

B.Tech

Scheme and Syllabus

of

B. TECH. CYBER SECURITY

By

Skill Department of Computer Science & Engineering
Skill Faculty of Engineering & Technology



w.e.f. Academic Session 2026-27

Shri Vishwakarma Skill University

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**It is certified that this version of Scheme and Syllabus, revised
and checked by us, is completed in all respects.**

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VISION AND MISSION

VISION OF UNIVERSITY

To emerge as one of the foremost institutions of quality in skill education acknowledges by industry, nationally and internationally.

MISSION OF UNIVERSITY

To focus on quality of skill education, aspired by students and admired by industry, nationally and internationally.

VISION OF THE DEPARTMENT

To build highly skilled and competent professionals with a futuristic outlook for research and innovation who can also generate sustainable employment with virtuous professional values.

MISSION OF THE DEPARTMENT

- To impart skill education and training as per industry needs in the domain of Computer Science & Engineering.
- To develop and maintain the state of art infrastructure for building sustainable skilled IT ecosystem in the domain.
- To cultivate the environment for fostering new ideas, research and innovations leading to emergence of skilled entrepreneurs, leaders, innovators and professionals.



Program Outcomes (POs)

The following are the PO's defined for the Graduate program in Engineering by NBA:

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

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

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

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

Program Educational Objectives (PEOs)

PEO 1: To produce engineering graduates with skill and knowledge in basic science, Mathematics & Engineering for the application in the domain.

PEO 2: To produce engineering graduates who can demonstrate technical competence in the field of Computer Science in order to develop solutions to the complex problems.

PEO 3: To produce engineering graduates who will continue to learn and adapt latest technologies to solve real life problems.

PEO 4: To produce graduates who contribute to the development of nation effectively in a multi-disciplinary environment.

PEO 5: To produce graduates who pursue research for sustainable development of self and nation.

Program Specific Objectives (PSOs)

At the end of course, Student:

PSO 1: Understand the fundamental concepts of Cyber Security, Computer Science, and Information Security along with their applications in emerging technological domains such as Artificial Intelligence, Cloud Computing, Blockchain, IoT, and Digital Forensics.

PSO 2: Apply technical knowledge, modern tools, and advanced cyber security technologies to identify vulnerabilities, protect digital systems, and solve real-world security challenges effectively and efficiently.

PSO 3: Analyze, design, and develop secure, reliable, and sustainable solutions for protecting networks, systems, applications, and data while demonstrating professional ethics, legal compliance, and concern for societal well-being.

PSO 4: Design, implement, and evaluate secure architectures and blockchain-based solutions for engineering and industrial applications using secure programming practices, cryptographic techniques, penetration testing, and cyber defence mechanisms.

Mapping of PO, PEO and PSO's

POs	PEO1	PEO2	PEO3	PEO4	PEO5	PSO1	PSO2	PSO3	PSO4
PO1	3	3	2	1	2	3	3	2	3
PO2	2	3	2	1	2	2	3	3	2
PO3	2	3	2	2	2	2	3	3	3
PO4	2	3	2	1	3	2	3	2	2
PO5	2	3	3	1	2	2	3	2	3
PO6	1	2	2	3	1	1	2	3	2
PO7	1	1	2	3	3	1	1	2	1
PO8	1	2	2	3	2	1	2	3	2
PO9	1	2	2	3	1	1	2	2	2
PO10	1	2	2	3	1	1	2	2	1
PO11	1	2	2	3	2	1	2	2	2
PO12	2	2	3	2	3	2	3	2	3



Scheme and Syllabus of B. TECH. CYBER SECURITY

w.e.f. Academic Session 2026-27

Semester I											
Sr. No.	Course Code	Course Title	L	T	P	Credits	Marks				
							I	E	Total		
1	24UPHY03	Applied Physics	3	1	0	4	15	35	50	BS	
2	24UPHY04	Applied Physics Lab	0	0	2	1	35	15	50	BS	
3	24UCSE01	Programming with C	2	0	0	2	30	70	100	PC	
4	24UCSE02	Programming with C Lab	0	0	4	2	35	15	50	PC	
5	24UBEE01	Basic Electrical & Electronics Engineering	3	0	0	3	30	70	100	ES	
6	24UBEE02	Basic Electrical & Electronics Engineering Lab	0	0	2	1	35	15	50	ES	
7	24UENG01	English Language and Business Communication	1	0	0	1	15	35	50	HS	
8	24UENG02	English Language and Business Communication Practical	0	0	2	1	35	15	50	HS	
9	24UMTH03	Engineering Mathematics-I	3	1	0	4	30	70	100	BS	
10	24UENV01	Environmental Science	2	0	0	-	30	70	100	AU	
11	26UGCSE01	Introduction to Disruptive Technologies	1	0	0	1	35	15	50	PC	
Total			15	2	10	20					
Semester II											
Sr. No.	Course Code	Course Title	L	T	P	Credits	Marks				
							I	E	Total		
1	24UMTH04	Engineering Mathematics - II	3	1	0	4	30	70	100	BS	

2	24UCEE02	Digital Electronics	3	0	0	3	30	70	100	ES	
3	24UCEE03	Digital Electronics Lab	0	0	2	1	35	15	50	ES	
4	24UCSE03	Data Structures	3	0	0	3	30	70	100	PC	
5	24UCSE04	Data Structures Lab	0	0	2	1	35	15	50	PC	
6	24UCHM03	Applied Chemistry	3	1	0	4	30	70	100	BS	
7	24UCHM04	Applied Chemistry Lab	0	0	2	1	35	15	50	BS	
8	26UCEC01	Basics of Python Programming	3	0	0	3	30	70	100	PC	
9	26UCEC02	Basics of Python Programming Lab	0	0	4	2	35	15	50	PC	
10	24UCSE05	Design Project-I	0	0	2	1	35	15	50	PC	
Total			15	2	12	23					

Note: Students will undergo Summer Internship (4-6 weeks) will be between 2nd and 3rd semester and will be evaluated in 3rd semester via viva voce.

For Exit after 1st year : To obtain the UG Certificate in Computer Science and Engineering (Artificial Intelligence/Machine Learning), the student must fulfil following credit requirements.

Skill Component Courses after First Year							
Sr. No.	Course Code	Course Title	L	T	P	Credits	Remarks
1	24UCEW01	Summer Internship/Project (min. 4 weeks)	-	-	-	4	The 4 credits will be counted as Skill Component/Vocational Course Credits for UG Certification in relevant field (preferably in the field of AI and ML or any other disruptive technology.)
Total			-	-	-	4	

Entry requirement for 2nd year: Candidate with Diploma in appropriate branch of Engineering/ UG Certificate/ Equivalent Vocational or Technical Program level 4.5. Bridge courses to be identified and offered as per requirement.

Semester III										
Sr. No.	Course Code	Course Title	L	T	P	Credits	Marks			
							I	E	Total	
1	24UCSE06	Discrete Mathematics	4	0	0	4	30	70	100	PC
2	24UCSE07	Computer Organization and Architecture	4	0	0	4	30	70	100	PC
3	24UCSE08	Database Management	3	0	0	3	30	70	100	PC

		Systems									
4	24UCSE09	Database Management Systems Lab	0	0	2	1	35	15	50	PC	
5	26UBCS01	Introduction to Cyber Security	2	0	0	2	30	70	100	PC	
6	26UBCS02	Introduction to Cyber Security Lab	0	0	2	1	35	15	50	PC	
7	24UCEC05	Computer Network Essentials	3	0	0	3	30	70	100	PC	
8	24UCEC06	Computer Network Essentials Lab	0	0	2	1	35	15	50	PC	
9	24UCEW01	Summer Internship I (4-6 weeks)*/Project	-	-	-	4	35	15	50	PW	
10	24UYHS01	Yoga and Health Skills-II	2	0	0	-	30	70	100	AU	
Total			18	0	6	23					
Semester IV											
Sr. No.	Course Code	Course Title	L	T	P	Credits	Marks				
							I	E	Total		
1	24UCSE14	Operating Systems	3	0	0	3	30	70	100	PC	
2	24UCSE15	Operating System Lab	0	0	2	1	35	15	50	PC	
3	26UBCS03	Cryptography & Network Security	3	0	0	3	30	70	100	PC	
4	24UCSE12	Design and Analysis of Algorithms	3	0	0	3	30	70	100	PC	
5	24UCSE13	Design and Analysis of Algorithm Lab	0	0	2	1	35	15	50	PC	
6	24UHPE01	Human Values and Professional Ethics	2	0	0	2	30	70	100	HS	
7	26UBCS04	Linux and System Administration	3	0	0	3	30	70	100	ES	
8	26UBCS05	Linux and System Administration Lab	0	0	2	1	35	15	50	ES	
9	24UCEW02	Minor Project-I	0	0	4	2	35	15	50	PW	
Total			14	0	10	19					

Note: Students continuing Next academic session, will undergo Summer Internship (6 weeks) will be between 4th and 5th semester and will be evaluated in 5th semester via viva voce.

For Exit after 2nd Year: UG Diploma in Computer Science and Engineering (Artificial Intelligence/Machine Learning), for earning the student, the student must fulfil following credit requirements.

<i>Skill Component Courses after First Year</i>							
Sr. No.	Course Code	Course Title	L	T	P	Credits	Remarks
1	24UCEW04	Summer Internship (min. 4 weeks)	-	-	-	4	The 4 credits will be counted as Skill Component/Vocational Course Credits for UG Certification in relevant field (preferably in the field of AI and ML or any other disruptive technology.)
Total			-	-	-	4	

Entry requirement for 3rd year: A candidate with 10+3+1/12+2/ UG Diploma (Engg.) in appropriate domain with level 5. Bridge courses to be identified and offered as per requirement.

Semester V											
Sr. No	Course Code	Course Title	L	T	P	Credits	Marks			Category	
							I	E	Total		
1	26UBCS06	Digital Forensics	3	0	0	3	30	70	100	PC	
2	26UBCS07	Digital Forensics Lab	0	0	2	1	35	15	50	PC	
3	26UBCS08	Cloud Computing and Cloud Security	3	0	0	3	30	70	100	PC	
4	26UBCS10	Ethical Hacking & Penetration Testing	3	0	0	3	30	70	100	PC	
5	26UBCS11	Ethical Hacking & Penetration Testing Lab	0	0	2	1	35	15	50	PC	
6	26UBCS12	MLOps & AIOps for Cyber Security	3	0	0	3	30	70	100	PC	
7	24UCEW03	Minor Project-II	0	0	4	2	35	15	50	PW	
8	—	Open Elective-I	3	0	0	3				OE	
9	24UCEW04	Summer Internship - II (4 – 6 weeks)*	-	-	-	4	70	30	100	PW	
Total			15	0	8	23					

Semester VI											
Sr. No	Course Code	Course Title	L	T	P	Credits	Marks			Category	
							I	E	Total		
1	26UBCS13	Intrusion Detection & Prevention Systems	3	0	0	3	30	70	100	PC	
2	26UBCS14	Intrusion Detection & Prevention Systems Lab	0	0	2	1	35	15	50	PC	
3	26UBCS15	DevOps and Cloud Automation	3	0	0	3	30	70	100	PC	
4	26UBCS16	DevOps and Cloud Automation Lab	0	0	2	1	35	15	50	PC	
5	26UBCS17	Security Operations Centre (SOC)	3	0	0	3	30	70	100	PC	
6	26UBCS18	Cyber Laws & IT Compliance	2	0	0	2	30	70	100	PE	
6	24UCEW05	Capstone Project-I	0	0	10	5	70	30	100	PW	
7	—	Open Elective-II	3	0	0	3	6			OE	
Total			14	0	14	21					

Note: Students continuing Next academic session, will undergo Summer Internship (6 weeks) will be between 6th and 7th semester and will be evaluated in 7th semester via viva voce.

For Exit after 3rd Year: Bachelor of Sciences (B.Sc.) in Computer Science Engineering (Artificial Intelligence/Machine Learning).

Entry requirement for 4th year: A candidate with 3 yrs. Bachelor degree in Vocation / B.Sc (Engg.)/ UG Degree with level 5.5. Bridge courses to be identified and offered as per requirement.

Semester VII											
Sr. No.	Course Code	Course Title	L	T	P	Credits	Marks				
							I	E	Total		
1	26UBCS19	Cyber Threat Intelligence	3	0	0	3	30	70	100	PE	
2	26UBCS20	Security Protocols	3	0	0	3	30	70	100	PC	

		& Standards									
3	26UBCS21	Security Protocols & Standards Lab	0	0	2	1	35	15	50	PC	
4	26UBCS22	Advanced Network Security	3	0	0	3	30	70	100	PE	
5	26UBCS23	Advanced Network Security Lab	0	0	2	1	35	15	50	PE	
6	26UBCS24	Vulnerability Assessment & Security Auditing	3	0	0	3	30	70	100	PC	
7	24UCEW06	Capstone Project - II	0	0	10	5	70	30	300	PW	
9	24UCEW07	Summer Internship III(6 weeks) *	-	-	-	4	70	30	100	PW	
		Total	12	0	14	23					
Semester VIII											
Sr. No.	Course Code	Course Title	L	T	P	Credits	Marks				
							I	E	Total		
1	24UCEW08	Internship	-	-	-	10	350	150	500	PW	
2		Open Elective-II via (MOOC)	3	0	0	3	30	70	100	OE	
2		Open Elective-III via (MOOC)	3	0	0	3	30	70	100	OE	
Total			6	0	0	16					
TOTAL CREDITS						168					

List of Open Elective courses

- 1 Entrepreneurship Development
- 2 Bioinformatics
- 3 Real Time Operating System
- 4 Embedded Systems
- 5 Computational Neuroscience
- 6 Rural Technology & Community Development
- 7 Economics
- 8 Game Theory with Engineering Applications
- 9 Cyber Law and Ethics

*May be decided at the time of offering by the Department. # The Elective may be chosen at the time of offering

The following common courses will be offered by respective Skill Faculty for all students enrolled for that course as per approved scheme:

A. Ability Enhancement Courses (AEC):

- Communication Skill/ English by SFASH
- Employability Skills by SFASH

- Human Values and Professional Ethics Skills by SFASH
- Entrepreneurship Skills by SFMSR

B. Value Added Courses (VAC):

- Understanding India Skills by SFASH
- Yoga and Health Skills by SFASH
- Environmental Studies Skills by SFASH

The Board of Studies approved syllabus, course code, evaluation scheme, credits etc. of these courses will be provided by the respective Skill Faculty/Departments to all Faculties/Departments of the university.

Category Wise Courses:

1. Humanity and Social Science Courses								
S.No.	Course Code	Course	L	T	P	To		
1.	24UENG01	English Language and Business Communication	1	0	0	1		HS
2.	24UENG02	English Language and Business Communication Practical	0	0	2	1		HS
3.	24UHPE01	Human Values and Professional Ethics	2	0	0	2		HS
					Total	4		
2. Basic Science Course								
S. No.	Couse Code	Course	L	T	P	To		
1	24UPHY03	Applied Physics	3	1	0	4		BS
2	24UMTH03	Engineering Mathematics-I	4	0	0	4		BS
3	24UPHY04	Applied Physics Lab	0	0	2	1		BS
4	24UMTH04	Engineering Mathematics - II	4	0	0	4		BS
5	24UCHM03	Applied Chemistry	3	1	0	4		BS
6	24UCHM04	Applied Chemistry Lab	0	0	2	1		BS
					Total	18		
3. Engineering Science Course								

S.No.	Course Code	Course	L	T	P	To		
1	24UBEE01	Basic Electrical & Electronics Engineering	3	0	0	3		ES
2	24UBEE02	Basic Electrical & Electronics Engineering Lab	0	0	2	1		ES
3	24UCEE02	Digital Electronics	3	0	0	3		ES
4	24UCEE03	Digital Electronics Lab	0	0	2	1		ES
5	26UBCS04	Linux and System Administration	3	0	0	3		ES
6	26UBCS05	Linux and System Administration Lab	0	0	2	1		ES
					Total	12		
4. Program Core Course								

Sr. No.	Course Code	Course Title	L	T	P	Credits	
1	24UCSE01	Programming with C	2	0	0	2	PC
2	24UCSE02	Programming with C Lab	0	0	4	2	PC
3	26UGCSE01	Introduction to Disruptive Technologies	1	0	0	1	PC
4	24UCSE03	Data Structures	3	0	0	3	PC
5	24UCSE04	Data Structures Lab	0	0	2	1	PC
6	24UCEC01	Basics of Python Programming	3	0	0	3	PC
7	24UCEC02	Basics of Python Programming Lab	0	0	4	2	PC
8	24UCSE05	Design Project-I	0	0	2	1	PC
9	24UCSE06	Discrete Mathematics	4	0	0	4	PC
10	24UCSE07	Computer Organization and Architecture	4	0	0	4	PC
11	24UCSE08	Database Management Systems	3	0	0	3	PC
12	24UCSE09	Database Management Systems Lab	0	0	2	1	PC
13	24UBCS01	Introduction to Cyber Security	2	0	0	2	PC
14	24UBCS02	Introduction to Cyber Security Lab	0	0	2	1	PC
15	24UCEC05	Computer Network Essentials	3	0	0	3	PC
16	24UCEC06	Computer Network Essentials Lab	0	0	2	1	PC
17	24UCSE14	Operating Systems	3	0	0	3	PC
18	24UCSE15	Operating System Lab	0	0	2	1	PC
19	24UBCS03	Cryptography & Network Security	3	0	0	3	PC
20	24UCSE12	Design and Analysis of Algorithms	3	0	0	3	PC
21	24UCSE13	Design and Analysis of Algorithm Lab	0	0	2	1	PC
22	24UBCS06	Digital Forensics	3	0	0	3	PC
23	24UBCS07	Digital Forensics Lab	0	0	2	1	PC
24	24UBCS08	Cloud Computing and Cloud Security	3	0	0	3	PC
25	24UBCS10	Ethical Hacking & Penetration Testing	3	0	0	3	PC
26	24UBCS11	Ethical Hacking & Penetration Testing Lab	0	0	2	1	PC
27	24UBCS12	MLOps & AIOps for Cyber Security	3	0	0	3	PC
29	24UBCS13	Intrusion Detection & Prevention Systems	3	0	0	3	PC
30	24UBCS14	Intrusion Detection & Prevention Systems Lab	0	0	2	1	PC
31	24UBCS15	DevOps and Cloud Automation	3	0	0	3	PC
32	24UBCS16	DevOps and Cloud Automation Lab	0	0	2	1	PC
33	24UBCS17	Security Operations Centre (SOC)	3	0	0	3	PC



34	24UBCS20	Security Protocols & Standards	3	0	0	3	PC
35	24UBCS21	Security Protocols & Standards Lab	0	0	2	1	PC
36	24UBCS24	Vulnerability Assessment & Security Auditing	3	0	0	3	PC
					Total	77	
5. Professional Elective Course							
Sr No	Course code	Course Title	L	T	P	Credits	
1	26UBCS18	Cyber Laws & IT Compliance	2	0	0	2	PE
2	26UBCS19	Cyber Threat Intelligence	3	0	0	3	PE
3	26UBCS22	Advanced Network Security	3	0	0	3	PE
4	26UBCS23	Advanced Network Security Lab	0	0	2	1	PE
					Total	9	
6. Open elective Course							
Sr No	Course Code	Course Title	L	T	P	Credits	
1	-	Open Elective-I	3	0	0	3	OE
2	-	Open Elective-II	3	0	0	3	OE
3	-	Open Elective-II via (MOOC)	3	0	0	3	OE
4	-	Open Elective-III via (MOOC)	3	0	0	3	OE
					Total	12	
7. Project Work, Seminar and Internship in Industry							
Sr No	Course Code	Course Title	L	T	P	Credits	
2	24UCEW02	Minor Project-I	0	0	4	2	PW
3	24UCEW03	Minor Project -II	0	0	4	2	PW
4	24UCEW01	Summer Internship I(4-6 weeks)	-	-	-	4	PW
5	24UCEW04	Summer Internship II(6 weeks)	-	-	-	4	PW
6	24UCEW07	Summer Internship III(6 weeks)	-	-	-	4	PW
7	24UCEW08	Internship	-	-	-	10	PW
8	24UCEW05	Capstone Project - I	0	0	10	5	PW
9	24UCEW06	Capstone Project - II	0	0	10	5	PW
					Total	36	

8. Ability Enhancement Course							
SNo	Course Code	Course Title	L	T	P	Credits	
1	24UYHS01	Yoga and Health Skills-II	2	0	0	-	AEC
2	24UHPE01	Human Values and Professional Ethics	2	0	0	-	AEC
		TOTAL	168				

Table 5. List of Open Elective courses

1. Entrepreneurship Development	6. Rural Technology & Community Development
2. Bioinformatics	7. Economics
3. Real Time Operating System	8. Game Theory with Engineering Applications
4. Embedded Systems	9. Cyber Law and Ethics
5. Computational Neuroscience	10. * May be decided at the time of offering by the department. #

The Elective may be chosen at the time of offering

Evaluation Scheme

w.e.f. Academic Session 2024-25

Type of Exam	Internal	External	Total
Theory Subject	30	70	100
Practical Subject	35	15	50

Division of Theory Internal Marks

Class Attendance	Assignment / Quiz / Presentation / Class Performance / Conduct	Sessional 1	Sessional 2	Total
5	15	5	5	30

Division of Practical Internal Marks

Lab Attendance	Practical Performance / Conduct	Practical File	Viva -Voce	Total
5	10	10	10	35

Division of Practical External Marks

Lab Written Exam	Practical Performance	Viva -Voce	Total
5	5	5	15

Table 1. Division of Internal Marks

Examination	Attendance/ Conduct	Synopsis	Presentation	Report	Viva -Voce	Total
Summer Internship - I/II/III	10	-	20	20	20	70
Minor Project - I/II	5	5	5	10	10	35

Capstone Project - I and II	10	10	10	20	20	70
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Table 2. Division of Internship / OJT Internal Marks

Examination	Attendance / Conduct	Internship / OJT Performance or Presentation				Report	Mid Term Viva -Voce	End Term Viva -Voce	Total
		After Ist month	After 2nd month	After 3rd month	After 4th month				
Internship / OJT	20	20	20	20	20	30	40	40	210

Table 3. Division of External Marks

Examination	Presentation	Report	Viva -Voce	Total
Summer Internship - I/II/III	10	10	10	30
Minor Project - I/II	5	5	5	15
Capstone Project - I and II	10	10	10	30
Internship / OJT	30	30	30	90

Instruction for External Practical Examination*:

Exams duration will be as following:

1. Theory exams will be of 03 hours duration.
2. External Practical exams will be of 03 hours duration.
3. External Summer Internships / Minor Projects / Capstone Projects / Internship / OJT exams will be of 02 hours duration.

Instruction for Theory Paper Examination*:

1. There should be 09 questions in the End Term Examination question paper.
2. The Question paper consists of two Sections. All sections are compulsory.
3. Section A comprises 1 question and 10 sub-parts / sub-questions of short answer type and covers the entire syllabus. All questions are compulsory. Each question carries 2 marks.
4. Section B comprises 8 long answer type questions out of which students must attempt any 5. Each question carries 10 marks. The paper shall consist of 5 units as per the syllabus. Every unit shall have two questions. Individual questions may contain sub-parts / sub-questions.
5. Each unit shall have a marks weightage of 14.
6. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.



7. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

*- Format of the Question Paper may be changed as per University Examination Ordinance / Policy in vogue at the time of examination.

Syllabus

of

B. TECH. CYBER SECURITY

Semester 1

24UMTH03 : Engineering Mathematics - I							
B. Tech.							
Semester – I							
L	T	P	Credits	Core Course	Internal Examination	:	30
3	1	0	4	24UMTH03	External Examination	:	70
Effective from Session:				2024-2025	Total	:	100
Date of BoS approval:				23-07-2024	Duration of Exam	:	3 Hrs.
Prerequisite							
Instruction for Paper Setter:							
1. There should be 11 questions in the end term examinations question paper.							
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type questions of total 20 marks.							
3. Apart from question 1 which is compulsory, the rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.							
4. Each Unit shall have a marks weightage of 14.							
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.							
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.							

Course Objective:

The objective of the paper is to facilitate the student with the basics of Applied Mathematics that are required for an engineering student. To impart basic knowledge on complex numbers, series, basics of calculus, linear algebra and matrices.

Course Outcomes:

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

- CO1. Apply differential and integral calculus to notions of curvature and to improper integrals. Apart from some other applications they will have a basic understanding of Beta and Gamma functions.



Explain the fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.

CO2. Discuss the tool of power series and Fourier series for learning advanced Engineering Mathematics.

CO3. Explain the tools of differentiation and integration of functions of a complex variable that are used in various techniques dealing with engineering problems.

CO4. Students should be able to apply linear algebra techniques to solve engineering problems.

CO5. Illustrate the mathematical tools needed in evaluating matrices and linear equations.

Course Contents:

Unit I

Calculus: Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions. Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin's theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and minima.



Unit II

Sequences and Series: Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

Unit III

COMPLEX VARIABLES: Real and complex numbers, basic properties and geometry. Cauchy-Riemann equations, Analytic functions, Harmonic functions, Derivatives of analytic functions, Contour integrals, Taylor's, Maclaurin's, Laurent's series. Zeros and poles, Cauchy Residue Theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.

Unit IV

Linear Algebra: Vector spaces, Subspaces, basis and dimension, linear transformations, representation of transformations by Matrices, linear functionals, transpose of linear transformations, canonical forms. Linear functionals and adjoints, Bilinear forms, symmetric bilinear forms, skew symmetric bilinear forms.

Unit V

Matrices: Linear Systems of Equations; Linear Independence; Determinants; Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.

Text books:

1. Reena Garg, Engineering Mathematics - I, Khanna Book Publishing Company, 2020.
2. B.S Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

Reference Books:

1. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. R.V. Churchill and J.W. Brown, Complex Variables and Applications, 5th edition, McGraw Hill, 1990.

Applied Physics/ Engineering Physics							
B.Tech (Common for all Branches)							
Semester – I							
L	T	P	Credits	Core Course	Internal Examination	:	15
3	1	0	4	24UPHY03	External Examination	:	35
Effective from Session:				2024-2025	Total	:	50
Date of BoS approval:				23-07-2024	Duration of Exam	:	3 Hrs
Prerequisite							
Instruction for Paper Setter:							
1. There should be 11 questions in the End Term examinations question paper. 2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type questions of total 20 marks. 3. Apart from question 1 which is compulsory, the rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions. 4. Each Unit shall have a marks weightage of 14. 5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook. 6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.							

Course Objective:

The objective of the course is to strengthen the fundamentals of physics and then build an interface of theoretical concepts with their industrial/engineering applications.

Course Outcome:

By the end of this course, the student will be able to:

CO1. Understand the role interference, diffraction and polarization.

CO2. Develop the basic understanding of lasers and fibres with their applications in various fields.

CO3. Understand and apply the basic phenomenon of quantum mechanics.

CO4. Explain the basics of electrostatics, magneto statics and electromagnetic laws.

CO5. Apply the acquired knowledge in understanding and designing the nano technology.

UNIT I

Wave optics: Interference of light by amplitude division; Interference due to thin films: Newton's rings, Michelson interferometer. Farunhoffer diffraction from a single slit, double slit, and N-slit, Diffraction gratings, Rayleigh criterion for limit of resolution; Resolving power of grating and telescope. Polarization in light, Double refraction, Nicol prism, Quarter and half wave plates, Production and analysis of plane, Circularly and elliptically polarized light, specific rotation, Polarimeter.

UNIT II

Lasers and Fiber Optics: Properties of laser beams, Different types of lasers: solid-state laser (ruby), gas laser (He-Ne), semiconductor laser; applications of lasers in science, and engineering. Need for



fiber Optic Communication, Total Internal Reflection (TIR), Acceptance angle and numerical aperture, Step index and graded index fibers, Applications of optical fibers.

UNIT III:

Quantum Physics: Inadequacy of classical physics, need for quantum physics, Historical overview, Plank's hypothesis, Quantization of energy, Origin of quantum theory, Photoelectric effect, de Broglie hypothesis – matter waves, Wave Particle duality, Wave-packets, Phase velocity and Group velocity, Experimental evidence of de Broglie's hypothesis: Davisson–Germer experiment, Heisenberg uncertainty principle.

UNIT IV: Electromagnetic Theory: Faraday's law, Lenz's law, Differential form of Faraday's law expressing curl of electric field in terms of time-derivative of magnetic field and calculating electric field due to changing magnetic fields, energy stored in a magnetic field. displacement current and magnetic field arising from time-dependent electric field, Maxwell's equation in vacuum and non-conducting medium.

UNIT V: Nanoscience and technology

Nanomaterials, types of nanomaterials, properties of nanomaterials; Density of states (0 dimensional, 1-dimensional, 2-dimensional, 3-dimensional), Top-down and bottom up approaches, Characterization of nanomaterials (Scanning Electron microscopes and Transmission electron microscopes).

Textbook

1. David Griffiths, Introduction to Electrodynamics
2. Nouredine Zettili, Quantum Mechanics: Concepts and Applications
3. A. Ghatak, Optics, 7th Edition, McGraw Hill Education (India) Pvt Ltd.
4. O. Svelto, Principles of Lasers, 5th Edition, Springer.
5. Shotwell, K. Thyagarajan, Introduction to Fiber Optics, 1st Edition, Pearson Education India
6. Avadhanulu M. N. and P G Kshirsagar, A Text Book of Engineering Physics, 7th Edition, S. Chand
7. H K Malik and A K Singh, Engineering Physics, 2nd Edition, McGraw Hill Education (India) Pvt Ltd.

Applied Physics Lab							
B.Tech (Common for all Branches)							
Semester – I							
L	T	P	Credits	Core Course	Internal Examination	:	35
0	0	2	1	24UPHY04	External Examination	:	15
Effective from Session:				2024-2025	Total	:	50
Date of BoS approval:				23-07-2024	Duration of Exam	:	3 Hrs
Prerequisite							

Course Objectives: The objective of the course is to strengthen the fundamentals of physics and then build an interface of theoretical concepts with their industrial/engineering applications.

Course Outcomes:

After completing this subject, student should be able to:

CO1. Understand the motion of electrons in the magnetic field and resonance phenomenon.

CO2. Apply the knowledge learned in calculating the charge and mass of an electron.

CO3. Understand basic concepts of quantum mechanics through experiments.

CO4. Apply the tunneling concept for building new-age technology.

CO5. Solve Schrodinger equation using C and Python programming languages.

List of Experiments:

1. RC, LC, RL and LCR circuits.
 - a. Series and Parallel RC, LC, RL and LCR circuits.
 - b. Resonance in Series and Parallel RC, LC, RL and LCR circuits.
2. The magnetic field from the Helmholtz coil.
 - a. Variation of the magnetic field due to a circular current-carrying coil on an axial point.
 - b. Determination of Helmholtz Coil radius.
 - c. Verification of Superposition principle using Helmholtz coil.
3. Experiments on electromagnetic induction and electromagnetic braking.
 - a. Study of the electromotive force (EMF) induced as a function of the velocity of the magnet.
 - b. Study of the charge delivered due to induction.
 - c. Study of electromagnetic (EM) damping.
4. Cathode ray experiment
 - a. Study of Lorentz force in a vacuum tube
 - b. Measurement of specific charge (e/m) in a vacuum tube
5. Experimental Verification of the Heisenberg Uncertainty Principle
6. Determine the wavelength of He-Ne Laser using a double slit experiment.
7. Photoelectric effect
 - a. Determine Planck's constant and Work function

- b. Verify the inverse square law of.
8. Measurement of Lorentz force in a vacuum tube.
9. Electron Spin Resonance (ESR) Spectrometer Experiment.
 - a. Determine magnetic field as a function of frequency.
 - b. Determine Lande's g-factor for free electrons.
10. Determine the wavelength of He-Ne Laser using a double slit experiment.
11. Oil drop experiment
 - a. Measurement of the terminal velocity of the drop.
 - b. Determine the charge on a drop.
12. Solution of the one-dimensional Schrodinger equation for "particle in a harmonic potential" using C and Python programming.

Note: Minimum 8 Experiments to be performed

Textbooks:

1. David Griffiths, Introduction to Electrodynamics
2. H.C. Verma, Quantum Physics

References:

1. B.Sc. Practical Physics, Geeta Sanon
2. B.Sc. Practical Physics, C. L. Arora
3. Halliday and Resnick, Physics
4. W. Saslow, Electricity, magnetism and light

Course Code: Theory: 24UCSE01 Lab: 24UCSE02	Programming with C	Credits: 4 (L-T-P-C): (2-0-4-4)	Int. Th. Examination: 30 Ext. Th. Examination: 70 Duration of Exam: 3 hours	
Offered for	UG	Course Type	Core ☒	Elective
Date of BoS Approval	July, 2024	Course Status	New ☒	Modification
To take effect from	2024-25	Prerequisite	NIL	

Course Objective:

- To acquire problem solving skills
- To be able to develop flowcharts
- To understand structured programming concepts
- To be able to write programs in C Language

Course Contents:



Unit 1

Introduction to Computers: Computer Systems, Computing Environments, Computer Languages, Creating and Running Programs, Software Development, Flow charts. Number Systems: Binary, Octal, Decimal, Hexadecimal.

Introduction to C Language: Background, C Programs, Identifiers, Data Types, Variables, Constants, Input / Output Statements.

Arithmetic Operators and Expressions: Evaluating Expressions, Precedence and Associativity of Operators, Type Conversions.

Unit 2

Conditional Control Statements: Bitwise Operators, Relational and Logical Operators, If, If-Else, Switch-Statement and Examples. Loop Control Statements: For, While, Do- While and Examples. Continue, Break and Go to statements

Functions: Function Basics, User-defined Functions, Inter Function Communication, Standard Functions, Methods of Parameter Passing. Recursion- Recursive Functions.

Storage Classes: Auto, Register, Static, Extern, Scope Rules, and Type Qualifiers.

Unit 3

Preprocessors: Preprocessor Commands

Arrays: Concepts, Using Arrays in C, Inter-Function Communication, Array Applications, Two-Dimensional Arrays, Multidimensional Arrays, Linear and Binary Search, Selection and Bubble Sort.

Unit 4

Pointers: Introduction, Pointers for Inter-Function Communication, Pointers to Pointers, Compatibility, L value and R value, Arrays and Pointers, Pointer Arithmetic and Arrays, Passing an



Array to a Function, Memory Allocation Functions, Array of Pointers, Programming Applications, Pointers to void, Pointers to Functions, Command- line Arguments.

Strings: Concepts, C Strings, String Input/Output Functions, Arrays of Strings, String Manipulation Functions.

Unit 5

Structures: Definition and Initialization of Structures, Accessing Structures, Nested Structures, Arrays of Structures, Structures and Functions, Pointers to Structures, Self- Referential Structures, Unions, Type Definition (typedef), Enumerated Types.

Input and Output: Introduction to Files, Modes of Files, Streams, Standard Library Input/output Functions, Character Input/output Functions.

Laboratory Objective:

The objective of the laboratory course is to give exposure to the student about the implementation of different algorithms in C language.

Laboratory Contents: List of practicals are

1. Finding the maximum and minimum of given set of numbers
2. Finding Roots of a Quadratic Equation
3. Sin x and Cos x values using series expansion
4. Conversion of Binary to Decimal, Octal, Hexa and vice versa
5. Generating a Pascal triangle and Pyramid of numbers
6. Recursion: Factorial, Fibonacci, GCD
7. Matrix addition and multiplication using arrays
8. Bubble Sort, Selection Sort
9. Programs on Linear Search and Binary Search using recursive and non-recursive procedures.
10. Functions for string manipulations
11. Finding the no. of characters, words and lines of given text file
12. File Handling programs.

Suggested Textbooks / Reference Books:

1. B.A. Forouzan and R.F. Gilberg, “A Structured Programming Approach in C”, Cengage Learning, 2007.

Reference Books:

1. Kernighan BW and Ritchie DM, “The C Programming Language”, 2nd Edition, Prentice Hall of India, 2006.
2. Rajaraman V, “The Fundamentals of Computer”, 4th Edition, Prentice-Hall of India, 2006.
3. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.
4. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.



BASIC ELECTRICAL AND ELECTRONICS ENGINEERING(BEEE)

Course Title	Basic Electrical and Electronics Engineering	Course Code	24UELE01 24UELE02			
Specialization	Engineering Science	Structure (LTPC)	3	0	1	4
Offered for	UG	Status	Core ✓		Elective	
Faculty	SFET	Type	New ✓		Modification	
Pre-requisite	Nil	To take effect from	2024-2025			
Submission date	23-07-2024	Date of approval by BoS	25-07-2024			
Course Objective:	The objective of this course is to provide students with a fundamental understanding of electrical and electronics principles, circuits, machines, semiconductor devices and their applications, energy generation and distribution, as well as troubleshooting and safety practices.					
Course Outcome:	After completion of the course, the student will be able to: 1. Apply fundamental electrical concepts to analyze and solve DC circuit problems. 2. Apply fundamental electrical concepts to analyze and solve AC circuit problems. 3. Comprehend the principles and working of electrical machines and transformers. 4. Understand the characteristics and applications of semiconductor devices and logic gates. 5. Analyze and interpret electrical energy generation, distribution systems and diagnose & rectify electrical faults while ensuring safety.					
Contents of the course	UNIT I: DC Circuit Analysis Fundamentals of Electric Circuits: Charge, Current, Resistance, Voltage, Ohm's Law, Kirchhoff's Laws, Ideal DC voltage and current sources, Electric Power and sign convention, open circuit voltage, short circuit current, voltage division rule, current division rule, Practical DC voltage and current sources, Source Transformation UNIT II: AC Circuit Analysis AC Networks: Energy storage elements-Inductance and Capacitor, Generation of sinusoidal emf, phasor representation of alternating quantities, Average and RMS values, Peak Factor, Form Factor, AC circuit analysis through: Purely resistive, inductive & capacitive circuit, RL, RC and RLC circuit, Active Power, Reactive Power, Apparent Power, Power Factor, Impedance, Admittance, Resonance in series and parallel RLC circuit, Star and Delta connection in three phase system, voltage and current relations in star and delta connections UNIT III: Electrical Machines and Transformers Transformer: Principle of Operation, Concept of Ideal Transformer, EMF Equation, Voltage transformation ratio and current ratio, Classification: Core Type and Shell Type DC Machines: Principle and Construction of DC Generator, EMF equation of DC generator, Types of DC generators: Separately and Self-Excited, DC Motors: Types and Applications Three phase Induction Motor: Principle of operation, slip, applications UNIT IV: Semiconductors and its Applications Semiconductor materials: Intrinsic and Extrinsic, n-type and p-type semiconductor, p-n junction, p-n junction diode, forward bias and reverse bias, V-I characteristics of diode, Zener Diode UNIT V: Electrical Energy Generation, Distribution and Safety					



	Power generation and power plants, Transmission and distribution systems, Electrical substations and switchgear, Power factor correction, Energy meters and energy management Troubleshooting techniques for electrical systems, Safety procedures and precautions in electrical work, Protection devices (Fuse, MCB) and grounding systems, Electrical codes and regulations, Introduction to electrical maintenance and repair.
Textbook	1. Principles and applications of Electrical Engineering by Giorgio Rizzoni, McGraw Hill Education, 6th Edition (2015) 2. "Electric Circuits" by James W. Nilsson and Susan A. Riedel, Pearson 3. "Electric Machinery Fundamentals" by Stephen J. Chapman 4. "Semiconductor Physics and Devices" by Donald A. Neamen 5. "Electrical Power Systems: Design and Analysis" by Mohamed E. El-Hawary 6. "Electrical Safety Handbook" by John Cadick and Mary Capelli-Schellpfeffer 7. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010. 8. S. Ghosh, "Fundamentals of Electrical and Electronics Engineering", PHI Publications. 9. J.B. Gupta, "Text book of Basic Electrical and Electronics Engineering", S.K.Kataria Publications 10. D.C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
References	1. V.D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India. 2. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010. 3. Hughes Edward, Electrical & Electronic Technology, Pearson Education, 2007. 4. Alexander. C. K. & Mathew. N. O. Sadiku, Fundamentals of Electrical circuits, Tata McGraw Hill, 2008. 5. P.S. Bhimbhara, "Electrical Machinery" Khanna Publishers 6. Milmann & Halkias, "Integrated Electronics" TMH 7. M. Morris Mano, "Digital Logic and Computer Design" Pearson
Laboratory Content	<u>List of Experiments</u> 1. Introduction of tools, electrical materials and abbreviations 2. To verify Ohm's Law using a DC circuit. 3. To study and verify Kirchhoff's Laws using a DC circuit. 4. To measure resistances using various methods: color coding and multimeter. 5. To verify series and parallel combinations of resistors. 6. To study running and reversing and working principle of Single-Phase Induction Motor. 7. To determine the turn ratio of the transformer. 8. To study voltage-current characteristics of a diode in forward and reverse bias condition. 9. To measure input resistance, output resistance and current gain of a PNP/NPN transistor in common collector configuration. 10. To troubleshoot electrical circuits: identification and rectification of faults 11. To wire up a circuit in the conduit system two lamps and a socket out let each controlled independently. 12. To wire up a circuit in a conduit system one lamp is controlled by two switches (stair case wiring) from different places. Note: Minimum 8 Experiments to be performed



English Language and Business Communication

Course Code: 24UENG01

Course Credit (L-T-P): 01 (1-0-0)

Max. Marks: 50 (15 I + 35 E)

Objective:

To train students to enhance their skills in written as well as oral communication through practical conduct of this course. This course will help students in understanding the principles and techniques of business communication.

Learning Outcomes: After completing this course, the learners will be able to

1. Students would be able to understand the nature, structure, types and process of various dimensions of communication and apply them in communication.
2. Students would be able to make effective presentations in various business/professional situations incorporating the ethics of good negotiations and assertive behavior.
3. Students would develop competency to understand and perform the diversity of the globalized multicultural world.
4. Students would be able to draft various types of documents used inside the organization for various types of communication.
5. Students would develop interview skills and competency incorporating the use of different social media platforms for networking.

Units	Topics
I Basics of Communication	Meaning, Process and Types of Communication; Principles of Effective Communication; Process and types of listening, deterrents to listening process, essentials of good listening.
II Presentation Skills	Prerequisites of effective presentation, format of Presentation. Negotiations-types, structures and basics of negotiations; Assertive behaviour.
III Multicultural World and Communication	Business Communication in a globalized and multicultural world; understanding cultural diversity and developing cultural competence and intercultural business communication skills; Barriers to cross-cultural communication and strategies to overcome them.
IV Written Communication	Mechanics of writing, report writing, agenda and minutes; business correspondence – business letter format, style of letter arrangement, types of letters, electronic mail; Resume Writing
V Communication in Practice	Preparing for interviews- types of interviews, process of interview and group discussion; effective ways of performing well in interviews; Social media and Networking, Social media profiles, Editing and Posting on social media;

Recommended Readings:

- Bovee, C., & Thill, J.V., and Raina, R.L. Business Communication Today. New York: Pearson, 2016.
- Lata, Pushp, and Sanjay Kumar. Communication Skills. 2nd ed. New Delhi: OUP, 2019.
- Lehman, C. M., Dufrene D. D., and Sinha, M. BCOM: The South Asian Perspective on Business Communication. New Delhi: Cengage Learning, 2016.
- Monippally, Matthukutty, M. Business Communication: From Principles to Practice. New Delhi: McGraw Hill Pub., 2018.
- Mukerjee, H. S. Business Communication: Connecting at Workplace. New-Delhi: Oxford University Press, 2012.
- Murphy, H. A., Hildebrandt, H.W., and Thomas, J.P. Effective Business Communication. Boston: McGraw-Hill Companies, 1997.
- Post, Emily. The Etiquette Advantage in Business. New York: Collins, 2005.
- Ramesh, Gopalaswamy, and Mahadevan Ramesh. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success. Noida: Pearson, 2019.
- Sandra, M. O. Handbook of Corporate Communication and Strategic Public Relations: Pure and Applied. New Delhi: Routledge, 2004.
- Sinha, K. K. Taxmann's Business Communication. 4th Revised ed. New Delhi: Taxmann's Pub., 2018.
- Taylor, Grant. English Conversation Practice. Indian ed. Chennai: McGraw Hill Education Pvt. Ltd., 2017.



English Language and Business Communication Lab

Course Code: 24UENG02

Course Credit (L-T-P): 01 (0-0-2)

Max. Marks: 50 (35 I + 15 E)

Objective:

This course is designed to strengthen the communication abilities of the learners by providing them hands-on practice.

Learning Outcomes: After completing this course, the learners will be able to

2. Demonstrate knowledge and understanding of a range of professional or public communication situations.
3. Perform effectively in diverse professional and public communication situations like interviews and negotiations, drafting emails and resumes etc.

Details

- Situational Conversations
- Listening Skills
- Resume Writing
- Mock Interviews
- Group Discussion
- Presentation Skills
- Negotiation Skills
- Email Writing
- Public Speaking
- Extempore Speech

Note: The teacher should play the role of the facilitator and allow the learners maximum time to practice these activities. The focus should be primarily on helping the learners overcome the LSWR barrier and gradually move towards honing these skills to enable the learners to use them in professional communication situations.

Unit V Speaking Skills - Preparing for interviews- Types of interviews, Group discussion; Effective ways of performing well in interviews; Public Speaking **Recommended Readings:**

- Joseph, C. J., Myall, E. G., and A. Biswas, eds. A Comprehensive Grammar of Current English. New Delhi: Inter University P, 2014.
- Lata, Pushp, and Sanjay Kumar. Communication Skills. 2 nd ed. New Delhi: OUP, 2019.
- Monippally, Matthukutty, M. Business Communication: From Principles to Practice. NewDelhi: McGraw Hill Pub., 2018.
- Mukerjee, H. S. Business Communication: Connecting at Workplace. New-Delhi: Oxford University Press, 2012. •
- Murphy, H. A., Hildebrandt, H.W., and Thomas, J.P. Effective Business Communication. Boston: McGraw-Hill Companies, 1997.
- Ramesh, Gopalaswamy, and Mahadevan Ramesh. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success. Noida: Pearson, 2019.
- Sandra, M. O. Handbook of Corporate Communication and Strategic Public Relations: Pure and Applied. New Delhi: Routledge, 2004.
- Sinha, K. K. Taxmann's Business Communication.4th Revised ed. New Delhi: Taxmann's Pub., 2018.
- Sinha, R. P. Current English and Usage with Composition. New Delhi: OUP, 2013.
- Taylor, Grant. English Conversation Practice. Indian ed. Chennai: McGraw Hill Education Pvt. Ltd

Course Title	Environmental Science	Course Code	24UEVS01		
Specialization	Value Added Course/ Audit Course	Structure (LTP)	2	0	0
Offered for	UG	Status	Core ✓	Elective	
Faculty	SFASH	Type	New ✓	Modification	
Credits	2	Marks	Internal	30	
Hours	30		External	70	
Prerequisite	Nil	To take effect from	2024-2025		
Submission date	13-07-2024	Date of approval by BoS	23-07-2024		
Course Objective	To develop foundation on principles of environmental studies and concept of structure and function of different compartments of the environment.				
Course Outcome	On completion of this course, students will be able to: CO1: Understand the fundamentals of environmental studies. CO2: Comprehend ecosystems and their dynamics. CO3: Implement corrective measures for the abatement of pollution. CO4: Understand the waste management techniques. CO5: Grasp environmental policies, legislation, and issues.				
Contents of the course	Unit 1: Indian Knowledge System- Indigenous Practices, Air & Environment Environment: Nature, Scope and Importance, Need for Public Awareness. Renewable and Non-Renewable Resources, Atmosphere: Introduction, layers of the atmosphere, Traditional agricultural practices - Organic farming, Crop rotation, Intercropping), Water management techniques - Stepwells, Tankas, Baolis, Forest management and conservation methods - Sacred groves, Agroforestry Unit 2: Ecosystems Concept, Structure and Function of an Ecosystem, Energy Flow in the Ecosystem, Biogeochemical Cycles, Types of Ecosystem: Forest Ecosystem, Grassland Ecosystem, Desert ecosystem, Aquatic Ecosystems. Unit 3: Environmental Pollution Environmental Pollution: Definition, Causes, Effects and Control Measures, Different Types of Pollutions, Air Pollution, Water Pollution, Soil Pollution, Marine Pollution, Noise Pollution, Thermal Pollution, Environmental issues: Climate change, global warming, acid rain, ozone layer depletion Unit 4: Waste Management, Environmental policies and legislation Solid waste management Municipal solid waste management techniques: Bio Composting, Vermicomposting, Incineration, Landfill sites, Liquid waste management: Waste water and Standards for its discharge given by CPCB, Wastewater treatment: Effluent Treatment Plant and Sewage treatment plant (STP), Wildlife Protection Act 1972, Forest Conservation Act 1980, Water (Prevention and control of Pollution) Act 1974, Air (Prevention and Control of Pollution) Act, 1981, Environment Protection Act, 1986				
Field Work	1. Visit to a local area to document environmental assets river/forest/grassland/hill/mountain 2. Visit to a local polluted Site-Urban/Rural/Industrial/Agricultural 3. Participation in plantation drives and nature camps. 4. Campus environmental management activities such as solid waste disposal, water Management and sanitation, and sewage treatment.				

Introduction to Disruptive Technologies (26UCSE01)							
B. Tech. Semester – I							
L	T	P	Credits	Core Course	Internal Examination	:	30
1	0	0	1		External Examination	:	70
Effective from Session:				w.e.f. 2026-2027	Total	:	100
Date of BoS approval:					Duration of Exam	:	3 Hrs
Prerequisite							

Course Objectives

The objectives of this course are to:

8. Introduce students to the concept and significance of disruptive technologies in the digital era.
9. Familiarize students with major emerging technologies and their real-world applications.
10. Develop awareness of technology-driven innovation and digital transformation across industries.
11. Enable students to identify potential career, certification, and internship opportunities in emerging technology domains.
12. Encourage lifelong learning and responsible use of emerging technologies.

Course Outcomes (COs)

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

CLO1: Explain the concepts and importance of disruptive technologies in modern society and industry.

CLO2: Identify the key features and applications of emerging technologies such as AI, IoT, Cloud Computing, and Blockchain.

CLO3: Illustrate the role of disruptive technologies in solving real-world problems across various sectors.

CLO4: Analyze emerging technology trends and their impact on future careers and industries.

CLO5: Evaluate opportunities for skill development, certifications, and internships in emerging technology domains.

UNIT – I : Introduction to Disruptive Technologies

Technology Evolution, Digital Transformation, Industry 4.0 and Industry 5.0, Characteristics of Disruptive Technologies, Emerging Technology Landscape, Impact of Disruptive Technologies on Society and Industry.

UNIT – II : Artificial Intelligence and Data Technologies

Artificial Intelligence, Machine Learning, Generative AI, Data Science, Big Data Analytics, Applications of AI in Healthcare, Education, Finance, and Manufacturing.

UNIT – III : Internet of Things and Cloud Computing

Internet of Things (IoT), Smart Devices and Connected Systems, Smart Cities, Industrial IoT, Cloud Computing Fundamentals, Cloud Services and Applications.

UNIT – IV : Blockchain and Cyber Security

Blockchain Fundamentals, Cryptocurrencies, Smart Contracts, Applications of Blockchain, Cyber Security Fundamentals, Digital Privacy, Cyber Threats and Security Awareness.

UNIT – V : Future Technologies and Innovation

Robotics and Intelligent Automation, Extended Reality (AR/VR), Digital Twins, Quantum Computing Overview, Green and Sustainable Technologies, Future Technology Trends and Innovation Opportunities.

Text Books

1. Bernard Marr, *Tech Trends in Practice: The 25 Technologies That Are Driving the Fourth Industrial Revolution*, Wiley.
2. Klaus Schwab, *The Fourth Industrial Revolution*, Crown Business.

Reference Books

1. Melanie Mitchell, *Artificial Intelligence: A Guide for Thinking Humans*, Farrar, Straus and Giroux.
2. Kai-Fu Lee, *AI Superpowers: China, Silicon Valley, and the New World Order*, Houghton Mifflin Harcourt.
3. Bernard Marr, *Future Skills: The 20 Skills and Competencies Everyone Needs to Succeed in a Digital World*, Wiley.

Semester-2

24UMTH04 : Engineering Mathematics-II							
B. Tech.							
Semester – II							
L	T	P	Credits	Core Course	Internal Examination	:	30
3	1	0	4	24UMTH04	External Examination	:	70
Effective from Session:				w.e.f. 2024-2025	Total	:	100
Date of BoS approval:				22-07-2024	Duration of Exam	:	3 Hrs
Prerequisite							
Instruction for Paper Setter:							
1. There should be 11 questions in the end term examinations question paper.							
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type questions of total 20 marks.							
3. Apart from question 1 which is compulsory, the rest of the paper shall consist of 5 units as per the syllabus. Every unit shall have two questions each of 10 marks each. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain sub-parts / sub-questions.							
4. Each Unit shall have a marks weightage of 14.							
5. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.							
6. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.							

Course Objective:

The objective of this course is to familiarize the prospective engineers with techniques in multivariable calculus, differential equations and statistics.

Course Outcomes:

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

- CO1. Deal with functions of several variables that are essential in most branches of engineering.
- CO2. Acquainted with mathematical tools needed in evaluating multiple integrals and their usage.
- CO3. Categories the effective mathematical tools for the solutions of ordinary differential equations that model physical processes.
- CO4. Categories the effective mathematical tools for the solutions of partial differential equations that model physical processes.
- CO5. Will be able to understand the applications of Laplace and Fourier transform.

Course Contents:

Unit I: Multivariable Calculus (Differentiation)

Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.

Unit II: Multivariable Calculus (Integration)

Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of

variables (Cartesian to polar), Applications: areas and volumes, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.

Unit III: Ordinary Differential Equations

First order ordinary differential equations: Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type. Ordinary differential equations of higher orders: Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

Unit IV: Partial Differential Equations

First order partial differential equations, solutions of first order linear and non - linear PDEs. Solution to homogeneous and non - homogeneous linear partial differential equations second and higher order by complementary function and particular integral method, Boundary-value problems: Solution of boundary-value problems for various linear PDEs in various geometries.

System of differential equations, Laplace transforms to solve differential equations, transfer functions, impulse functions, frequency response.

Unit V: Fourier And Laplace Transform

Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transforms by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs and PDEs by Laplace Transform method. Fourier transforms, Z-transform and Wavelet transforms: properties, methods, inverses and their applications

Text Book:

1. Reena Garg and Chandrika Prasad, Advanced Engineering Mathematics, Khanna Book Publishing Company, 2020.
2. R.V. Churchill and J.W. Brown, Complex Variables and Applications, 5th edition, McGraw Hill, 1990.
3. I. N. Sneddon, Elements of Partial Differential Equations, Dover Publications, 2006
4. A. D. Poularikas, The Transforms and Applications Handbook, CRC Press, 1996.
5. E. Kreyszig. Advanced Engineering Mathematics, Wiley, 2015
6. Calculus and Analytic Geometry, G. B. Thomas and R. L. Finney, Pearson Education, 2010

Reference Book:

1. L. Garcia, Probability and Random Processes for Electrical Engineering, 2nd Ed., Addison-Wesley, 1993.
2. P.Z. Peebles, Probability, Random Variables and Random Signal Principles, 4th Ed., McGraw Hill, 2000.
3. H. Stark and J.W. Woods, Probability and Random Processes with Applications to Signal Processing, Prentice Hall, 2002.
4. K. L. Chung and F. AitSahlia, Elementary Probability Theory with Stochastic Processes
5. Introduction to Mathematical Finance, 4th Ed., Springer-Verlag, 2003.

Course Code: Theory: 24UCEE02 Lab: 24UCEE03	Digital Electronics	Credits: 4 (L-T-P-C): (3-0-2-4)	Int. Th. Examination: 30 Ext. Th. Examination: 70 Duration of Exam: 3 hours	
Offered for	UG	Course Type	Core ✓	Elective
Date of BoS Approval	July, 2024	Course Status	New	Modification ✓
To take effect from	2024-25	Prerequisite	NIL	

Course Objective:

- To understand the basics of Boolean algebra.
- To understand the combinational and sequential circuit with the difference between them.
- To understand A/D and D/A converters.

Course Contents:

Unit I: Fundamentals of Digital Systems and Boolean Algebra

Information Representation: Number Systems - binary, signed binary, octal, decimal, hexadecimal; Binary Arithmetic, one's and two's complements arithmetic, Fixed-point and Floating-point representation of numbers, BCD Codes, Error detecting and correcting codes, Character Representation – ASCII, EBCDIC, Unicode.

Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations.

Binary Logic: Boolean Algebra, Boolean Theorems, Boolean Functions and Truth Tables, Canonical and Standard forms of Boolean functions, Simplification of Boolean Functions – Venn Diagram, Karnaugh Maps

Unit II: Combinational Digital Circuits

Standard representation for logic functions, K-map representation, simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, DeMultiplexer / Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker / generator, code converters.

Unit III: Sequential circuits and systems

A 1-bit memory, the circuit properties of Bistable latch, the clocked SR flip flop, J- K, T- and D-types flip flops, applications of flip-flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC's, asynchronous sequential counters, applications of counters.

Unit IV: A/D and D/A Converters

Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter ICs, sample and hold circuit, analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, A/D converter using voltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/D converter ICs.

Unit V: Digital logic families, Semiconductor memories and PLDs

Digital logic families: Examples of IC gates, characteristics of digital ICs, digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-state logic.

Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read only memory (ROM), read and write memory (RAM), content addressable memory (CAM), charge de coupled device memory (CCD), commonly used memory chips, ROM as a PLD, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).

Laboratory Objective:

The objectives of the course are to make students aware about the practical implementation of Boolean logics, combinational and sequential circuits.

List of Laboratory / Practicals:

1. Implementation of AND, OR and NOT gate
2. Implement NAND and NOR gate, and show these are universal gates
3. To study and perform logic gates.
4. To study and perform De'Morgan's Theorem.
5. To study and perform NAND and NOR as a universal gate.
6. To design and implement a circuit that converts binary code to Grey code.
7. To study and perform about Half Adder and full Adder.
8. To study and perform about Half subtractor and full subtractor.
9. To design a 3-bit odd/even parity generator and checker.
10. To study and perform R-S and D flip flops.
11. To study and perform a J-K and T flip flop.
12. To study and perform a Master slave JK flip flop.
13. To realise Boolean functions using a multiplexer.
14. To study and perform about Decoder and Demultiplexer.
15. To study the use of decoder for BCD to seven segment LED display.

Note - The above list is indicative and tentative. As per requirement of the syllabus and industry, the list of practicals can be updated by the concerned faculty / instructor.

Suggested Text Book(s):

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.

Reference Books:

1. "Digital Principles and applications", Donald P Leach, Albert Paul Malvino, GoutamSaha. McGrawHill , 8th Edition, 2015.
2. Digital Logic & State Machine Design, David J. Comer, Oxford University Press, 3rd Reprinted Indian Edition, 2012.
3. Digital Logic Design, R.D. Sudhakar Samuel, Elsevier.

Course Outcomes:

The course will enable the student to:

- CO1. Recall the basic concepts of digital logic and systems
- CO2. Understand the working of digital logic families and logic gates.
- CO3. Design and implement Combinational and Sequential logic circuits.
- CO4. Understand the process of Analog to Digital conversion and Digital to Analog conversion.
- CO5. Be able to use PLDs to implement the given logical problem.

Laboratory Outcomes:

At the end of this course, students will demonstrate the ability to

- CO1. Recall theory and correlate with the practical
- CO2. Understand working of logic families and logic gates
- CO3. Design and implement Combinational and Sequential logic circuits for a given problem
- CO4. Demonstrate the implementation of various flip-flops and their applications.

Course Code: Theory: 24UCSE03 Lab: 24UCSE04	Data Structures	Credits: 4 (L-T-P-C): (3-0-2-4)	Int. Th. Examination: 30 Ext. Th. Examination: 70 Duration of Exam: 3 hours	
Offered for	UG	Course Type	Core ☒	Elective
Date of BoS Approval	July, 2024	Course Status	New ☒	Modification
To take effect from	2024-25	Prerequisite	NIL	

Course Objective:

1. To impart the basic concepts of data structures and algorithms.
2. To understand concepts about searching and sorting techniques
3. To understand basic concepts about stacks, queues, lists, trees and graphs.
4. To enable them to write algorithms for solving problems with the help of fundamental data structures.

Course Contents:

Unit I: Introduction

Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time- Space trade off.

Searching: Linear Search and Binary Search Techniques and their complexity analysis.

Unit II: Stacks and Queues

ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each type of Queues: Algorithms and their analysis.

Unit III: Linked Lists

Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.

Unit IV: Trees

Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis.

Unit V: Sorting and Hashing

Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing.

Graph: Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

Laboratory Objective:

To write and execute programs in C to solve problems using data structures such as arrays, linked lists, stacks, queues, trees, graphs, hash tables and search trees.

Laboratory Content:

1. Write a program to search an element in an array using: linear search and binary search
2. Write a menu-driven program to perform array operations: search, insert at beginning, insertion at end, insertion after a given number, insertion before a given number, deletion from beginning, deletion from t end, deletion after a given number, deletion before a given number.
3. Write a Program to implement the operations of Singly Linked Lists.
4. Write a Program to implement the operations of doubly Linked Lists.
5. Write a Program to implement the operations of Circular Linked Lists.
6. Write a C program that uses stack operations to convert a given infix expression into its Postfix.
7. Write a Program to Implement Queue Operations by using Array and Linked Lists.
8. Write a Program to implement factorial of n using stack.
9. Write a Program to Implement Circular Queue operations by using array and linked list.
10. Write a Program to Sort the set of elements: (i.e., numbers or strings)
 - i) Quick Sort ii) Heap Sort iii) Merge Sort
11. Write a Program to Implement the Binary Search Tree Operations.
12. Write a Program to Perform the Tree Traversal Techniques by using the Iterative Method
13. Write C programs for implementing the following graph traversal algorithms:
 - a) Depth first traversal b) Breadth first traversal

Note - The above list is indicative and tentative. As per requirement of the syllabus and industry, the list of practicals can be updated by the concerned faculty / instructor.

Suggested Text/Reference Books:

1. “Fundamentals of Data Structures”, Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.

References Books:

1. Algorithms, Data Structures, and Problem Solving with C++”, Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company
2. “How to Solve it by Computer”, 2nd Impression by R. G. Dromey, Pearson Education.
3. Data Structures, R.S. Salaria, Khanna Book Publishing, 2019.
4. Data Structures and Program Design in C By Robert L. Kruse, C.L. Tondo, Bruce Leung, Pearson Education, 2007.
5. Expert Data Structures with C/ 3rd Edition, R.B. Patel, Khanna Book Publishing, 2020.
6. Expert Data Structures with C++/ 2nd Edition, R.B. Patel, Khanna Book Publishing, 2020.
7. Data Structures Using C & C++, By Langsam, Augenstein, Tanenbaum, Pearson Education, 1989.
8. Fundamentals of Data Structures, By Ellis Horowitz and Sartaj Sahni, Computer Science Press, 2011.
9. An introduction to data structures with applications, By J.P. Trembley & P.G. Sorensen, TMH, 2004.

Suggested Online Resources:

1. NPTEL video series, Data-structures and Algorithms, Instructor: Naveen Garg.
2. Introduction to Algorithms, 4th Edition, Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, MIT Press/McGraw-Hill.

Course Code: Theory: 26UCEC01 Lab: 26UCEC02	Basics of Python Programming	Credits: 5 (L-T-P-C): (3-0-4-5)	Int. Th. Examination: 30 Ext. Th. Examination: 70 Duration of Exam: 3 hours	
Offered for	UG	Course Type	Core √	Elective
Date of BoS Approval	June, 2026	Course Status	New	Modification √
To take effect from	2026-27	Prerequisite	NIL	

Course Objective:

The objective of this course is to introduce students to the Python programming language.

- To understand various data structures
- To visualize data in 2D
- To read files and handle exceptions

Course Contents:**Unit I: Fundamentals of Python Programming**

Python Introduction: Overview of Python, Features, History and versions, Python Applications and associated framework introduction, Installing and setting Python environment, Execution of Python program. Python Data Model: Objects, Identity, Type and Value, Mutable and Immutable Objects, Built-in Data Types, identifiers, variables, keywords. Operators and Operators precedence.

Unit II: Python Programming Constructs I: Standard Types and Operations

Numbers: Introduction, Integers, Floating Point Real Numbers, Complex Numbers, Conversion and functions.

Sequences: Strings, Lists, Tuples, Sets, Dictionary.

Strings: Sequence operations, String Methods, Pattern Matching.

Regular Expressions: Introduction, Special Symbols and Characters, RE and Python, Pattern matching and searching, Password, email, url validation using regular expression.

Lists: Basic Operations, Iteration, Indexing, Slicing and Matrixes, List Functions and Methods.

Tuples: Basic Operations, Iteration, Indexing, Slicing And Matrices, Tuple Functions.

Sets; Dictionaries: Basic dictionary operations, Dictionary Functions and Methods.

Unit III: Python Programming Constructs-II: Control Structures and Functions

Control Statements: If, If-else, Nested If, For, While, range() function, Break, Continue, Pass.

Functions: Definition, Call, Arguments, Return statement, Scope rules, Name resolution, Python Built-In Functions, Related Modules.

Unit IV: Object oriented Programming and Modules in Python

Object Oriented Programming in Python: Classes, Objects, Accessing Attributes, Inheritance, Polymorphism, Constructors and Destructors, Overloading operators and functions, Overriding methods, Data Hiding.

Modules: Modules and Files, Namespaces and scoping, Module Coding Basics, Creating and importing modules and attributes, Module Built-in Functions, dir(), globals(), locals(), reload(), Executing Modules as Scripts, Compiled Python files(.pyc), Standard Modules: OS, SYS, Math, Random, Statistics, Packages, Package

creation and importing, Other features of modules, Date and Time modules.

Unit V: File and Exception Handling

File Handling: File Objects, Built-in Functions, Methods and Attributes, Standard Files, Command-line Arguments, File System, Directories, File Execution, Persistent Storage Modules, Related Modules.

Exception Handling: Errors and Exception detection and handling, Context Management, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions, Creating Exceptions, Exceptions and the sys Module, Related Modules, User-Defined Exceptions, Default Exception Handler, Regular expressions, User Defined Package with Python.

Laboratory Objective:

The objective of this course is to do hands-on practice of the Python programming language concepts and its frameworks and libraries.

List of Laboratory / Practicals.

1. Study and implementation of Python variables, identifiers, literals, keywords, comments, and basic input/output operations.
2. Program to demonstrate arithmetic, relational, logical, bitwise, assignment operators, and operator precedence.
3. Program to explore Python objects, data types, type checking, and type conversion.
4. Program to demonstrate the use of numeric data types and built-in numeric functions.
5. Program to perform user interaction and simple calculations using console-based input and output.
6. Program to perform string operations including indexing, slicing, concatenation, and string methods.
7. Program to implement pattern matching and searching using regular expressions.
8. Program for email, URL, and password validation using regular expressions.
9. Program to perform list operations including insertion, deletion, searching, sorting, and list traversal.
10. Program to implement matrix operations using nested lists.
11. Program to demonstrate tuple operations including indexing, slicing, and built-in tuple functions.
12. Program to perform set operations such as union, intersection, difference, and symmetric difference.
13. Program to implement dictionary operations including creation, update, deletion, and traversal.
14. Program to develop a menu-driven application using conditional statements (if, if-else, nested if).
15. Program to generate patterns and number series using for and while loops.
16. Program to demonstrate the use of range(), break, continue, and pass statements.
17. Program to create and invoke user-defined functions with different types of arguments.
18. Program to demonstrate recursive functions and scope rules in Python.
19. Program to use built-in functions and related modules for common computational tasks.
20. Program to create classes and objects and demonstrate constructors, attributes, and methods.
21. Program to demonstrate inheritance, polymorphism, method overriding, and operator overloading.
22. Program to create, import, and use user-defined modules and packages.
23. Program to use standard Python modules such as os, sys, math, random, statistics, and datetime.
24. Program to perform file handling operations including reading, writing, appending, and processing text files.
25. Program to implement exception handling, assertions, user-defined exceptions, and command-line argument processing.

Note - The above list is indicative and tentative. As per requirement of the syllabus and industry, the list of practicals can be updated by the concerned faculty / instructor.

Suggested Text Book(s):

1. Downey, A.B., (2015), Think Python – How to think like a Computer Scientist, 3rd edition. O'Reilly Media.
2. Taneja, S. & Kumar, N., (2017), Python Programming- A Modular Approach. Pearson Education.

Reference Books:

1. Head First Python by Paul Barry, O'Reilly, 2010.
 2. Taming Python by Programming, Jeeva Jose, Khanna Book Publishing Co., Delhi.
 3. Learning Python, 5th Edition, by Mark Lutz, O'Reilly Media, Inc., ISBN: 9781449355739.
 4. Guttag, J.V.(2016), Introduction to computation and programming using Python. MIT Press.
 5. Liang, Y.D. (2013), Introduction to programming using Python. Pearson Education.
- Python Crash Course: A Hands-On, Project-Based Introduction to Programming by Eric Matthes, No Starch Press.

Course Title	Applied Chemistry	Course No. :	24UCHM03 (Theory) 24UCHM04 (Lab)		
Specialization	Basic Sciences	Structure (LTP)	3	1	1
Offered for	UG (B.Tech.)	Status	Core √	Elective	
Faculty	SFASH	Type	New √	Modification	
Pre-requisite	Nil	To take effect from	2024-2025		
Submission date		Date of approval by BoS	23-07-2024		
Course Objective:	The concepts developed in this course will aid in quantification of several concepts in chemistry. Technology is being increasingly based on the electronic, atomic and molecular level modifications. Quantum theory is more than 100 years old and to understand phenomena at nanometer levels, one has to base the description of all chemical processes at molecular levels. An understanding of the principles of Applied Chemistry will develop scientific attitude in the budding engineers to understand the physical and chemical properties of the available materials for engineering application as well as an ability to design new effective material.				

Course Outcome:	By the end of this course, the student will be able to: CO1. Analyze microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces. CO2. Rationalize bulk properties and processes using thermodynamic considerations. CO3. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques. CO4. Rationalize periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity. CO5. List major chemical reactions that are used in the synthesis of molecules.
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Contents of the course	Unit 1 Atomic and molecular structure Schrodinger equation. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations. Molecular orbitals of diatomic molecules and plots of the multicentre orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures. • <i>Spectroscopic techniques and applications</i> Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Diffraction and scattering. Unit 2: Intermolecular forces and potential energy surfaces Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H₃, H₂F and HCN and trajectories on these surfaces. Unit 3: Use of free energy in chemical equilibria Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham diagrams. Unit 4 Periodic properties Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries Unit 5 Organic Chemistry • Stereochemistry: Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds • Organic reactions and synthesis using conventional and green approach: Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.
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Textbook	(iv) Engineering Chemistry-I concept and application by Jit Chakraborty, Asimesh Dutta Gupta, Ravikanth Kamlekar (v) University chemistry, by B. H. Mahan Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane (iii) Fundamentals of Molecular Spectroscopy, by C. N. Banwell Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan 2 Physical Chemistry, by P. W. Atkins 3 Organic Chemistry: Structure and Function by K. P. C. Vollhardt and N. E. Schore, 5th Edition, http://bcs.whfreeman.com/vollhardtschore5e/default.asp 4 Dr. G. H. Hugar and Prof A. N. Pathak, Applied Chemistry Laboratory Practices, Vol. I and Vol. II, NITTTR, Chandigarh, Publications, 2013-14. 5 Agnihotri, Rajesh, Chemistry for Engineers, Wiley India Pvt.Ltd., 2014. 6 Jain & Jain, Engineering Chemistry, Dhanpat Rai and Sons; New Delhi, 2015.
References	13. A text book of Engineering Chemistry by M. Thirumala Chary, E. Laxminarayana and K. Shashikala. 14. Spectroscopy (Vol-4) by K.L. Kapoor 15. Hydrogen – A fuel for Automatic Engines, Prashukumar G P, ISTE 16. Fuel cells: Principles and Applications, Viswanathan B and AuliceScibioh, University Press 17. Fuel Cells: Theory and Applications, Hart A B and Womack G J, Chapman and Hall 18. A Text Book of Engineering Chemistry, Shashi Chawla, 19. “Engineering Chemistry” by A. Mallick 20. Engineering Chemistry by R. Devi, V. R. Reddy and Rath, Cengage learning 21. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, 22. Vogel’s text book of practical organic chemistry 5th edition 23. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications. 24. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd..
Laboratory Content	<u>List of Experiments</u> 3. Determination of surface tension and viscosity 4. Thin layer chromatographic separation 5. Ion exchange column for removal of hardness of water 6. Determination of chloride content of water 7. Colligative properties using freezing point depression 8. Determination of the rate constant of a reaction 9. Determination of cell constant and conductance of solutions 10. Potentiometry - determination of redox potentials and emfs 11. Synthesis of a polymer/drug 12. Saponification/acid value of an oil 13. Chemical analysis of a salt

	4. Lattice structures and packing of spheres 5. Models of potential energy surfaces 6. Chemical oscillations- Iodine clock reaction 7. Determination of the partition coefficient of a substance between two immiscible liquids 8. Adsorption of acetic acid by charcoal 9. Use of the capillary viscometers to demonstrate the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg. 10. Prediction and analysis of ^1H NMR spectra of some selected compounds. 11. Prediction and analysis of ^{13}C NMR spectra of some selected compounds. 12. Prediction and analysis of IR spectra of some selected compounds. 13. To calculate Biochemical Oxygen Demand (BOD) of the given water sample. 14. To calculate Total Dissolved Solids (TDS) present in the given water sample. 15. To determine the inorganic nitrogen (Nitrate Nitrogen) in the given water sample. 16. To calculate the Total Kjeldahl Nitrogen in the given water sample Note: Minimum 8 Experiments to be performed
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