting and Non-inverting amplifier.

UNIT V SENSORS AND TRANSDUCERS**9**

Sensors: Capacitive and resistive sensors, magnetic sensors, Hall effect sensors, Piezo-resistive sensors, viscosity, optical sensors, Ultrasonic sensors, Nuclear and microsensors. Transducers: Classification of transducers, strain gauges, RTD, thermocouples, Piezo-electric, LVDT and Thermo electric transducers

TOTAL HOURS: 45**TEXT BOOKS:**

1. Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", McGraw Hill Education, 2014
2. Alan S. Moris, Principles of Measurements and Instruments, Prentice Hall of India Pvt. Ltd., New Delhi, 1999.
3. S.Salivahanan, R.Rengaraj and G.R.Venkatakrishnan, Basic Electrical, Electronics and Measurement Engineering, McGrawHill, 2017.

REFERENCES:

1. S.B. Lal Seksena and Kaustuv Dasgupta, Fundaments of Electrical Engineering, Cambridge, 2016.
2. M.S. Sukhija and T.K. Nagsarkar, Basic Electrical and Electronic Engineering, Oxford, 2016.
3. S.K.Sahdev, Basic of Electrical Engineering, Pearson, 2015.
4. Edward Hughes, John Hiley, Keith Brown and Ian McKenzie Smith "Electrical And Electronic Technology" Pearson Education Ltd, 10 th Edition, 2008
5. H.Cotton, "Electrical Technology" 7th Edition, CBS; 2005

COURSE OUTCOMES:

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

CO1: Solve and analyse DC and AC circuits.

CO2: Explain the operating principle of AC and DC machines.

CO3: Know the concepts electrical power utilization.

CO4: Describe the working principle of various electronic devices and its applications

CO5: Describe the working principle of various sensors and transducers.

COs	POs
-----	-----

	1	2	3	4	5	6	7	8	9	10	11	12
1	3	3	2		2	1						1
2	3	2	1			1						
3	3	2	1		2	1						
4	3	2	1									
5	3	2	1									

COURSE CODE	COURSE TITLE	L	T	P	EL	C
UIT2201	PROGRAMMING AND DATA STRUCTURES	3	0	2	0	4

OBJECTIVES:

The objective of this course is to enable the students to

- understand the concepts of ADTs and implement them using Python
- design and implement linear data structures – lists, stacks, and queues
- design, analyze, and implement sorting, searching, and hashing algorithms
- formulate problems using tree and graph structures and solve them using Python

UNIT I ABSTRACT DATA TYPES

9

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

UNIT II LINEAR STRUCTURES

9

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

UNIT III SORTING AND SEARCHING

9

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

UNIT IV TREE STRUCTURES

9

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

UNIT V GRAPH STRUCTURES

9

Graph ADT – representations of graph – graph traversals – DAG – topological ordering – shortest paths – minimum spanning trees – disjoint sets

LECTURE HOURS: 45

TEXTBOOK:

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

REFERENCES:

1. Lee, Kent D., Hubbard, Steve, “Data Structures and Algorithms with Python” Springer Edition 2015
2. Rance D. Necaie, “Data Structures and Algorithms Using Python”, John Wiley & Sons, 2011
3. Aho, Hopcroft, and Ullman, “Data Structures and Algorithms”, Pearson Education, 1983.
4. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, “Introduction to

Algorithms", Second Edition, McGraw Hill, 2002.

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

LABORATORY COMPONENT:

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

**LABORATORY
HOURS: 30
TOTAL HOURS: 75**

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

CO1: Implement ADTs as Python classes.

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

CO3: Design, implement, and analyze sorting, searching, and indexing techniques.

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.

COs	POs												PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2		
1	2	1														
2	2	2	1										2			
3	2	2	1										2			
4	2	2	1										2			
5	2	2	1										2			
COURSE CODE		COURSE TITLE										L	T	P	EL	C
UIT2211		SOFTWARE DEVELOPMENT PROJECT – I										0	0	3	0	1.5

Students will be divided into teams of size not exceeding seven. Each team will be given a project as a context. Teams will be mentored to follow best software engineering practices to develop data-structure-intensive software. The grading rubrics are as outlined below:

1. Processes: PSP, Scrum, DevOps

: 5%

- | | |
|---|-------|
| 2. Management: Estimation, WBS, Planning, Tracking | : 5% |
| 3. Risk Management | : 5% |
| 4. Coding, Testing, and Configuration Management | : 25% |
| 5. Automation of routine tasks | : 5% |
| 6. Meetings: “Customer” meetings, review meetings, brain-storming | : 5% |
| 7. Presentations | : 25% |
| 8. Documentations | : 25% |

TOTAL HOURS: 45

REFERENCES:

1. Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, “Data Structures & Algorithms in Python”, John Wiley & Sons Inc., 2013.
2. Watts S. Humphrey, “PSP: A self-improvement process of software engineers”, Pearson Education, 2005.
3. Roger S. Pressman, “Software Engineering – A practitioner’s Approach”, Seventh Edition, McGraw-Hill International Edition, 2017.
4. Ian Sommerville, “Software Engineering”, Tenth Edition, Pearson Education Asia, 2017.
5. Alan D. Moore, “Python GUI programming with Tkinter”, Second Edition, Packt Publishing Ltd., 2021.
6. Joshua M. Willman, “Beginning PyQt: A hands-on approach to GUI programming with PyQt6”, Second Edition, APress, 2022.

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

CO1: Design and develop data structure intensive software systems by applying best practices for IT project management.

CO2: Communicate efficiently in team meetings & presentations and prepare documents for data structure intensive software systems.

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	3	3		2				2		2	1	2	
2	2	3	3						3	3	1			

COURSE CODE	COURSE TITLE	L	T	P	C
ACY2276	ENVIRONMENTAL SCIENCE	3	0	0	0

OBJECTIVES:

The students of Engineering undergoing this Course would develop a

- Better understanding of human relationships, perceptions and policies towards the environment
- Focus on design and technology for improving environmental quality

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 9

Definition, scope and importance of environment– concept, structure and function of an ecosystem – energy flow- food chains, food webs and ecological pyramids – ecological succession. Introduction to biodiversity definition and types– values of biodiversity- India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity-endangered and endemic species of India -conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

UNIT II NATURAL RESOURCES 9

Uses, over-exploitation of natural resources: Forest, Water, Mineral, Food, Energy and Land. Case studies on over exploitation of natural resources -Role of an individual in conservation of natural resources- Equitable use of resources for sustainable life styles.

UNIT III CURRENT ENVIRONMENTAL ISSUES 9

Environmental issues– causes, effects and control measures of Pollution of (a) Air (Smog, acid rain, climate change and global warming, ozone layer depletion) (b) Water (rain water harvesting, watershed management and waste water treatment) (c) Soil (solid waste management, wasteland reclamation) (d) Electronic waste. Population explosion, Resettlement and rehabilitation of people and Disaster management.

UNIT IV ENGINEERING INTERVENTIONS TO REDUCE ENVIRONMENTAL STRESSES 9

Role of information technology in environment- Remote Sensing- satellites and sensors- Geographical Information Systems(GIS)-Applications. Environment data base management system. Green chemistry- Principles - Green buildings-Advantages of green buildings over conventional buildings-Electric and Hybrid Electric Vehicles (HEV).

UNIT V ENVIRONMENTAL REGULATIONS 9

Environmental Ethics for sustainable development- Human rights- Environmental Impact Assessment– Ecomark-role of NGO- Central and state pollution control boards- Air (Prevention and Control of Pollution) act 1981– Water (Prevention and control of Pollution) act 1974– Wildlife protection act 1972 – Forest conservation act 1980- The National Green Tribunal Act 2010.

TOTAL HOURS: 45

TEXT BOOKS:

1. Anubha Kaushik and C. P. Kaushik, Environmental Science and Engineering, New Age International Publishers, 14th Edition, 2014.
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006

REFERENCES:

1. Gilbert M. Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
3. G. Tyler Miller and Scott E. Spoolman, "Environmental Science", Cengage Learning India PVT, LTD, Delhi, 2014

COURSE OUTCOMES:

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

CO1: The structure and functions of the ecosystems and diversity among life forms within an ecosystem

CO2: The importance of various natural resources and its sustainable use

CO3: The various environmental issues such as pollution, population explosion etc and suggest remedial measures.

CO4: The role of engineering techniques to minimize environmental stress

CO5: The role of various environmental machineries and to ensure proper environmental regulation

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

COURSE CODE	COURSE TITLE	L	T	P	C
UPH2251	PHYSICS FOR INFORMATION SCIENCE AND TECHNOLOGY	3	0	0	3

OBJECTIVES:

Enable the students to

- Understand the transport properties of conducting materials and their modelling using classical and quantum theories.
- Analyze the physics of semiconductors and relate their microscopic properties to observable bulk phenomena.
- Understand the origin of magnetism and data storage principles.
- Study the fundamentals of optical materials and their applications to display devices.
- Develop an overview of Nanomaterials and their applications to Nanodevices.

UNIT I SEMI CONDUCTING MATERIALS

9

Classification of solids- Conductors – classical free electron theory of metals – Electrical and thermal conductivity – Band theory of solids (qualitative), Intrinsic semiconductor – Bond and energy band diagrams – Concept of hole - carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – extrinsic semiconductors –

UNIT II SEMI CONDUCTOR DEVICES

9

Formation of PN junction – energy band diagram – biased and unbiased conditions – BJT – Current gain and voltage gain – common emitter, common base and common collector configurations – Field effect - MOSFET – common source, common drain and common gate configurations – CMOS ICs.

UNIT III DATA STORAGE PRINCIPLES

9

Origin of magnetic moment – Bohr magneton, atomic magnetic moments – magnetic permeability and susceptibility – Microscopic and macroscopic classification of magnetic materials – comparison of Dia and para magnetism and Ferro magnetism – Ferromagnetism : origin and exchange interaction – saturation magnetization and Curie temperature – Domain theory – Hysteresis (based on domain theory) – soft and hard magnetic materials – Magnetic principles in computer data storage – Magnetic hard disc – GMR Sensor- Principle of GMR- Parts of a magnetic hard disc - CD-ROM- WORM- Magneto-optical storage, recording and reading systems - Holographic optical data storage.

UNIT IV OPTICAL MATERIALS AND DISPLAY DEVICES

9

Absorption emission and scattering of light in metals, insulators and semiconductors (concepts only)- Carrier generation and recombination in semiconductors – LED – OLED – Semiconductor Laser diodes (Homo and double heterojunction)– Photodetectors– Photo diodes and Photo conductors (concepts only) – Solar cell – Liquid crystal display - Charged Coupled Devices.

UNIT V NANO DEVICES

9

Nano materials – Properties, Applications, Size effect - Density of states in quantum well, quantum wire and quantum dot structures – Quantum confinement- Quantum well and Quantum dot lasers- Franz-

Keldysh effect-Quantum Confined Stark effect-Quantum Well Electro Absorption modulators-Magnetic semiconductors – Spintronics.

TOTAL HOURS: 45

TEXTBOOKS:

1. Adaptation by Balasubramanian, R., Callister's Material Science and Engineering, Wiley India Pvt. Ltd., 2nd Edition, 2014.
2. Kasap, S.O., Principles of Electronic Materials and Devices, (Special Indian Edition) McGraw-Hill Education, 3rd Edition, 2017.

REFERENCES:

1. Pal Laboratory Bhattacharya, Semiconductor Optoelectronic Devices, Pearson, 2nd Edition, 2017.
2. Umesh K Mishra & Jasprit Singh, Semiconductor Device Physics and Design, Springer, 2008.
3. Wahab, M.A., Solid State Physics: Structure & Properties of Materials, Narosa Publishing House, 2009.
4. Gaur, R.K. & Gupta, S.L., Engineering Physics, Dhanpat Rai Publishers, 2012.
5. Salivahanan, S., Rajalakshmi, A., Karthie, S., Rajesh, N.P., Physics for Electronics Engineering & Information Science, McGraw Hill (India) Private Limited, 2018.
6. Avadhanulu, M.N., P.G. Shirsagar, A Text Book of Engineering Physics, S. Chand & Co. Ltd. Ninth Revised Edition, 2012
7. Theuwissen, A.J., Solid state imaging with Charge-Coupled Devices, Kluwer-Academic Publisher, Springer 1995.

COURSE OUTCOMES:

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

CO1: Estimate the conducting properties of materials based on classical and quantum theories and understand the formation of energy band structures.

CO2: Acquire knowledge on basics of semiconductor physics and its application to PN junction devices.

CO3: Elucidate the function of magnetic and optical properties of materials in data storage devices.

CO4: Explain the functioning of modern display devices.

CO5: Apply quantum mechanics of nanostructures and their application to Nano devices for optoelectronic switching.

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3											2	
CO2	3	3											2	
CO3	3	3											2	
CO4	3	3											2	
CO5	3	3											2	

COURSE CODE	COURSE TITLE	L	T	P	C
UGA2276	TAMILS AND TECHNOLOGY	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)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

UNIT III MANUFACTURING TECHNOLOGY 3

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

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY 3

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

UNIT 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 : 15 PERIODS

TEXT – CUM – REFERENCE BOOKS

1. Social Life of Tamils (Dr. K.K. Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
2. Social Life of the Tamils - The Classical Period (Dr. S. Singaravelu) (Published by: International Institute of Tamil Studies.
3. Historical Heritage of the Tamils (Dr. S.V. Subaramanian, Dr. K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
4. The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies.)
5. 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)
6. Studies in the History of India with Special Reference to Tamil Nadu (Dr. K.K. Pillay) (Published by: The Author)
7. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
8. Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by: RMRL) – Reference Book.

Course Code	Course Title	L	T	P	C
UGE2297	DESIGN THINKING AND ENGINEERING PRACTICES LABORATORY	0	0	3	1.5
Objectives: <ul style="list-style-type: none"> To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering To train the students to dismantle, understand the functional / aesthetic aspects of the product, prepare the part functional model, and to assemble the different engineering components 					
List of Experiments:					

GROUP A (CIVIL & MECHANICAL ENGINEERING PRACTICE)

I - CIVIL ENGINEERING PRACTICE

Buildings:

Study of plumbing and carpentry components of residential and industrial buildings - Safety aspects.

Plumbing Works:

- (a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, and elbows in household fittings.
- (b) Preparation of plumbing line sketches for water supply and sewage works.
- (c) Hands-on-exercise:
 - Basic pipe connections - Mixed pipe material connection - Pipe connections with different joining components.
 - Plumbing with basic connections for washing basin and sink

Carpentry using Power Tools only:

- (a) Study of the joints in roofs, doors, windows and furniture.
- (b) Hands-on-exercise: Wood work, joints by sawing, planing and cutting.
 - Fabrication of different models of pencil box and pen stand.
 - Fabrication of wooden wall shelf
- (c) Demonstration of wood working machinery

II - MECHANICAL ENGINEERING PRACTICE

Basic Machining:

- (a) Drilling Practice (holes of various diameters - steel sheet metal, wood, hylam/plywood sheet)

Sheet Metal Work

- (a) Forming & Bending
- (b) Different type of joints.
 - Fabrication of mobile phone metal stand
 - Fabrication of electrical control panel box

Design thinking practices

To dismantle, understand the functional / aesthetic aspects of the product, prepare the part functional model, and to assemble the following components.

- Pedestal Fan head swing mechanism - Reserve mechanism (Two wheeler) - Hot Glue gun - Paper clips - Flush tank container mechanism - Hand pump – washer Mechanism

GROUP B (ELECTRICAL & ELECTRONICS ENGINEERING PRACTICE)

1. Residential house wiring, staircase wiring and tube light wiring with single phase AC two wire system.
2. Energy measurement with RLC Load.
3. Earth resistance measurement.
4. Measurement of AC parameters using CRO and half wave and Full wave rectifier.
5. Study of logic gates AND, OR, EX-OR & NOT.
6. Soldering practice – Components Devices and Circuits – Using PCB.

Design thinking practices

1. Assemble a single phase 3 wire circuit for connecting household appliances and explain through schematic diagram
2. Measure the energy consumed by the household appliances and verify it theoretically
3. Analyze the fault occurring in electrical appliances
4. Design, assemble and test a cell phone charger
5. Design, assemble and test a relay logic to control electrical appliances.
6. Design, assemble and test a dc power supply using PCB

Total Periods:45

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

CO1: Draw pipeline plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household woodwork (K2)

CO2: Practice machining to make holes on different materials; fabricate sheet metal components (K2)
CO3: Dismantle, understand the functional / aesthetic aspects of the product, prepare the part functional model of various components (K2)
CO4: Construct domestic electrical circuits and verify their output parameters (K3)
CO5: Construct electronics circuits and verify their output (K3)
References:
1. Willis H. Wagner, Howard "Bud" Smith, and Mark W. Huth Modern Carpentry, 12th Edition, 2015
2. P.C.Sharma, Production Technology (Manufacturing Process): Manufacturing Process, S.Chand publisher, 2006
3. Robert W. Messler, Reverse Engineering: Mechanisms, Structures, Systems & Materials, McGraw-Hill Education, 2014
4. David W Rongey , A Complete Guide to Home Electrical Wiring, 2013
5. K.Jeyachandran, S.Natarajan & S, Balasubramanian, "A Primer on Engineering Practices Laboratory", Anuradha Publications, (2007).

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
1	3	2		1					2	1		1
2	3	2		1					2	1		1
3	3	2		1					2	1		1
4	3	3	3	3					3	1		1
5	3	3	3	3					3	1		1

COURSE CODE	COURSE TITLE	L	T	P	C
UMA2377	DISCRETE MATHEMATICS (Common to Third semester CSE and IT)	3	1	0	4

OBJECTIVES

The objective of this course is to enable the student to

- study the concepts of classical logic, normal forms and its applications.
- solve problems using different counting techniques.
- learn the basic concepts in graph theory and prove simple properties.
- study the algebraic structures.
- study the concept of Boolean algebra.

UNIT I LOGIC AND PROOFS

12

Propositional Logic–Propositional equivalences–Predicates and quantifiers– Nested quantifiers– Rules of inference–Introduction to proofs–Proof methods and strategy–Normal forms– Applications to switching circuits.

UNIT II COMBINATORICS

12

Mathematical induction–Strong induction–The pigeon hole principle–Recurrence relations–Partition of Integers–Solving linear recurrence relations using generating functions –Inclusion and Exclusion Principle and its applications.

UNIT III GRAPHS

12

Graphs–Graph terminology and special types of graphs–Subgraphs–Matrix representation of graphs and

UNIT IV ALGEBRAIC STRUCTURES

12

UNIT V LATTICES AND BOOLEAN ALGEBRA

12

TOTAL HOURS: 60

1. Kenneth H Rosen, “Discrete Mathematics and its Applications”, 7th Edition, Special Indian edition, Tata McGraw Hill, New Delhi, 2017.
2. Tremblay JP and Manohar R, “Discrete Mathematical Structures with Applications to Computer Science”, 30th Reprint, Tata McGraw Hill, New Delhi, 2011.

1. Ralph P Grimaldi, “Discrete and Combinatorial Mathematics: An Applied Introduction”, 4th Edition, Pearson Education Asia, 2007.
2. Eric Lehman, F Tom Leighton, Albert R Meyer, Mathematics for Computer Science, Samurai Media Limited, 2017.
3. Thomas Koshy, “Discrete Mathematics with Applications”, Elsevier Publications, 2006.
4. Seymour Lipschutz, Mark Lipson, “Discrete Mathematics”, Schaum’s Outlines, 3rd Edition, Tata McGraw Hill, 2010.
5. CLLiu, DP Mohapatra, “Elements of Discrete Mathematics”, 4th Edition, McGraw Higher Education, 2017.
6. John M Harris, Jeffry L Hirst, Michael J Mossinghoff, “Combinatorics and Graph Theory”, Springer verlag New York, 2008.

On successful completion of this course, the student will be able to

CO1: Write simple proofs using Propositional and First Order Logics

CO2: Solve problems using different counting techniques

CO3: Prove simple graph properties.

CO4: Explain basic concepts in group theory such as semigroups, monoids and groups.

CO5: Solve problems in partial ordering relations, equivalence relations and lattices.

CO6: Application of Graph theory and Boolean algebra in engineering problems

[illegible]