B.TECH. CURRICULUM

ACADEMIC YEAR: 2026–27

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (IOT)

Undergraduate Rules and Regulations-2026 (URR26)
In accordance with the National Education Policy 2020
w.e.f AY 2026-27

Regulations Governing the
Choice Based Credit System and
Multiple Entry and Multiple Exit Options
with
Competancy-Focused Outcome Based Curriculum (CF-OBC)

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE, WARANGAL – 506 015

TELANGANA

(UGC Autonomous Institute Under Kakatiya University, Warangal)

I SEMESTER
(ForStream – II: CE, ME, IT, CSN, CSM, CSO, CSD)

S. No.	Category	Course Code	Course Title	Lectures / week				Credits
				L	T	P	E	C
-	IKSC	U26IK100	AICTE Mandated Student Induction Programme (Universal Human Values - I)					-
1	BSC	U26MH101	Differential Calculus and Ordinary Differential Equations	2	1	-	3	3
2	BSC	U26CY102X	Engineering Chemistry (from Pool – V)	2	1	-	3	3
3	ESC	U26IN103	Programming for Problem Solving with C	2	1	-	3	3
4	HSMC	U26MH104	English Communication and Report Writing	2	1	-	3	3
5	PCC	U26IN105	Digital Logic Design	2	1	-	3	3
6	BSC	U26CY106X	Engineering Chemistry Laboratory (from Pool – VI)	-	-	2	2	1
7	ESC	U26IN107	Programming for Problem Solving with C Laboratory	-	-	2	2	1
8	VAC	U26VA108	Sports & Yoga	-	-	2	2	1
9	PCC	U26IN109	Fundamentals of Computing Systems Laboratory	-	-	2	2	1
10	ESC	U26ME110	Engg. Graphics & CAD*	-	-	2	2	1
			Total:	**10**	**5**	**10**	**25**	**20**
Summer/ Inter-sem Bridge Courses (Approved by BoS and Dean,AA): 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)				**NIL**				

S. No.	Course Code	Course Title		S. No.	Course Code	Course Title
Pool –V				**Pool – VI**		
1.	U26CY102A	Engineering Chemistry (for CE)		1.	U26CY106A	Engineering Chemistry Laboratory (for CE)
2.	U26CY102B	Engineering Chemistry (for ME)		2.	U26CY106B	Engineering Chemistry Laboratory (for ME)
3.	U26CY102C	Engineering Chemistry (for EEE/ECE/ECV)		3.	U26CY106C	Engineering Chemistry Laboratory (for EEE/ECE/ECV)
4.	U26CY102D	Engineering Chemistry (for CS/IT)		4.	U26CY106D	Engineering Chemistry Laboratory (for CS/IT)

DIFFERENTIAL CALCULUS AND ORDINARY DIFFERENTIAL EQUATIONS			
Class: B.Tech. I -Semester		**Branch:** Common to all branches	
Course Code:	**U26MH101**	**Credits:**	**3**
Hours/Week (L-T-P-E):	**2-1-0-3**	**CIE:**	**40 %**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60 %**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

CO1: examine the convergence of a series and interpret mean value theorems

CO2: apply partial differentiation to functions of several variables in solving various engineering problems

CO3 : apply appropriate methods of differential equations of first order and first degree to solve real life engineering problems

CO4 : analyze the solutions of higher order linear differential equations with constant coefficients

UNIT-I	**9 Hrs**

Infinite Series: Sequences, Series, General properties of series, Series of positive terms, Comparison tests-Limit form, Integral test, D'Alembert's Ratio test, Cauchy's root test

Differential Calculus and its applications: Fundamental theorems-Rolle's theorem (Geometrical interpretation), Lagrange's mean value theorem (Geometrical interpretation), Cauchy's mean value theorem, Taylor's theorem (Generalized mean value theorem), Expansions of functions- Maclaurin's series, Taylor's series, Maxima and Minima-Conditions, Practical problems (rectangle, right circular cylinder, cone)

UNIT-II	**9 Hrs**

Partial differentiation and its applications: Functions of two or more variables, Partial derivatives, Total derivative, Change of variables, Jacobians, n Functional relationship, Geometrical Interpretation-Tangent plane and Normal to a surface, Taylor's theorem for function of two variables (without proof),Errors and approximations, Total differential, Maxima and minima of functions of two variables, Lagrange's method of undetermined multipliers , Differentiation under the integralsign

UNIT-III	**9 Hrs**

Differential equations of first order (DE): Reorientation of differential equation of first order and first degree Formation a differential equation, variables separable method, homogeneous equations, Linear equations), Exact differential equations, Equations reducible to exact equations,

Applications of differential equations of first order: Orthogonal trajectories - Orthogonal trajectories of the family of curves f(x, y, c)=0, Physical applications-Motion of a boat across a stream, Resisted motion, Velocity of escape from the earth, Simple electric circuits - RL series circuit, Newton's law of cooling, Rate of decay of Radio-active materials, Rate of growth of population

UNIT-IV	**9 Hrs**

Linear differential equations: Linear differential equations with constant coefficients, Rules for finding complementary function, Inverse operator, Rules for finding the particular integral ($Q=e^{ax}$, sin(ax+b) or cos(ax+b), $x^m$and $e^{ax}V(x)$), Method of variation of parameters, Linear dependence of solutions

Applications of linear differential equations: Simple harmonic motion, Simple pendulum, Oscillations of spring, Oscillatory electrical circuit-LCR circuit, Electro-mechanical analog

Textbook:

1. Grewal, B.S.,*Higher Engineering Mathematics*, Khanna Publishers, Delhi, 44th edition, 2017

Reference Book(s):

1. Shanti Narayan, Dr. Mittal P.K, *Differential Calculus*, S. Chand & Co., New Delhi, 1stedition, Reprint 2014
2. Kreyszig E, *Advanced Engineering Mathematics*, Inc, U.K, John wiely & sons, 10th edition, 2020
3. S.S. Sastry, *Engineering Mathematics, Vol.II,* Prentice Hall of India, 3rd edition, 2014

Web and Video link(s):

1. https://youtu.be/4EYko9rdF7g?si=WUu12*NPTEL Video Lecture on Infinite series by Prof. S.K.Ray, Professor of Mathematics, IITK Kanpur.*
2. https://youtu.be/0apMXhWG_W8?si=M-abw2Gq3buX5HLM*NPTEL Video Lecture on Fundamental mean value theorems by Prof. Jithedra Kumar, Professor of Mathematics, IITK Kharagpur.*
3. https://youtu.be/6r5jfT8xrXM?si=ryLXYVJr4-iUkdlV; *NPTEL Video Lecture on Exact Differential Equations, Prof. Jithedra Kumar, Professor of Mathematics, IIT Kharagpur.*
4. https://youtu.be/kbGhrqV9AOM?si=yGyK_V7kJKGa3OaR*NPTEL Video Lecture on Orthogonal Trajectories of family of curvesby Prof. Aditya Sharma, Professor of Physics, IISE Bhopal.*
5. *https://youtu.be/btOCUmJkrrg?si=zq3nB00kplm7b5se; NPTEL Video Lecture on Higher Order Linear Differential Equations, Prof. Jithedra Kumar, Professor of Mathematics, IIT Kharagpur.*

Course Articulation Matrix (CAM):		U26MH101: DIFFERENTIAL CALCULUS AND ORDINARY DIFFERENTIAL EQUATIONS												
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO1	U26MH101.1	2	2	1	1	-	-	-	1	1	-	1	1	1
CO2	U26MH101.2	2	2	1	1	-	-	-	1	1	-	1	1	1
CO3	U26MH101.3	2	2	1	1	-	-	-	1	1	-	1	1	1
CO4	U26MH101.4	2	2	1	1	-	-	-	1	1	-	1	1	1
U26MH101		**2**	**2**	**1**	**1**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**1**	**1**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

CO–SDG Alignment Matrix				
CO	**CO Statement** *The student should be able to…*	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	examine the convergence of a series and interpret mean value theorems	SDG4	Quality Education	Develops analytical thinking, mathematical reasoning, and problem-solving skills essential for quality technical education
CO2	apply partial differentiation to functions of several variables in solving various engineering problems	SDG9	Industry, Innovation and Infrastructure	Supports engineering design, optimization, modelling, and innovation in industrial and technological applications
CO3	apply appropriate methods of differential equations of first order and first degree to solve real-life engineering problems	SDG9	Industry, Innovation and Infrastructure	Differential equation models are widely used in transportation, environmental systems, population studies, and engineering infrastructure
CO4	analyze the solutions of higher order linear differential equations with constant coefficients	SDG9	Industry, Innovation and Infrastructure	Helps in analyzing dynamic systems, control systems, electrical/mechanical engineering applications, and technological advancement

ENGINEERING CHEMISTRY			
Class: B Tech I – Semester		**Branches:** CSM, CSD, CSN, CSO & IT	
Course Code:	**U26CY102D**	**Credits:**	**3**
Hours/Week (L-T-P- E):	**2-1-0-3**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1: apply the concepts of electrochemical energy systems for batteries and fuel cells

CO2: interpret suitable techniques of water analysis and corrosion treatment of solid materials

CO3: apprise manufacturing of engineering materials and spectroscopic techniques of chemical analysis

CO4: apprise the synthesis, applications of engineering materials and principles of green chemistry

UNIT-I	9 Hrs

Electrochemical Technology and Engineering: Introduction, Specific conductance, Equivalent conductance, Effect of dilution; Conductometric titrations-Acid base titrations-Strong acid vs strong base, Strong acid vs weak base, Weak acid vs strong base, Weak acid vs weak base, Advantages of conductometric titrations; Galvanic cell, Electrode potential, Electrochemical series, Nernst equation; Potentiometric titrations-Acid base titrations and advantages of potentiometric titrations

Batteries: Classification, Lead-acid battery, Li-ion battery

Fuel cells: Hydrogen-oxygen fuel cell

UNIT-II	9 Hrs

Applied Chemistry:

Water Technology: Introduction, Hardness of water, Estimation of hardness of water by complexometry, Alkalinity, Determination of alkalinity, Numerical problems Determination of dissolved oxygen (DO), Biochemical oxygen demand (BOD), Chemical oxygen demand (COD), Softening methods-Ion exchange method, Desalination processes, Reverse osmosis; Quality parameters of potable water (BIS and WHO)

Corrosion: Introduction, Dry corrosion, Pilling-Bedworth rule, Wet corrosion; Factors effecting corrosion-Purity of the metal, Relative areas of anodic and cathodic parts, Nature of surface film, Humidity, pH and Temperature; Prevention methods of corrosion-Cathodic protection-Impressed current cathodic protection, Sacrificial anodic protection

UNIT-III	9 Hrs

Engineering Materials: Nanomaterials-Introduction, Synthesis of nanomaterials Top down and bottom-up approaches, Synthesis by sol-gel method; Nanoscale Materials-Fullerenes, Carbon nanotubes and Graphene, Properties and applications, Biosensors

Spectroscopy: Introduction to spectroscopy, Microwave Spectroscopy-Principle, Selection rules, Applications; Infra-red spectroscopy-Principle, Selection rules, Applications; UV Spectroscopy-Lambert-Beer's law and its applications

UNIT-IV	9 Hrs

Polymers: Introduction, Monomer, Polymer, Types of polymerization reactions addition and condensation; Preparation, Properties and Applications-Polythene, Polyvinyl cyanide, Polyvinyl chloride, Bakelite, Nylon 6:6; Thermosetting resins and thermoplastic resins; Conducting polymers and their applications

Green Chemistry: Principles of green chemistry, Synthesis of Adipic Acid by traditional pathway and green pathway; Green methods in electronic production, Impact of electronic waste on environment and public health

Textbook:

1. Jain and Jain, *Engineering Chemistry*, Dhanpat Rai Publishing Company, 17th edition, 2019

Reference Book(s):

1. J C Kuriacose and J Rajaram, *Chemistry in Engineering and Technology* (vol I & vol II),Tata Mc Graw-Hills Education Pvt Ltd, 2010
2. Shashi Chawla,*Textbook of Engineering Chemistry*, Dhanpat Rai Publishers, 3rd edition, 2003
3. S S Dara, S S Umare,*A Textbook of Engineering Chemistry*, S Chand & Company Ltd, 12th edition, 2010

Web and Video link:

https://elearnnptelacin/shop/iit-workshops/completed/battery-cell-technology-materials-and industrial-applications/?v=c86ee0d9d7ed NPTEL Video Lecture on Battery technology by Dr Kothandaraman, Professor of Chemistry, IIT Madras & Dr Raghunathan, Professor of Chemical engineering, IIT Madras

Course Articulation Matrix (CAM):		U26CY102D: ENGINEERING CHEMISTRY												
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U26CY102D.1	2	-	-	-	1	1	1	-	1	-	1	1	1
CO2	U26CY102D.2	2	-	-	-	1	1	1	-	1	-	1	1	1
CO3	U26CY102D.3	2	-	-	-	1	1	1	-	1	-	1	1	1
CO4	U26CY102D.4	2	-	-	-	1	2	1	-	1	-	1	1	1
U26CY102D		2	-	-	-	1	1.25	1	-	1	-	1	1	1
3 – HIGH, 2 – MEDIUM, 1 - LOW														

CO–SDG Alignment Matrix				
CO	**CO Statement** *The student should be able to…*	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	apply the concepts of electrochemical energy systems for batteries and fuel cells	SDG7	Affordable and Clean Energy	Electrochemical energy systems such as batteries and fuel cells provide clean, reliable, and efficient energy storage and reduce dependence on fossil fuels, promote renewable energy utilization
CO2	interpret suitable techniques of water analysis and corrosion treatment of solid materials	SDG3	Good Health and well being	Water analysis techniques help identify contaminants and ensure safe drinking water, thereby protecting human health and preventing water-borne diseases Corrosion treatment of solid materials improves the safety and durability of pipelines, storage systems, and medical equipment
CO3	apprise manufacturing of engineering materials and spectroscopic techniques of chemical analysis	SDG9	Industry, Innovation and Infrastructure	Engineering materials enhancing knowledge of manufacturing processes for engineering materials and Spectroscopic technique develops knowledge of modern spectroscopic techniques used in chemical analysis These concepts promote industrial innovation, quality improvement, and advanced material development for sustainable industries
CO4	apprise the synthesis, materials and principles of green chemistry applications of engineering	SDG9	Industry, Innovation and Infrastructure	Engineering materials, and principles of green chemistry promote sustainable industrial development through the design of eco-friendly materials and processes It encourages innovation in engineering applications by reducing waste, energy consumption, and environmental impact in manufacturing industries

PROGRAMMING FOR PROBLEM SOLVING WITH C			
Class: B.Tech. I–Semester		**Branch: CSE(IoT)**	
Course Code:	**U26IN103**	**Credits:**	**3**
Hours/Week(L-T-P-E):	**2-1-0-3**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1:	enumerate programming development steps , design an algorithm and draw flow chart for a given application
CO2:	apply logical skills for problem solving using control structures and arrays
CO3:	develop string operations and modular programming with functions
CO4:	analyse and implement structures, unions, pointers and files in C programming

UNIT-I	**9 Hrs**

Introduction to Programming: Components of a computer, concept of hardware and software, Art of programming through algorithms and flow charts
Overview of C: History of C, Importance of C, Basic structure of C programs
Constants, Variables and Data Types: Character set, C tokens, Declaration of variables, Defining symbolic constants
Managing Input and Output Operations: Reading a character, Writing a character**,** Formatted input, Formatted output
Operators and Expressions: Arithmetic, Relational, Increment, Decrement, Conditional, Logical, Bit-wise, Special operators, Arithmetic expressions, Evaluation of expressions, Operator precedence and associativity

UNIT-II	**9 Hrs**

Decision Making and Branching: Simple if statement, if-else statement, Nesting of if-else statements, else if ladder, switch statement, Conditional operator, goto statement
Decision Making and Looping: while statement, do-while statement, for statement, Nested loops, Jumps in loops
Arrays: One-dimensional arrays, Declaration of one-dimensional arrays, Initialization of one-dimensional arrays, Linear search, Two-dimensional arrays, Initializing two dimensional arrays, Multi-dimensional arrays, Dynamic arrays

UNIT-III	**9 Hrs**

Character Arrays and Strings: Declaring and initializing string variable, Reading strings from terminal, Writing strings to screen, String handling functions, Table of strings
Modular Programming with User Defined Functions: Need for user-defined functions, Elements of user-defined functions, Definition of functions, Return values and their types, Function calls, Function declaration, Category of functions, Nesting of functions Recursion, The scope, Visibility and life time of variables (storage classes)

UNIT-IV	**9 Hrs**

Structures and Unions: Defining a structure, Declaring and initializing structure variables, Accessing structure members, Array of structures, Structures within structures, Unions
Pointers: Understanding pointers, Declaring and initializing pointer variables, Pointer expressions, Pointers and arrays, Pointers and character strings, Pointers to functions, Pointers and structures, Aarray of pointers

File Management in C: Defining and opening a file, Closing a file,Input and output operations on sequential text files, Random access to files
Textbook: 1. E Balagurusamy, *Programming ANSIC*, 8th ed, NewDelhi, India: McGraw Hill Education (India), 2022
Reference Book(s): 1. P Deitel and H Deitel, C How to Program: With Case Studies Introducing Applications Programming and Systems Programming, 9th ed, Harlow, England: Pearson Education Limited, 2022 2. B W Kernighan and D M Ritchie, The C Programming Language, 2nd ed, New Delhi, India: Pearson Education India, 2015 3. R Thareja, Programming in C, 3rd ed, New Delhi, India: Oxford University Press, 2023 **4.** .Y Kanetkar, Let Us C, 19th ed, New Delhi, India: BPB Publications, 2022 **5.** A K Sharma, Computer Fundamentals and Programming in C, 2nd ed, Hyderabad, India: Universities Press, 2018
Web and Video link(s): 1. https://nptel.a.cin/courses/106105171 NPTEL Video Lecture on Problem Solving through Programming in C by Prof Anupam Basu, Professor of CSE, IIT Kharagpur 2. https://nptel.ac.in/courses/106104128 NPTEL Video Lecture on Introduction to Programming in C by Prof Satyadev Nandakumar, Professor of CSE, IIT Kanpur

Course Articulation Matrix(CAM):		**U26IN103: PROGRAMMING FOR PROBLEM SOLVING WITH C**												
CO		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	**U26IN103.1**	2	1	1	1	-	-	-	1	-	1	2	1	2
CO2	**U26IN103.2**	2	2	2	1	-	-	-	1	-	1	2	2	2
CO3	**U26IN103.3**	2	2	3	1	-	-	-	1	-	1	2	2	2
CO4	**U26IN103.4**	2	2	3	2	-	-	-	1	-	1	2	2	2
U26IN103		**2**	**1.75**	**2.25**	**1.25**	**-**	**-**	**-**	**1**	**-**	**1**	**2**	**1.5**	**2**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

CO–SDGAlignmentMatrix				
CO	**Course Outcome**	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	enumerate programming development steps, design algorithms, and draw flowcharts for problem solving	SDG 4	Quality Education	Develops computational thinking, logical reasoning, and foundational programming skills essential for lifelong learning
CO2	apply logical skills for problem solving using control structures and arrays	SDG 4, SDG 8	Quality Education; Decent Work and Economic Growth	Enhances programming proficiency and analytical skills required for software development and professional careers
CO3	develop string operations and modular programs using functions	SDG 9	Industry, Innovation and Infrastructure	Promotes structured software development practices that support innovation and reliable software systems
CO4	analyse and implement structures, unions, pointers, and file handling in c programming	SDG 8, SDG 9	Decent Work and Economic Growth; Industry, Innovation and Infrastructure	Builds advanced programming competencies for developing efficient software solutions used in industrial and technological applications

ENGLISH COMMUNICATION AND REPORT WRITING			
Class: BTech I		**Branch:** Common to all branches	
Course Code:	**U26MH104**	**Credits:**	**3**
Hours/Week (L-T-P- E):	**2-1-0-3**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1 : apply basic grammar principles in speech and writing, read fast, form new words, make coherent paragraphs and adapt the real value of life

CO2 : create effective letters, e-mails, reply to Memos and do the given tasks with confidence

CO3 : analyze the given texts and write clear and unambiguous reports

CO4 : deduct the superfluous information from lengthy text, prepare SoP (Statement of Purpose) effectively and solve critical problems in life with emotional balance

UNIT-I	9 Hrs

Speaking Activities: Self-Introduction - News paper reading (reading aloud)- Pronunciation check-Presentation, Narration/ Oral description of a story/incident/event with the clues (JAM)

Grammar: Tenses- Definition and identification through examples-Main and Sub Tenses-Present Tense- Structures through examples-usage- Correct use of Tenses with a focus on Present Tense-exercises for practice

Vocabulary: Word formation- Prefixes-Suffixes- Definition & Examples-Sentence formation with newly

Reading Skill: Reading Definition, Sub skills of reading- Emphasis on Skimming-Definition-Purpose-How to skim through the text- Exercises for practice

Writing Practices: Report Writing, Definition-Purpose- Qualities of a good report-Types-Format

Paragraph Writing: Definition-Organizing principles of paragraphs- Making a paragraph through hints/graphs and pictures-Coherence-Linking devices- Systematic development of Ideas

Life Skills: Ethical Values and humanity

The Last Leaf: A Short Story by O Henry - Discussion based on collaborative interaction - Comprehension of Grammar, Vocabulary and content

UNIT-II	9 Hrs

Speaking Activities : Group discussion-narration/ oral description of a story/incident/event with the clues provided (jam)--debate

Grammar: Tenses- Past Tense, Sub Tenses, Structures, Correct use of Past Tense, Exercises for practice

Subject-Verb Agreement: Identification with examples-Rules-Exercises for practice

Reported Speech: Definition, Rules, Examples- Transformation Process, Exercises for practice

Sentence Correction: Emphasis on Concord, Reported Speech and Present and Past Tenses-Sentence Structures

Vocabulary: Synonyms, Antonyms, Single word substitutes, Definition, Examples-Popular abbreviations

Reading Strategy: Reading Strategy, Emphasis on scanning the text, Definition of scanning, Purpose advantages, Examples, Exercises and practice through team work

Writing Practices: Report writing, Technical reports, Purpose, Format, significance of abstract/Executive summary

Letter Writing: Effective letter writing techniques, Information seeking letters, Job application letters, Apology Letters, Resume and cover letter

Life Skills: Determination, How I became a public speaker: An essay by George Bernard Shaw Discussion based on collaborative interaction, Comprehension of grammar, Vocabulary and content

UNIT-III	**9 Hrs**

Speaking Activities: Self-Introduction through videos- Narration/ Oral Description of a story/incident/event with the clues provided (JAM)- Poster presentations / Power-Point presentations

Grammar: Tenses: Future Tense- Sub Tenses-Structures- Correct use of future tense- exercises for practice, Nouns, Prepositions, Adverbs, Adjectives, Definition, Identification, Exercises for practice, Sentence Correction based on correct use of Future Tense-, Nouns, Prepositions, Adverbs, Adjectives

Vocabulary: Phrasal verbs- Technical words-Latin words

Readings Trategy: Intensive reading: purpose, Types of comprehension questions, Examples, Exercises and Practice through team work

Writing Practices: Report Writing, Informational Reports, Inspection Reports, Feasibility reports, Purpose, Format, Content, Exercises for practice

Life Skills: Positive attitude, Be the Best of Whatever You Are: A Poem by Douglas Malloch, Discussion based on collaborative interaction, Comprehension of content

UNIT-IV	**9 Hrs**

Speaking Activities: Extempore speech on the given topic- Visual presentation- Group discussion on the topic given well in advance, Providing the required inputs, Story telling of one's choice

Grammar: Tenses: Revision, Exercises for practice, Clauses –Definition, Identification through examples, Objective, Purpose, Types, Conjunctions, Transformation of sentences, Sentence correction (Based on Parts of Speech), Clauses-Tenses

Vocabulary: Appropriate use of words in communication, Commonly confused words, Active reading and Note-Making, Definition, Purpose, Effectiveness

Writing Practices: Report writing, Progress report, Purpose, Format, Content, Exercises for practice

Précis writing: Definition, Purpose, Uses, Examples and Exercises, Practice through Teamwork Preparing Statement of Purpose (SoP)

Life Skills: Emotional Balance, "A Poison Tree": Poem by William Blake, Discussion based on collaborative interaction, Comprehension of content

Textbook(s):

1. Sanjay Kumar& Pushp Lata, "*English Language and Communication Skills for Engineers"* As per the latest AICTE syllabus, Oxford University Press, 1st edition 2018
2. *"Language and Life: A Skill's Approach"* Based on the latest AICTE model curriculum Orient Black swan Private Limited 2nd Edition 2019

Reference Book(s):

1. Thomson AJ, Martinet AV, "*A Practical English Grammar*", Oxford UniversityPress3rd Edition1997
2. Thomson AJ Martinet AV, "*A Practical English Grammar*" Exercise2, Oxford University Press3rd Edition1997

3. Standard Allen W, "*Living English Structure*", Pearson India Education Pvt Ltd5th Edition 2009

Web and Video link(s):

1. https://onlinecourses.nptel.ac.in/noc20_hs56/Preview Technical English for Engineers by Ais haIcbal, IIT Madras
2. https://onlinecoursesswayam2acin/cec21_lg13/preview Indian Writing in English by Dr Bindu Ann Philip, St Mary's College Trissur

Course Articulation Matrix (CAM):		U26MH104: ENGLISH COMMUNICATION AND REPORT WRITING												
CO		PO1	PO2	PO3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	PO 10	PO 11	PS O1	PS O2
CO1	U26MH104.1	-	-	-	-	-	1	-	2	2	2	2	1	1
CO2	U26MH104.2	-	-	-	-	-	1	-	2	2	2	2	1	1
CO3	U26MH104.3	-	-	-	-	-	1	-	2	2	2	2	1	1
CO4	U26MH104.4	-	-	-	-	-	1	-	2	2	2	2	1	1
U26MH104		-	-	-	-	-	1	-	2	2	2	2	1	1
3 – HIGH, 2 – MEDIUM, 1 - LOW														

CO–SDG Alignment Matrix				
CO	**CO Statement** *The student should be able to…*	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	apply basic grammar principles in speech and writing, read fast, form new words, make coherent paragraphs and adapt the real value of life	SDG-3	Good health and well-being	This aligns with SDG-3 as it partially contributes to the negative impact of mental imbalance on health through the irrational fears of Johnsy who is certain of her death when the last leaf falls down
		SDG-5	Gender equality	This also aligns with SDG-5 as is highlights women accomplishments on par with men by exposing Johnsy and Sue as painters who come out of their home town to stay in another place and work along with men for societal exposure
		SDG-4	Quality education	This aligns with SDG-4 as its primary focus is on enhancing the quality of language in speech and writing by strengthening grammar, vocabulary and writing skills
CO2	create effective letters, e-mails, reply to Memos and do the given tasks with confidence	SDG-4	Quality education	This aligns with SDG-4 as its aim is to enhance reading and writing skills by helping students write letters and resumes effectively applying grammar rules and using relevant vocabulary
		SDG-8		This aligns with SDG-8 as it indirectly contributes to economic growth and helps students become aware of the inevitability of strengthening their resume by improving their skills

			Decent work and economic growth	
CO3	analyze the given texts and write clear and unambiguous reports	SDG-4	Quality education	This aligns with SDG-4 as it focuses on enhancing the speaking, reading and writing skills of students to prove their abilities and the best communicators in society and work place by exhibiting professionalism in the usage of language
CO4	deduct the superfluous information from lengthy text, prepare SoP (Statement of Purpose) effectively and solve critical problems in life with emotional balance	SDG-4 SDG-16	Quality education Peace, justice and strong institutions	This aligns with SDG-4 as it orientates the students towards reading and writing, and improves critical and critical thinking Though not completely, it aligns with SDG-16 as it emphasizes the need to give up anger which is the most potential enemy of man to enjoy peace and become morally strong

DIGITAL LOGIC DESIGN

Class: B.Tech. I-Semester		**Branch :** CSE(IoT)	
Course Code:	**U26IN105**	**Credits:**	**3**
Hours/Week (L-T-P-E):	**2-1-0-3**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1 : apply Karnaugh maps for minimization of switching functions

CO2 : design combinational circuits for real-world applications

CO3 : design sequential circuits for real world applications

CO4 : design logic circuits using PLDs

UNIT-I	**9 Hrs**

Number Systems and Codes: Representation of number systems, conversion of numbers from one radix to other, Binary arithmetic, 1's and 2's complement subtraction, Binary weighted and non-weighted codes – BCD, Self complementing, Gray Codes

Boolean Algebra and Minimization: Postulates and theorems; logic gates –symbols and truth tables, realization of switching functions - AOI, NAND- NAND and NOR-NOR realizations; minimization of switching functions - using theorems, standard SOP & POS forms, Karnaugh map

UNIT-II	**9 Hrs**

Combinational circuits: Design of combinational circuits using logic gates – Half adder, Full adder, Half subtractor, Full subtractor, Parallel adder, Carry look ahead adder, BCD adder and 1's & 2's complement adder/subtractors; Decoders, Encoders, Priority encoders; Multiplexers, Demultiplexers, Realization of switching functions using Multiplexers

UNIT-III	**9 Hrs**

Sequential circuits: NAND RS latch, NOR RS latch; Flip flops- SR, JK, D and T, preset and clear inputs, truth tables, excitation tables , race around condition, Master slave flip flop, conversion of one flip flop to other; Binary counters – ripple and synchronous counters

UNIT-IV	**9 Hrs**

Programmable logic devices (PLDS): Introduction to PLDs, read only memories (ROMs), programmable logic array devices (PLAs), programmable array logic devices (PALs), implementation of Boolean functions on various PLDs

Textbook:

1. Moris Mano, *Digital Design,* PHI, 4th edition, NewDelhi, 2003

ReferenceBook(s):

1. R.P.Jain, *Modern Digital Electronics*, Tata Mc Graw-Hill,3rd edition,NewDelhi,2003
2. AnandKumar,*FundamentalsofDigitalCircuits*,PHI,3rd edition, NewDelhi, 2014
3. Zvi Kohavi, *Switching and Finite Automata Theory*, Tata McGraw-Hill,NewDelhi,2nd edition, 2008
4. Herbert Taub and Donald Schilling, *Digital Integrated Circuits*, Tata Mc Graw-Hill New Delhi, 2008

Web and Video link(s):

1. NPTEL: Electrical Engineering-NOC: Digital Circuits; *NPTEL Video Lecture on Digital Circuits*

Course Articulation Matrix(CAM):		U26CI05:DIGITALLOGIC DESIGN												
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U26IN105.1	2	2	-	1	1	-	-	-	1	1	-	1	1
CO2	U26IN105.2	2	2	2	1	1	-	-	-	1	1	-	1	1
CO3	U26IN105.3	2	2	2	1	1	-	-	-	1	1	-	1	1
CO4	U26IN105.4	2	2	2	1	1	-	-	-	1	1	-	1	1
U26IN105		2	2	2	1	1	-	-	-	1	1	-	1	1
3–HIGH,2–MEDIUM,1-LOW														

CO–SDG Alignment Matrix				
CO	**CO Statement** *The student should be able to…*	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	apply karnaugh maps for minimization of switching functions	SDG 9	Industry, Innovation and Infrastructure	Karnaugh map minimization enables efficient digital circuit design by reducing hardware complexity, supporting innovation and resource-efficient electronic systems
CO2	design combinational circuits for realworld applications	SDG 9	Industry, Innovation and Infrastructure	Combinational circuit design forms the foundation of modern digital systems, fostering technological innovation and supporting the development of reliable industrial infrastructure
CO3	design sequential circuits for real world applications	SDG 11	Sustainable Cities and Communities	Sequential circuits are essential in control and automation systems used in smart cities, transportation, energy management, and sustainable urban infrastructure
CO4	design logic circuits using plds	SDG 12	Responsible Consumption and Production	PLDs enable flexible and optimized hardware implementation, reducing electronic waste and promoting efficient utilization of computing resources

ENGINEERING CHEMISTRY LABORATORY			
Class: B. Tech. I Semester		**Branch:** CSE(IoT)	
Course Code:	**U26CY106D**	**Credits:**	**1**
Hours/Week (L-T-P- E):	**0-0-2-2**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1: apply titration techniques to calculate the concentration of acid and base solutions

CO2: apply volumetric analysis methods to estimate hydroxide ions and alkalinity in water samples

CO3: assess the quality of water by determining its total hardness and dissolved oxygen content

CO4: implement suitable techniques for the synthesis and characterization of nano materials and polymers

List of Experiments
Experiment-1
Estimation of hydroxideion by acidimetry
Experiment-2
Estimation of alkaline species present in the given water sample
Experiment-3
Determination of viscosity of the given liquid by Ostwald's viscometer
Experiment-4
Determination of rate of corrosion of mild steel in the presence and absence of inhibitor
Experiment-5
Determination of hardness of water by complexometric method
Experiment-6
Determination of dissolved oxygen in water sample
Experiment-7
Estimation of chloride ion in water sample by argentometry method
Experiment-8
Standardization of weak acid(aceticacid) by conduct of metry using sodium hydroxide (NaOH) and standard hydrochloric acid (HCl)
Experiment-9
Standardization of strong acid(HCl) by potentiometry using standard sodium hydroxide (NaOH)
Experiment-10
Colorimetric analysis-verification of Lambert-Beer's law
Experiment-11
Estimation of ferrous(Fe2+) ion in the given solution using potassium permanganate
Experiment-12
Synthesis of polymer (phenol-formaldehyde)
Textbook(s):

1. Mendham, J, Denney, RC, Barnes, JD and Thomas, MJK, *Vogel's Textbook of Quantitative Chemical Analysis*, Pearson Education, 6th edition, 2009
2. Sivasankar, B, *Engineering Chemistry*, Tata McGraw-Hill Education Pvt Ltd, New Delhi, 2nd edition, 2013

Reference Book(s):

1. J.C. Kuriacose and J Rajaram, *Chemistry in Engineering and Technology*(vol I), Tata Mc Graw-Hills Education Pvt Ltd, 2010
2. Sharma, B.K, *Instrumental Methods of Chemical Analysis*, Goel Publishing House, Meerut, 24th Edition, 2005

Laboratory Manual:

Engineering Chemistry Laboratory Manual , Department of M&H, KITSW

Course Articulation Matrix (CAM):		U26CY106D: ENGINEERING CHEMISTRY LABORATORY												
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U26CY106D.1	2	1	-	-	-	1	1	-	1	-	1	1	1
CO2	U26CY106D.2	2	1	-	-	2	1	1	-	1	-	1	1	1
CO3	U26CY106D.3	2	1	-	-	2	1	2	1	1	-	1	1	1
CO4	U26CY106D.4	2	1	-	-	-	1	1	-	1	-	1	1	1
U26CY106D		2	1	-	-	2	1	1.25	1	1	-	1	1	1
3 – HIGH, 2 – MEDIUM, 1 - LOW														

CO–SDG Alignment Matrix				
CO	**CO Statement** *The student should be able to*	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	apply titration techniques to calculate the concentration of acid and base solutions	SDG 3	Good Health and Well-being	Accurate concentration measurements support safe chemical handling and healthcare applications.
CO2	apply volumetric analysis methods to estimate hydroxide ions and alkalinity in water samples	SDG 6	Clean water and sanitation	Water alkalinity analysis helps assess water quality and supports safe water management.
CO3	assess the quality of water by determining its total hardness and dissolved oxygen content	SDG 6	Clean water and sanitation	Monitoring hardness and dissolved oxygen ensures water quality and protects aquatic ecosystems.
CO4	implement suitable techniques for the synthesis and characterization of nano materials and polymers	SDG 9	Industry, Innovation and Infrastructure	Nano materials and polymers promote technological innovation and sustainable industrial development.

PROGRAMMING FOR PROBLEM SOLVING WITH C LABORATORY			
Class: B.Tech. I–Semester		**Branch:** CSE(IoT)	
Course Code:	**U26IN107**	**Credits:**	**3**
Hours/Week(L-T-P-E):	**0-0-2-2**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36Hrs**	**ESE:**	**60%**

Course Learning Outcomes(COs)

After completion of this course, the students should be able to,

CO1: develop programs using operators and decision making statements

CO2: apply loops and arrays to develop a program of an application

CO3: implement string operations and develop modular programs using user-defined functions, recursion, and storage classes

CO4: develop programs using structures, unions, pointers and files

LIST OF EXPERIMENTS

Experiment-1
To develop the Programs using input output functions,operators (arithmetic,relational and conditional)
Experiment-2
To develop the Programs using operators(bit-wise,logical,increment and decrement)
Experiment-3
To develop the Programs using conditional control structures: if,if-else,nested if
Experiment-4
To develop the Programs using else if ladder, switch and goto statements
Experiment-5
To develop the Programs using loop control structures: while
Experiment-6
To develop the Programs using loop control structures: do-while and for
Experiment-7
To develop the Programs on one dimensional array and two-dimensional array
Experiment-8
To develop the Program son String operations and string handling functions

Experiment-9
To develop the Programs on different types of functions, parameter passing using call-by-value & call-by-address, recursion and storage classes
Experiment-10
To develop the Programs using structures,unions,pointers to arrays and pointers to strings
Experiment-11
To develop the Programs using array of pointers and pointers to structures
Experiment-12
To develop the Programs on File operations and file handling functions for sequential text files
TextBook(s): 1. Balagurusamy, *Programming in ANSIC*, 8th ed, NewDelhi, India: McGraw Hill Education (India), 2022 Limited,2022 2. B. W. Kernighan and D M Ritchie, *The C Programming Language*, 2nd ed, New Delhi, India: Pearson Education India, 2015 3. R. Thareja, *ProgramminginC*,3rd ed,NewDelhi,India:Oxford UniversityPress,2023 4. Y. Kanetkar, *LetUsC*, 19thed, NewDelhi, India: BPB Publications,2022, A.K.Sharma, *Computer Fundamentals and Programming in C*, 2nd ed, Hyderabad, India: Universities Press, 2018
Web and Video link(s): 1. https://nptelacin/courses/106105171 *NPTEL Video Lecture on Problem Solving through Programming in C by ProfAnupam Basu, Professor of CSE, IIT Kharagpur* 2. https://nptelacin/courses/106104128*NPTEL Video Lecture on Introduction to Programming in C by ProfSatyadev Nanda kumar,Professor of CSE, IIT Kanpur*
Laboratory Manual(for Laboratory Component): 1. *Programming for Problem Solving with C Laboratory Manual and Record Book,* Department of CSE(IoT), KITSW

Course Articulation Matrix(CAM):		U26IN107: PROGRAMMING FOR PROBLEM SOLVING WITH C LABORATORY												
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U26IN107.1	1	1	1	1	1	-	1	1	1	-	2	1	2
CO2	U26IN107.2	1	2	2	2	1	-	1	1	1	-	2	2	2
CO3	U26IN107.3	1	2	3	2	1	-	1	1	1	-	2	2	2
CO4	U26IN107.4	1	2	3	2	1	-	1	1	1	-	2	2	2
U26IN107		1	2.25	2.25	1.75	1	-	1	1	1	-	2	1.75	2

CO–SDGAlignmentMatrix				
CO	Course Outcome	Relevant SDG	SDG Description	Mapping Justification
CO1	develop programs using operators and decision-making statements	SDG 4	Quality Education	Strengthens practical programming skills and computational thinking through hands-on implementation of programming fundamentals
CO2	apply loops and arrays to develop programs for solving real-world problems	SDG 4, SDG 8	Quality Education; Decent Work and Economic Growth	Enhances logical reasoning and practical coding skills that improve employability and software development capabilities
CO3	implement string operations and develop modular programs using user-defined functions, recursion, and storage classes	SDG 9	Industry, Innovation and Infrastructure	Promotes structured and modular software development practices that support innovation and reliable software systems
CO4	develop programs using structures, unions, pointers, and file handling	SDG 8, SDG 9	Decent Work and Economic Growth; Industry, Innovation and Infrastructure	Builds advanced programming competencies for developing efficient, maintainable, and industry-oriented software applications

SPORTS & YOGA			
Class: B.Tech. I Semester		**Branch:** Common to All Branches	
Course Code:	**U26VA108**	**Credits:**	**1**
Hours/Week (L-T-P- E):	**0-0-2-2**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1 : demonstrate Physical Fitness by performing Yoga Asanas

CO2 : demonstrate Physical Fitness through various games & Sports

CO3 : demonstrate Sportsman spirit and ethics

CO4 : demonstrate Physical, Psychological, Social and Emotional balance

Event-1
Basket Ball: Passing, Dribbling, Shooting, Blocking, Rebounding, Offense/ Defence
Event-2
Foot Ball : Dribbling, Passing, Receiving , Shooting ,Ball Control ,Heading ,Tracking Marking, Movement off the Ball develop a program to implement contrast stretching
Event-3
Volley Ball: Serving, Passing (upper hand / under hand), Setting, Blocking, Spiking
Event-4
Badminton : Proper Grip , Footwork, Stance, Serving, Basic Strokes
Event-5
Chess : Tactics, Calculation, Visualization, Opening, Evaluation ,Ending games, Strategy
Event-6
Carroms : Proper Flicking technique, Angle Awareness, Controlling force, Focus and Consistency, Visualize the shot, Body Alignment and Posture, Watch your Wrist Use the Right Finger
Event-7
Table Tennis : Grip, Stance, Footwork, Basic Stokes, Serving
Event-8
Cricket : Batting ,Bowling , Fielding ,Wicket Keeping
Event-9
hand ball : Gripping, Catching Passing, Dribbling ,Faking, Shooting
Event-10
Kabaddi : Offensive (Raiding) Skills, Defensive (Tackling) Techniques
Event-11
Kho-Kho : Chasing (Attacking) ,Running(Evading)Techniques
Event-12
Yoga : Surya Namaskar, Thirkonasanam, Vajrasanam, Shashankasanam, Navukasanam, Chakrasanam, Dhanurasanam, Pranayamam

Textbook(s):

1. Rules and Skills of Games and Sports, Author – BKChaturvedi, Publisher – Goodwill Publishing House, B-9, Rattan Jyoti, 18 Rajendra Place, New Delhi – 110008 (India)
2. Yoga For Every Athlete, Secrets of an Olympic Coach, Author – Aladar Kogler, PhD, Sports Psychologist, JAICO Publishing House, Mumbai, Delhi, Bangalore, Calcutta, Hyderabad, Chennai

3. Coaching Successfully BasketBall, Author – Yograj Thani, Sports Publication, WP-474, 1st Floor, Shiv Market, Ashok Vihar, Delhi-110052
4. Badminton for Schools, AuthorJake Downey, Publisher – SChand& Company Ltd, Ram Nagar, New Delhi-110055
5. Volleyball for Schools, Author- Dave James Phtographs by Gordon Ruck, Publisher – SChand& Company (Pvt) LTD, Ram Nagar, New Delhi – 110055
6. FootBall Skills & Rules, Author – OPSharma, Publisher- Khel Sahitya Kendra, 4264/3, Ansari Road, Darya Ganj, New Delhi-110002

Reference Book:

1. Foundation of Physical Education and Sports, Dr. Sakure Girish Madhaorao, Sports Publication 7/26,Ground Floor,New Delhi-110002,E-mail:lakshaythani@hotmail.com

Course Articulation Matrix (CAM):		**U26VA108 : SPORTS & YOGA**												
CO		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PS O1**	**PS O2**
CO1	**U26VA108.1**	**-**	**-**	**1**	**-**	**-**	**2**	**1**	**2**	**-**	**-**	**1**	**-**	**-**
CO2	**U26VA108.2**	**-**	**-**	**1**	**-**	**-**	**2**	**1**	**2**	**1**	**-**	**1**	**-**	**-**
CO3	**U26VA108.3**	**-**	**-**	**1**	**-**	**-**	**2**	**1**	**2**	**-**	**-**	**1**	**-**	**-**
CO4	**U26VA108.4**	**-**	**-**	**1**	**-**	**-**	**2**	**1**	**2**	**-**	**1**	**1**	**-**	**-**
U26VA108		**-**	**-**	**1**	**-**	**-**	**2**	**1**	**2**	**2**	**1**	**1**	**-**	**-**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

CO–SDG Alignment Matrix				
CO	**CO Statement** *The student should be able to*	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	demonstrate physical fitness by performing yoga asanas	SDG13, SDG5	Climate Action, Gender Equality	Promoting eco-friendly sports practices, minimal resource usage, outdoor yoga, and sustainable lifestyle habits Promoting teamwork, leadership, inclusiveness, equal participation, and collaboration in sports and group yoga sessions
CO2	demonstrate physical fitness through various games & sports	SDG3	Good Health & Well-being	Designing personalized fitness routines, yoga modules, and wellness programs to meet individual health needs
CO3	demonstrate sportsman spirit and ethics	SDG16	Peace, Justice & Strong Institutions	Encouraging discipline, fairness, inclusivity, respect, mental balance, and ethical conduct through sportsmanship and yogic values
CO4	demonstrate physical, psychological, social and emotional balance	SDG3, SDG11	Good Health & Well-being, Sustainable Cities & Communities	Understanding the role of physical fitness and yoga in improving societal health, work-life balance, and community well-being

FUNDAMENTALS OF COMPUTING SYSTEMS LABORATORY			
Class: B. Tech. I – Semester		**Branch:** CSE (IoT)	
Course Code:	**U26IN109**	**Credits:**	**1**
Hours/Week (L-T-P- E):	**0-0-2-2**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1 : identify and explain computer hardware, software, operating system features, and utility tools

CO2 : install, configure, and manage operating systems, files, folders, and system resources

CO3 : create professional documents, spreadsheets, and presentations using productivity tools

CO4 : prepare technical reports using LaTeX and apply basic troubleshooting and security practices in computing environments

Experiment-1

Exploring Computer Hardware Components: Identify and study the functions of CPU, RAM, motherboard, storage devices, SMPS, monitor, keyboard, mouse, ports, and peripheral devices by physically examining a computer system and preparing a hardware inventory sheet

Experiment-2

Understanding Software and Operating Systems: Examine different categories of software including operating systems, device drivers, utility software, browsers, office applications, and productivity tools Compare the features of Windows and Linux operating systems

Experiment-3

Installing and Configuring an Operating System: Perform the steps involved in installing an operating system, creating partitions, configuring user accounts, installing device drivers, enabling updates, and customizing desktop settings

Experiment-4

File and Folder Management using Command Prompt: Practice file management using DOS commands such as DIR, CD, MD, RD, COPY, MOVE, DEL, REN, TREE, and XCOPY to organize and maintain files and directories efficiently

Experiment-5

Using System Utilities for Monitoring and Troubleshooting: Use Task Manager, Device Manager, Disk Management, Event Viewer, Resource Monitor, and System Information tools to monitor system performance and identify common system issues

Experiment-6

Securing Computer and Mobile Devices: Configure antivirus software, firewall settings, password protection, software updates, backup mechanisms, and mobile security features to protect digital assets and personal information

Experiment-7

Preparing Professional Documents using MS Word: Create technical reports using styles, headings, page numbering, tables, images, references, headers, footers, captions, and table of contents following standard documentation practices

Experiment-8

Data Analysis and Reporting using MS Excel: Perform calculations using formulas and functions, organize datasets, apply filters, conditional formatting, and generate charts for effective data visualization and reporting

Experiment-9

Designing Technical Presentations using MS PowerPoint: Develop professional presentations using themes, layouts, SmartArt, charts, animations, transitions, and multimedia elements to communicate technical concepts effectively

Experiment-10

Technical Document Preparation using LaTeX: Create structured documents containing title pages, sections, subsections, lists, tables, and formatting commands using LaTeX
Experiment-11
Scientific Writing using Advanced LaTeX: Prepare technical reports including figures, equations, cross-references, citations, bibliography, and document templates suitable for academic publications
Experiment-12
Integrated Documentation and Reporting Exercise: Prepare a complete mini-project report and presentation by integrating MS Word, Excel, PowerPoint, and LaTeX tools following professional documentation standards
Textbook(s): 1. Peter Norton, *Introduction to Computers*, McGraw Hill Education, 8th Edition, 2019 (Chapters 1 to 6) 2. Joan Lambert, *Microsoft Office 365 & Office 2021 Step by Step*, Microsoft Press, 1st Edition, 2021 (Chapters 1 to 4) 3. Leslie Lamport,*LaTeX: A Document Preparation System*, Pearson Education, 2nd Edition, 2016 (Chapters 1 to 5)
Reference Book(s): 1. P.K. Sinha and Priti Sinha, *Computer Fundamentals*, BPB Publications, 7th Edition, 2020 2. V. Rajaraman, *Fundamentals of Computers*, PHI Learning, 6th Edition, 2019 3. Michelle Carey and Jason Eckert, *New Perspectives Microsoft Office 365 & Office 2021*, Cengage Learning, 2022
Laboratory Manual (for laboratory component): 1. *Laboratory Manual, Designed by Faculty of* Department of CSE (Networks), KITSW

Course Articulation Matrix (CAM):		**U26IN109 :** Fundamentals of Computing Systems Laboratory												
CO		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	**U26IN109.1**	3	2	1	1	2	1	-	-	1	1	-	2	2
CO2	**U26IN109.2**	3	2	2	1	3	1	-	-	1	1	-	2	2
CO3	**U26IN109.3**	2	2	2	1	3	1	-	-	1	2	-	2	2
CO4	**U26IN109.4**	2	2	1	1	3	1	-	-	1	2	-	2	2
U26IN109		2	**2**	**1.5**	**1**	**3**	1	**-**	**-**	**1**	1.5	**-**	**2**	**2**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

CO–SDG Alignment Matrix				
CO	**CO Statement (The student should be able to…)**	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	identify and explain computer hardware, software, operating system features, and utility tools	**SDG 4**	Quality Education	Provides foundational knowledge of computing systems and digital technologies, supporting technology-enabled learning and skill development
CO2	install, configure, and manage operating systems, files, folders, and system resources	**SDG 9**	Industry, Innovation and Infrastructure	Develops practical skills in operating system installation, configuration, maintenance, and efficient utilization of computing infrastructure
CO3	create professional documents, spreadsheets, and presentations using productivity tools	**SDG 8**	Decent Work and Economic Growth	Enhances employability and workplace readiness through proficiency in widely used productivity and communication tools
CO4	prepare technical reports using latex and apply basic troubleshooting and security practices in computing environments	**SDG 4, SDG 9**	Quality Education; Industry, Innovation and Infrastructure	Promotes professional technical communication, problem-solving skills, secure computing practices, and effective use of digital infrastructure

ENGINEERING GRAPHICS THROUGH CAD			
Class: B.Tech. I Semester		**Branch:** Common to all Branches	
Course Code:	**U26ME110**	**Credits:**	**1**
Hours/Week(L-T-P-E):	**0-0-2-2**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60%**

Course Learning Outcomes(COs)

After completion of this course ,the students should be able to,

CO1: draw projections of points and straight lines

CO2: develop the projections of planes using Auto CAD

CO3: construct the projections of solids and sections of solids using Auto CAD

CO4: create orthographic and isometric projections; develop the simple electrical, electronic Circuit & 3D model using Auto CAD

List of Experiments
Experiment-1
Draw the simple geometries (Polygons, circle and semi-circle)
Experiment-2
Draw the Projection of points in different quadrants
Experiment-3
Draw the Projection of straight lines in simple position and inclined to one plane
Experiment-4
Draw the Projection of straight lines inclined to both the planes & traces
Experiment-5
Draw the Projection of planes
Experiment-6
Draw the Projection of solids – Simple position (Axis per pendicular to HP or VP)
Experiment-7
Draw the projections of solids inclined to both the planes
Experiment-8
Draw the Sections of solids
Experiment-9
Draw the Orthographic projections of given objects
Experiment-10
Draw the Isometric view from the given orthographic views
Experiment-11
Draw the given Electrical and Electronics circuit diagrams
Experiment-12
Draw the given 3D object for engineering applications

Text book(s):

1. Bhatt ND, *Elementary Engineering Drawing*, Charotar Publishing House, Anand, India, 2017
2. Kulkarni D M, Rastogi A P, and Sarkar A, Engineering Graphics with Auto CAD, PHI, publisher, revised edition, July 2010

Reference Book(s):

1. Dhananjay A Jolhe, *Engineering Drawing*, Tata McGraw-Hill, 2008
2. Venugopal K *Engineering Graphics with Auto CAD*, NewAge International Publishers Ltd, Hyderabad, 2012
3. Luzadder W Jand DuffJ M, *Fundamentals of Engineering Drawing*, Prentice-Hall of India,1995

Web and Video link(s):

1. *https://onlinecoursesnptelacin/noc20_me79/preview NPTEL video link for* ***Engineering drawing and computer graphics*** *By Prof Rajaram Lakkaraju,IIT Kharagpur*

Laboratory Manual(forlaboratorycomponent):

Engineering Graphics through CAD Laboratory Manual & Record Book, Dept of ME, KITSW

Course Articulation Matrix(CAM):		**U26ME110: ENGINEERING GRAPHICS THROUGH CAD**											
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**
CO1	**U26ME110.1**	2	1	1	-	2	1	-	1	2	-	1	2	1
CO2	**U26ME110.2**	2	1	1	-	2	1	-	1	2	-	1	2	1
CO3	**U26ME110.3**	2	1	1	-	2	1	-	1	2	-	1	2	1
CO4	**U26ME110.4**	2	1	1	-	2	1	-	1	2	-	1	2	1
U26ME110		**2**	**1**	**1**	**-**	**2**	**1**	**-**	**1**	**2**	**-**	**1**	**2**	**1**

CO–SDG Alignment Matrix				
CO	**CO Statement – The student should be able to…**	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	draw projections of points and straight lines	SDG4	Quality Education	Develops fundamental engineering graphics knowledge,spatial visualization skills, and technical competencies required for quality engineering education
CO2	develop the projections of planes using cad	SDG4	Quality Education	Enhances students' proficiency in CAD-based drafting and graphical communication, promoting modern technology – enabled learning
		SDG9	Industry, Innovation and Infrastructure	Introduces the use of CAD tools employed in industrial design and infrastructure-related engineering applications
CO3	construct the projections of solids and sections of solids using cad	SDG4	Quality Education	Strengthens analytical thinking, visualization, and engineering drawing Skills through practical CAD applications
		SDG9	Industry, Innovation and Infrastructure	Supports engineering design and manufacturing practices by enabling the creation and interpretation of complex engineering models
CO4	create orthographic and isometric projections; develop simple electrical, electronic circuits and 3d models using cad	SDG4	Quality Education	Promotes advanced technical skills, creativity, and lifelong learning through modern engineering software and design practices
		SDG9	Industry, Innovation and Infrastructure	Facilitates innovation and industrial development by equipping learners with CAD-based design, modeling, and visualization skills used in engineering industries

II SEMESTER (ForStream – II: CE, ME, IT, CSN, CSM, CSO, CSD)

S No	Category	Course Code	Course Title	Lectures / week				Credits
				L	T	P	E	C
1	BSC	U26MH201	Matrix Theory and Vector Calculus	2	1	-	3	3
2	BSC	U26PY202X	Engineering Physics (from Pool-IX)	2	1	-	3	3
3	ESC	U26IN203	Data Structures through C	2	1	-	3	3
4	PCC	U26IN204	Computer Architecture and Organisation	2	1	-	3	3
5	ESC	U26EE205X	Basic Electrical & Electronics Engineering (from Pool – X)	2	1	-	3	3
6	BSC	U26PY206X	Engineering Physics Laboratory (from Pool-XI)	-	-	2	2	1
7	ESC	U26IN207	Data Structures through C Laboratory	-	-	2	2	1
8	PCC	U26IN208	Networking and AI Tools Laboratory	-	-	2	2	1
9	ESC	U26EE209X	Basic Electrical & Electronics Engineering Laboratory (from Pool – XII)	-	-	2	2	1
10	AEC	U26AE210	IDEA Lab Makerspace	-	-	2	2	1
Total:				**10**	**5**	**10**	**25**	**20**
Summer/ Inter-sem Bridge Courses (Approved by BoS and Dean,AA): 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)								

*** For CE and ME, it will be a three (03) credit (1-0-4) course on Engineering Graphics & Design (Pedagogy: Sessions with conventional drafter and CAD) (For CE: U26CE107/U26CE207 and for ME: U26ME107A/U26ME207A)**

Bridge Courses for exit:

Successful completion of two subjects (6-Credits)during 2-months internship at the institute
OR
Successful completion of two suitable skill based courses (external) to qualify for Certification

A After First Year: (UG Certificate in CSE(IOT))
(i) The candidate should pass any two of the following additional courses (ITI Level) during the 2-Months internship at institute

Exit Option to Qualify UG Certificate in CSE(IOT): Any Two (02) Courses during the 2 - Months internship								
S No	**Category**	**Course Code**	**Course Title**	**L**	**T**	**P**	**E**	**C**
1	**PCC**	**U26IN211X**	Arduino Programming	**2**	**-**	**2**	**4**	**3**
2	**PCC**	**U26IN212X**	Web Development	**2**	**-**	**2**	**4**	**3**
3	**PCC**	**U26IN213X**	Raspberry Pi Programming	**2**	**-**	**2**	**4**	**3**

(OR)

(ii) Any two suitable skill based courses to qualify for Certification

Exit Option to Qualify UG Certificate in CSE(IOT): Any Two (02) Skill based Courses -:								
S. No.	**Category**	**Course Code**	**Course Title**	**L**	**T**	**P**	**E**	**C**
1	**SEC**	**U26SE211X**	Programming with C++ Reference:https://trainings.internshala.com/c-plus-plus-course	**-**	**-**	**6**	**6**	**3**
2	**SEC**	**U26SE212X**	Advance Excel Reference: https://trainings.internshala.com/excel-course	**-**	**-**	**6**	**6**	**3**
3	**SEC**	**U26SE213X**	CISCO: IT Essentials Reference:Offered by CISCO CoE, KITSW	**-**	**-**	**6**	**6**	**3**
4	**SEC**	**U26SE215X**	CISCO: Introduction to Networks Reference:Offered by CISCO CoE, KITSW	**-**	**-**	**6**	**6**	**3**

MATRIX THEORY AND VECTOR CALCULUS

Class: B Tech II – Semester		**Branch:** Common to all	
Course Code:	**U26MH201**	**Credits:**	**3**
Hours/Week (L-T-P- E):	**2-1-0-3**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1: analyze eigen value problems using matrix theory

CO2 : apply basic concepts of multiple integrals in evaluating physical quantities of real-life engineering problems

CO3: apply differential operators on vector and scalar point functions

CO4: solve line, surface, volume integrals and correlate these with applications of Green, Stoke and Gauss divergence theorems

UNIT-I	**9 Hrs**

Matrices: Rank of a Matrix, Elementary transformations of a matrix, Gauss Jordan method of finding the inverse, Normal form of a matrix, Consistency of linear system of equations, System of linear homogenous equations, Eigen values, Eigen vectors, Properties of Eigen values, Cayley Hamilton's theorem, Reduction to diagonal form, Factorization method (LU Decomposition)

Applications of Eigen value problems: Stretching of an elastic membrane, Eigen value problems arising from Markov processes, Eigen value problems arising from population models, Leslie model

UNIT-II	**9 Hrs**

Multiple Integrals and Beta, Gamma functions: Double Integrals, change of order of integration, Double Integrals in polar coordinates, Area enclosed by plane curves, Triple integrals, Volumes of solids, Calculation of mass for a plane lamina, Beta function, Gamma function, Relation between Beta and Gamma functions (without proof)

UNIT-III	**9 Hrs**

Vector Calculus and its applications: - Vector Space, Linear dependent and independent vectors, Differentiation of vectors, Curves in space, Tangent, Principal normal, Binormal, Curvature, Torsion, Velocity and acceleration, Scalar and vector point functions, Del applied to scalar point functions - Gradient, Geometrical interpretation, Directional derivative, Del applied to vector point functions -Divergence, Curl, Physical interpretation of divergence, Physical interpretation of curl, Del applied twice to point functions, Del applied to products of point functions, Decomposition of vector valued functions

UNIT-IV	**9 Hrs**

Integration of vectors: Line integral, Surfaces-Surface integral, flux across a surface, Green's theorem in the plane (without proof), Stoke's theorem (Relation between line and surface integrals) (without proof), Volume integral, Gauss divergence theorem (Relation between surface and volume integrals) (without proof), irrotational fields, solenoidal fields

Textbook(s):

1. Grewal, BS, *Higher Engineering Mathematics*, Khanna Publishers, Delhi, 44th edition, 2017(Chapters 2,7,8)
2. Kreyszig E, *Advanced Engineering Mathematics*, Inc, UK, John Wiely &sons, 10th edition, 2020 (Chapter -2 to 8)

Reference Book(s):

1. Spiegel M, *Vector Analysis* -Schaum's Series, McGraw Hill, 2nd edition, 2017
2. S.S. Sastry, *Engineering Mathematics, VolII,* Prentice Hall of India, 3rd edition, 2014
3. Gilbert Strang, *Introduction to Linear Algebra*, Wellesley-Cambridge Press, 5th edition

Course Articulation Matrix (CAM):		U26MH201C: MATRIX THEORY AND VECTOR CALCULUS												
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U26MH201.1	2	2	1	1	-	-	-	1	1	-	1	1	1
CO2	U26MH201.2	2	2	1	1	-	-	-	1	1	-	1	1	1
CO3	U26MH201.3	2	2	1	1	-	-	-	1	1	-	1	1	1
CO4	U26MH201.4	2	2	1	1	-	-	-	1	1	-	1	1	1
U26MH201		2	**2**	1	**1**	-	**-**	**-**	**1**	**1**	**-**	**1**	1	**1**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

CO–SDG Alignment Matrix				
CO	**CO Statement (The student should be able to…)**	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	analyze eigen value problems using matrix theory	SDG 4	Quality Education	Matrix theory and eigenvalue analysis strengthen mathematical reasoning, computational skills, and problem-solving abilities essential for higher education, engineering, and scientific research
CO2	apply basic concepts of multiple integrals in evaluating physical quantities of real-life engineering problems	SDG 9	Industry, Innovation and Infrastructure	Multiple integrals are widely used in engineering applications such as fluid mechanics, thermodynamics, structural analysis, image processing, computer graphics, data modeling, probability distributions, and optimization techniques, supporting technological innovation and infrastructure development
CO3	apply differential operators on vector and scalar point functions	SDG 9	Industry, Innovation and Infrastructure	Differential operators such as gradient, divergence, and curl are fundamental in fluid dynamics, electromagnetism, computational modeling, engineering simulations, and scientific research, contributing to technological advancement and innovation
CO4	solve line, surface, and volume integrals and correlate these with applications of green's, stoke's, and gauss divergence theorems	SDG 9	Industry, Innovation and Infrastructure	Vector integration techniques and integral theorems are extensively used in engineering analysis, fluid mechanics, electromagnetics, computer graphics, image processing, simulation systems, artificial intelligence, and data visualization, enabling innovative engineering solutions

ENGINEERING PHYSICS			
Class: B Tech II – Semester		**Branch:** Common to all	
Course Code:	**U26PY202D**	**Credits:**	**3**
Hours/Week (L-T-P- E):	**2-1-0-3**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1: analyse the phenomena of interference, diffraction and polarization, working principles and applications of lasers

CO2: assess the operation and applications of optical fibre and interpret the formation and characteristics of special diodes through semiconductor physics principles

CO3: evaluate the magnetic and superconducting properties of materials and justify their use in engineering applications

CO4: estimate the energy values of a particle in an infinite potential well and apply quantum mechanical principles to understand quantum computing

UNIT-I	**9 Hrs**

Applied Optics: Principle of superposition, Concept and Types of interference, Interference in thin film due to reflection, Newton's Rings and its applications, Non- reflecting films; Definition and types of diffractions, Single Slit diffraction, Diffraction grating- types and applications (qualitative); Introduction to polarization, Malus law, Brewster's law, Double efraction, Optical activity, LCD (qualitative)

Lasers: Difference between conventional light and laser, Basic principles and characteristics of lasers, Absorption, Spontaneous and stimulated emission, Population inversion, Pumping methods, Optical resonator; Types of lasers, Ruby laser, Nd:YAG laser and He-Ne laser; Applications of lasers

UNIT-II	**9 Hrs**

Fiber Optics: Introduction, Total internal reflection, Optical fiber construction, Numerical aperture and acceptance angle, Types of optical fibers - Step index and graded index, Modes of propagation in an optical fibre; V-number; Power losses in optical fibers - Attenuation, Dispersion, Bending; Applications of optical fibers- Fiber optic communication system, Endoscopy, Fiber optic sensors- active and passive sensors

Semiconductor Physics: Classification of solids based on energy band theory- Conductors, Semiconductors and insulators; Types of semiconductors- carrier generation and recombination(qualitative); PN junction diode, Diode current equation and Diode current dependence on forward and reverse voltages; Direct and indirect band gap semiconductors, Light emitting diode (LED) and Photo diode

UNIT-III	**9 Hrs**

Magnetic materials: Introduction, Permeability, Magnetization, Susceptibility, Origin of magnetism, Bohrmagneton, Ferro, Antiferro and ferri magnetic materials, Hysteresis, Soft and hard magnetic materials; Magnetic memories- core and bubble memories

Superconducting materials: Superconductivity, properties of superconductors, Transition temperature, Critical magnetic field and critical current, Isotope effect, Meissner effect, Type-I and type-II superconductors, High Tc superconductors, Magnetic levitation, Applications of superconductors

UNIT-IV	**9 Hrs**

Elements of Quantum Mechanics: Wave-particle duality, de-Broglie wavelength, Physical significance of wave function, Schrodinger time-independent wave equation, Schrodinger time-dependent wave equation, Particle in an infinite potential well (one dimension)

Introduction to Quantum Computing: Observables and operators, Expectation values, Expectation values in operator notation, Dirac Bra-Ket notation, Superposition principle, Concept of Quantum bits, Classical versus Quantum computing, Quantum parallelism and Quantum entanglement, Applications of quantum computing

Textbook(s):

1. M Avadhanulu and Kshirsagar, TVS Arun Murthy, *A Text Book of Engineering Physics,* S Chand & Company Ltd, 11th edition, 2018 (Unit-I, II, III & IV)
2. S Salivahanan, N Suresh Kumar, *Electronic devices and circuits,* Mc Graw Hill edition, 2017 (Unit-II-Chapter 4 & 5)
3. Michael Nielsen and Isaac Chuang, *Quantum Computation and Quantum Information,* Cambridge University Press, 2010(Unit-IV-Chapter 11, 12 & 13)

Reference Book(s):

1. Neil Gershenfeld, *Physics of Information Technology*, Cambridge University Press, 1st edition, 2000
2. V Rajendran, *Engineering Physics*, Mc Graw Hill edition, 2013
3. Eleanor Rieffel and Wolfgang Polak, *Quantum Computing: A Gentle Introduction,* The MIT Press Cambridge, Massachusetts London, England, 2011
4. RK Gaur and SLGupta, *Engineering Physics*, Dhanpath Rai and Sons, 2013
5. David Halliday, Robert Resnick and S Krane, *Physics Volume I&II*, Wiley India Limited, 5th edition, 2014

Web and Video link(s):

1. https://onlinecourses.nptel.ac.in/noc24_ph28/preview; NPTEL *video lecture on Concepts in Magnetism and Superconductivity by Prof Arghya Taraphder IIT Kharagpur*
2. https://onlinecourse.nptel.ac.in/noc24_lw07/preview; NPTEL video lecture on Intro*duction to Law on Electricity* by Prof Uday Shankar, IIT Kharagpur
3. https://onlinecourse.nptel.ac.in/noc24_ph45/preview; *NPTEL Video Lecture on Intro-duction to LASER - Course* by Prof M R Shenoy, IIT Delhi
4. https://onlinecourse.nptel.ac.in/noc20_ee77/preview; *NPTEL Video Lecture on Semi-conductor Devices and Circuits By Prof Sanjiv Sambandan, IISc Bangalore*
5. https://nptel.ac.in/courses/106106232; *NPTEL Video Lecture on Introduction to Quantum Computing: Quantum Algorithms and Qiskit by Prof Prabha Mandayam, Prof Anupama Ray, Prof Sheshashayee Raghunathan, IIT Madras*

Course Articulation Matrix (CAM)		**U26PY202D: ENGINEERING PHYSICS**												
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PS O1**	**PSO2**
CO1	**U26PY202D.1**	2	1	1	-	-	1	1	1	1	-	1	1	1
CO2	**U26PY202D.2**	2	1	-	-	-	1	1	1	1	-	1	1	1
CO3	**U26PY202D.3**	2	1	-	-	-	1	1	1	1	-	1	1	1
CO4	**U26PY202D.4**	2	1	-	-	-	1	1	1	1	-	1	1	1
U26PY202D		2	1	1	-	-	1	1	1	1	-	1	1	1

CO–SDG Alignment Matrix				
CO	**CO Statement***The student should be able to…*	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	analyse the phenomena of interference, diffraction and polarization, and explain the working principles and applications of lasers.	SDG 4, SDG 9	Quality Education; Industry, Innovation and Infrastructure	Understanding optical phenomena and laser technologies strengthens scientific knowledge and supports innovations in communication, healthcare, manufacturing, and engineering applications.
CO2	assess the operation and applications of optical fibre and interpret the formation and characteristics of special diodes through semiconductor physics principles.	SDG 7, SDG 9	Affordable and Clean Energy; Industry, Innovation and Infrastructure	Optical fibre and semiconductor devices enable energy-efficient communication systems and advanced electronic technologies, contributing to sustainable infrastructure and innovation.
CO3	evaluate the magnetic and superconducting properties of materials and justify their use in engineering applications.	SDG 7, SDG 9	Affordable and Clean Energy; Industry, Innovation and Infrastructure	Advanced magnetic and superconducting materials improve energy efficiency and support the development of high-performance engineering systems and sustainable technologies.
CO4	estimate the energy values of a particle in an infinite potential well and apply quantum mechanical principles to understand quantum computing.	SDG 4, SDG 9, SDG 17	Quality Education; Industry, Innovation and Infrastructure; Partnerships for the Goals	Quantum mechanics builds advanced scientific knowledge, drives next-generation computing technologies, and promotes interdisciplinary research collaborations for technological advancement.

DATA STRUCTURES THROUGH C			
Class: B. Tech. – II Semester		**Branch:CSE (IoT)**	
Course Code:	**U26IN203**	**Credits:**	**3**
Hours/Week (L-T-P- E):	**2-1-0-3**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1 : analyze and implement array operations by utilizing dynamic memory allocation and evaluating their time and space complexities

CO2 : analyze and implement stack and queue data structures by utilizing array representations and evaluating their applications and operational complexities

CO3 : analyze and implement various types of linked lists by utilizing dynamic memory allocation techniques and evaluating their operational complexities

CO4 : develop various sorting algorithms, analyze their time complexities, and apply hashing techniques with collision resolution methods, comparing their efficiencies

UNIT-I	**9 Hrs**

Data Structures: Basic terminology, Classification of data structures, Applications and operations on data structures, Time and space complexity

Arrays: Operations on arrays-traversing an array, Inserting an element in an array, Deleting an element from an array, Searching an element using binary search and their complexities

Dynamic Memory Allocation: Memory allocation functions, Dynamic memory allocation for single and two dimensional arrays, Three dimensional and n-dimensional arrays, Passing arrays to functions and pointers

UNIT-II	**9 Hrs**

Stacks: Stacks, Array representation of stacks, Operations on a stack–push and pop, Multiple stacks, Applications of stacks- recursion, Fibonacci series, Tower of Hanoi, Evaluation of expressions (Infix to postfix conversion, Evaluation of postfix expression) Queues: Queues, Array representation of queues, Double ended queues, Circular queues

Queues: Queues, Array representation of queues, Double ended queues, Circular queues, Priority queue

UNIT-III	**9 Hrs**

Linked Lists: Basic terminologies, Linked list versus arrays, Memory allocation and de-allocation for a linked list, Singly linked list, Circular linked list, Doubly linked list, Circular doubly linked list (Linked list operations- traversing, searching, inserting, deleting), Representing stack and queue using linked list,Skiplist

UNIT-IV	**9 Hrs**

Sorting Techniques: Selection sort, Insertion Sort, Shell sort and Radix sort, Time complexities of sorting,Two way insertion sort,Comparison of sorting techniques

Hashing: Hashing techniques, Collision resolution techniques, Closed hashing, Open hashing, Comparison of collision resolution techniques

Textbook:

1. D.Samantha, *Classic Data Structure,* Prentice Hall India New Delhi, 2nd edition, 2009

Reference Book(s):

1. R.Thareja, *Data Structures Using C,* Oxford University Press, New Delhi, India, 2nd edition, 2014
2. E.Balagurusamy, *Data Structure Using C*, McGraw Hill Education, New Delhi, India: 1st edition, 2017
3. R. F. Gilberg and B. A. Forouzan, *Data Structures: A Pseudocode Approach with C*,Cengage Learning, Boston, MA, USA, 2nd edition 2007

Web and Video link(s):

1. *https://nptelacin/courses/106106130 NPTEL Video Lecture on Programming and Data Structures Dr.N S Narayana Swamy, CSE, IIT Madras*

Course Articulation Matrix (CAM):		U26IN203 : DATA STRUCTURES THROUGH C												
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U26IN203.1	2	2	2	1	-	-	1	-	1	-	1	2	1
CO2	U26IN203.2	2	2	2	2	-	-	1	-	1	-	2	2	2
CO3	U26IN203.3	2	2	2	2	-	-	1	-	1	-	2	2	2
CO4	U26IN203.4	2	2	2	2	-	-	1	-	1	-	2	2	2
U26IN203		2	2	2	1.75	-	-	1	-	1	-	1.75	2	1.75
3 – HIGH, 2 – MEDIUM, 1 – LOW														

CO–SDG Alignment Matrix				
CO	**CO Statement** *The student should be able to…*	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	analyze and implement array operations by utilizing dynamic memory allocation and evaluating their time and space complexities	SDG 4	Quality education	Unit I introduces foundational thinking skills - algorithmic analysis, complexity trade-offs, and memory management - that are core to inclusive, quality technical education (SDG 4) Teaching students *how to reason about efficiency* equips them with problem-solving competencies that transcend programming languages and support lifelong learning in computing
CO2	analyze and implement stack and queue data structures by utilizing array representations and evaluating their applications and operational complexities	SDG 9	Industry, Innovation and Infrastructure	Stacks and queues are the structural backbone of real-world software infrastructure - OS process scheduling, compiler design (infix→postfix parsing), undo/redo systems, and network packet buffering Recursion and the Tower of Hanoi build the algorithmic innovation skills that drive SDG 9's goal of fostering resilient, modern industrial systems through technology
CO3	analyze and implement various types of linked lists by utilizing dynamic memory allocation techniques and evaluating their operational complexities	SDG 4	Quality Education	Linked lists require students to reason about pointer manipulation, memory deallocation, and abstract data representation - demanding higher-order thinking that reflects SDG 4's emphasis on deep, quality learning The progression from arrays to dynamic structures builds adaptable knowledge, and topics like skip lists and merging extend learners toward self-directed inquiry beyond the classroom
CO4	develop various sorting algorithms, analyze their time complexities, and apply hashing techniques with collision resolution methods, comparing their efficiencies	SDG 9	Industry, Innovation and Infrastructure	Sorting and hashing are workhorses of industry-grade systems - database indexing, search engines, cryptographic hashing, and load balancing all rely on these techniques Collision resolution directly models the design challenges engineers face building scalable, fault-tolerant infrastructure This unit's focus on performance trade-offs and real-world applicability aligns strongly with SDG 9's innovation and infrastructure mandate

COMPUTER ARCHITECTURE AND ORGANIZATION			
Class: B Tech II– Semester		**Branch:** CSE (IoT)	
Course Code:	**U26IN204**	**Credits:**	**3**
Hours/Week (L-T-P- E):	**2-1-0-3**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1 : explain the basic structure of a computer, functional units, instruction set architecture, addressing modes, and assembly language concepts

CO2 : apply the concepts of instruction execution, control unit design, arithmetic operations, and number representation to solve computational problems

CO3 : analyze the organization and performance of memory systems, cache memory, secondary storage, and input-output interfaces

CO4 : analyze the performance of pipelining, vector processing, multiprocessor systems, DMA, and interrupt-driven data transfer mechanisms

UNIT-I	**9 Hrs**

Basic Structure of Computers: Functional units, basic operational concepts, performance of computer

Instruction Set Architecture: Memory locations and addresses, memory operations, instructions and instruction sequencing, instruction formats, addressing modes, assembly language, and assembler directives

UNIT-II	**9 Hrs**

Basic Processing Unit: Fundamental concepts, instruction execution, hardware components, Instruction fetch and execution steps, control signals, hard-wired control, CISC-style processors

Arithmetic: Addition and subtraction of signed numbers, multiplication of unsigned numbers, multiplication of signed numbers, fast multiplication, integer division, floating- point numbers and operations

UNIT-III	**9 Hrs**

The Memory System: Basic concepts, semiconductor RAM memories – Internal organization of memory chips, static memories, dynamic RAMs; read-only memories, memory hierarchy, cache memory mapping functions, performance considerations, secondary storage

Input-Output Organization: Input-output interface - I/O bus and interface modules, I/O vs memory bus, Isolated vs memory-mapped I/O, asynchronous data transfer – strobe control, handshaking, asynchronous serial transfer

UNIT-IV	**9 Hrs**

Modes of Transfer: Modes of transfer, priority interrupt, direct memory access, interconnection standards

Pipeline and Vector Processing: Parallel processing, pipelining, arithmetic pipeline, instruction pipeline, vector processing

Multi Processors: Characteristics of multiprocessors, Interconnection structures

Textbook(s):

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, *Computer Organization and Embedded Systems,* 6th ed, New Delhi: Mc Graw-Hill Education, 2012(Chapters 1,2,5,8,9)
2. M Morris Mano, *Computer System Architecture*, 3rd ed, New Delhi: Pearson Education, 2007(Chapters 8,4,9,11,13)

Reference Book(s):

1. B Ram, Sanjay Kumar, *Computer Fundamentals: Architecture and Organization*, 5th ed,New Delhi: New Age International Publishers, 2018
2. W Stallings, *Computer Organization and Architecture - Designing for Performance*, 7th ed, New Delhi: Pearson Education, 2009

Web and Video link(s):

https://wwwyoutubecom/watch?v=at4X0HRQRbA&utm_sour; *NPTEL Video Lecture on Computer Organization and Architecture by Prof Kamalika Datta, Dept of computer science and engineering, National Institute of Technology, Meghalaya*

Course Articulation Matrix (CAM):		U26IN204 : COMPUTER ARCHITECTURE AND ORGANIZATION											
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO1	PSO 2
CO1	U26IN204.1	3	2	-	-	-	-	-	-	-	-	1	2	1
CO2	U26IN204.2	3	2	2	1	2	-	-	-	-	-	1	2	1
CO3	U26IN204.3	2	3	1	2	2	-	-	-	-	-	1	2	2
CO4	U26IN204.4	2	3	2	2	2	-	-	-	-	-	1	2	2
U26IN204		2	2.5	2.5	1.66	1.66	2	-	-	-	-	1	1	2
3 – HIGH, 2 – MEDIUM, 1 - LOW														

CO–SDG Alignment Matrix				
CO	**CO Statement** *The student should be able to…*	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	explain the basic structure of a computer, functional units, instruction set architecture, addressing modes, and assembly language concepts	SDG4	Quality Education	Understanding computer fundamentals builds technical knowledge and digital literacy, contributing to quality education and lifelong learning
CO2	apply the concepts of instruction execution, control unit design, arithmetic operations, and number representation to solve computational problems	SDG9	Industry, Innovation and Infrastructure	Computational problem-solving and processor design concepts support technological innovation and the development of efficient computing systems
CO3	analyze the organization and performance of memory systems, cache memory, secondary storage, and input-output interfaces	SDG12	Responsible Consumption and Production	Efficient memory and storage utilization helps optimize computing resources, reducing energy consumption and promoting sustainable use of technology smart cities
CO4	analyze the performance of pipelining, vector processing, multiprocessor systems, dma, and interrupt-driven data transfer mechanisms	SDG9	Industry, Innovation and Infrastructure	Advanced processor architectures and high-performance computing techniques drive innovation, efficient infrastructure, and technological advancement

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING			
Class: B. Tech. II – Semester		**Branch:** Common to CSE,CSE-Allied, IT	
Course Code:	**U26EE205A**	**Credits:**	**3**
Hours/Week (L-T-P- E):	**2-1-0-3**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1 : apply network reduction, Kirchhoff's laws, nodal and mesh analysis to determine resistance, voltage, current & power in electrical circuits

CO2 : evaluate impedance, voltage, current, and power in 1- Ø AC circuits & select suitable motor for given application

CO3 : evaluate the voltage and current characteristics of PN junction diode and Zener diode

CO4 : evaluate the voltage and current characteristics of transistors and select suitable sensor for given application

UNIT-I	**9 Hrs**

DC Circuits: Network elements, Linear & non-linear elements, Active & passive elements, Unilateral & bilateral elements, Ohm's law, Power, Energy, Kirchhoff's laws, Resistances connected in series and parallel, Voltage divider rule & Current divider rule

DC Circuit Analysis: Source transformation, Mesh analysis & Nodal analysis

UNIT-II	**9 Hrs**

1-Ø AC circuits: RMS value, Average value, Concept of phasor, Phase and phase difference, Rectangular and polar form representation, Basic Sinusoidal steady state analysis of R, L, C, Series RL, RC, RLC circuits and Power factor

Electrical Machines (Qualitative treatment): Construction, Principle of operation & applications of 1-Ø transformer, 1-Ø induction motor, DC motor, Stepper motor, and BLDC motor

UNIT-III	**9 Hrs**

Diodes: P-N Junction diode, volt- amp characteristics, Zener diode, volt-amp characteristics, Half-wave rectifier and Full-wave rectifier (center-tapped)

Rectifiers: P-N junction as a rectifier - Half Wave Rectifier, Ripple Factor - Full Wave Rectifier, Bridge Rectifier

UNIT-IV	**9 Hrs**

Transistors: Bi-polar Junction Transistor symbol, operation of N-P-N and P-N-P transistors, Characteristics of BJT (CE, CB & CC configurations), Applications of diodes and transistors

Sensors and Transducers: Introduction to Sensors and transducers, Thermocouple, Thermistor, Resistance temperature detector (RTD), Hall effect sensor, Piezoelectric sensor, Light dependent resistor (LDR), Ultrasonic sensor, Applications of sensors in IoT

Textbook(s):

1. K Uma Rao, *Basic Electrical Engineering*, 5th ed, 2011, Pearson Education, Delhi (Part-I-*Chapters 1 to 5, Part-II-Chapters 1 to 4 and 7*)
2. S Salivahanan& N Suresh Kumar, *Electronic Devices and Circuits*, 5th ed, 2006, Tata McGraw Hill, Delhi (*Chapters 1 to 3*)

Reference Book(s):

1. B.L.Thereja, A.K.Thereja, *Electrical Technology Vol I & II*, 2005, S.Chand & Company Ltd
2. Chakravarthy A, Sudhipanath and Chandan Kumar, *Basic Electrical Engineering*, 3rd ed, 2009, Tata McGraw Hill, Delhi

Web and Video link(s):

https://nptelacin/courses/108105112; *Fundamentals of Electrical Engineering, by Prof Debapriya Das, Professor, IIT Kharagpur*

Course Articulation Matrix (CAM):		**U26EE205A: BASIC ELECTRICAL & ELECTRONICS ENGINEERING**												
CO		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	**U26EE205A.1**	3	3	1	1	1	–	–	–	1	1	1	1	1
CO2	**U26EE205A.2**	3	3	1	1	1	–	–	–	1	1	1	1	1
CO3	**U26EE205A.3**	2	2	1	1	1	–	–	–	1	1	2	1	1
CO4	**U26EE205A.4**	2	1	1	1	1	–	–	–	1	1	2	1	1
U26EE205A		2.5	2.25	1	1	1	–	–	–	1	1	1.25	1	1
3 – HIGH, 2 – MEDIUM, 1 - LOW														

CO–SDG Alignment Matrix				
CO	**CO Statement (The student should be able to…)**	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	apply network reduction, kirchhoff's laws, nodal and mesh analysis to determine resistance, voltage, current & power in electrical circuits	**SDG 9**	Industry, Innovation and Infrastructure	Mastering fundamental DC circuit analysis techniques (Ohm's law, KVL/KCL, mesh/nodal analysis) is essential for designing reliable and efficient power distribution networks This foundational knowledge supports the development of resilient industrial infrastructure and fosters innovation in electrical systems
CO2	evaluate impedance, voltage, current, and power in 1-ø ac circuits & select suitable motor for given application	**SDG 7**	Affordable and Clean Energy	**SDG 7:** Analysis of AC circuits (phasors, power factor, RLC analysis) is crucial for optimizing power transmission and distribution, which directly enables reliable and affordable clean energy access **SDG 9:** Selecting the appropriate motor (1-Ø IM, DC, Stepper, BLDC) for specific applications like pumps, EVs, and industrial drives improves overall energy efficiency and supports innovation in sustainable automation and infrastructure
CO3	evaluate the voltage and current characteristics of pn junction diode and zener diode	**SDG 9**	Industry, Innovation and Infrastructure	Understanding the V-I characteristics of PN junction and Zener diodes is fundamental to modern electronics This knowledge is critical for designing power supplies, rectifiers, and protection circuits, which are key components in developing innovative industrial electronics and communication systems, thereby driving infrastructure modernization
CO4	evaluate the voltage and current characteristics of transistors and select suitable sensor for given application	**SDG 7**	Affordable and Clean Energy	Evaluating BJT characteristics (CE, CB, CC configurations) is foundational for analog and digital electronics Furthermore, the ability to select suitable sensors (Thermocouple, RTD, Hall Effect, LDR, Ultrasonic) is crucial for creating smart systems and IoT applications This directly contributes to industrial innovation and the development of intelligent infrastructure

ENGINEERING PHYSICS LABORATORY			
Class: B.Tech. II – Semester		**Branches:** CSM, CSD, CSO, CSN, IT	
Course Code:	**U26PY206D**	**Credits:**	**1**
Hours/Week (L-T-P-E):	**0-0-2-2**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1: measure small lengths and diameters of wires, hollow tubes and thin objects using Vernier callipers and a screw gauge

CO2: determine the wavelength of light and the dimensions of fine slits using interference and diffraction phenomena, including Newton's Rings and laser diffraction techniques

CO3: evaluate the numerical aperture of an optical fibre and the dielectric constant of a material using experimental setups

CO4: analyse the energy band gap and V-I characteristics of semiconductor devices such as PN junction diodes and LEDs

List of Experiments
Experiment-1
Linear Measurements using Vernier callipers and screw gauge
Experiment-2
Diffraction grating by normal incidence method
Experiment-3
Determination of Wavelength of Sodium light using Newton's Rings
Experiment-4
Determination of slit width using He-Ne laser
Experiment-5
1. Determination of wavelength of He-Ne laser using reflection diffraction grating 2. Determination of wavelength of He-Ne laser-using transmission diffraction grating
Experiment-6
Determination of slit width using He-Ne laser
Experiment-7
Numerical aperture and acceptance angle of an optical fiber
Experiment-8
Determination of dielectric constant of materials using parallel plate capacitor
Experiment-9
Energy band gap of a semiconductor material
Experiment-10
Determination of Planck's constant
Experiment-11
Study of V-I characteristics of PN junction diode

Experiment-12

Study of V-I characteristics of LED

Textbook(s):

1. M Avadhanulu and Kshirsagar, TVS Arun Murthy, *A Textbook of Engineering Physics,*SChand& Company Ltd, 11th edition, 2018 (Unit-I, II, III & IV)
2. S Salivahanan, N Suresh Kumar, *Electronic devices and circuits,* Mc Graw Hill edition, 2017 (Unit-II-Chapter 4 &5)
3. Michael Nielsen and Isaac Chuang, *Quantum Computation and Quantum Information,* Cambridge University Press, 2010(Unit-IV-Chapter 11, 12& 13)

Reference Book(s):

1. Neil Gershenfeld, *Physics of Information Technology*, Cambridge University Press, 1st edition, 2000
2. V Rajendran, *Engineering Physics*, McGraw Hill, 2013
3. Eleanor Rieffel and Wolfgang Polak, *Quantum Computing: A Gentle Introduction,* The MIT Press Cambridge, Massachusetts London, England, 2011
4. RK Gaur and SLGupta, *Engineering Physics*, Dhanpath Rai and Sons, 2013
5. David Halliday, Robert Resnick and S Krane, *Physics Volume I&II*, Wiley India Limited, 5thedition, 2014

Web and Video link(s):

1. https://onlinecoursesnptelacin/noc24_ph28/preview; NPTEL *video lecture on Concepts in Magnetism and SuperconductivitybyProf Arghya Taraphder IIT Kharagpur*
2. https://onlinecoursesnptelacin/noc24_lw07/preview; *NPTEL video lecture onIntroduction to Law on Electricity by Prof Uday Shankar, IIT Kharagpur*
3. https://onlinecoursesnptelacin/noc24_ph45/preview; *NPTEL Video Lecture on Introduction to LASER - Course by Prof M R Shenoy, IIT Delhi*
4. https://onlinecoursesnptelacin/noc20_ee77/preview; *NPTEL Video Lecture on Semiconductor Devices and Circuits By Prof Sanjiv Sambandan, IISc Bangalore*
5. https://nptelacin/courses/106106232; *NPTEL Video Lecture on Introduction to Quantum Computing: Quantum Algorithms and Qiskit by Prof Prabha Mandayam, Prof Anupama Ray, Prof SheshashayeeRaghunathan, IIT Madras*

Laboratory Manual:

1. *Engineering Physics Laboratory Manual& Record Book,* Department of PS, KITSW
2. AKKatiyar, CKPandey, *Engineering Physics Theory and Practical,* Wiley India Pvt Ltd,2ndedition, 2017

Course Articulation Matrix (CAM):		U26PY206D: ENGINEERING PHYSICS LABORATORY												
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U26PY206D.1	2	1	1	-	1	1	1	1	2	-	1	-	-
CO2	U26PY206D.2	2	1	-	-	1	1	1	1	2	-	1	-	-
CO3	U26PY206D.3	2	1	-	-	1	1	1	1	2	-	1	-	-
CO4	U26PY206D.4	2	1	-	1	1	1	1	1	2	1	1	-	-
U26PY206D		2	1	1	1	1	1	1	1	2	` 1	1	-	-
3 – HIGH, 2 – MEDIUM, 1 - LOW														

CO–SDG Alignment Matrix				
CO	**CO Statement** *The student should be able to…*	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	measure diameter of wire and hollow tubes using Vernier callipers and screw gauge	SDG 4	Quality Education	Precision measurement using Vernier callipers and a screw gauge is a foundational laboratory skill Hands-on experimentation with standard instruments builds scientific competency, promotes inquiry-based learning, and strengthens the quality of engineering education envisioned by SDG 4
CO2	determine the wavelengths of spectral lines using normal incidence method and Newton's Rings, and the width of a narrow slit and wavelength of laser using diffraction phenomenon	SDG 4	Quality Education	Experiments on diffraction grating, Newton's Rings and laser diffraction build core optical-physics competencies and experimental rigor, strengthening quality, inquiry-based STEM education as envisaged by SDG 4
		SDG 9	Industry, Innovation & Infrastructure	Wavelength and slit-width determination using lasers and diffraction gratings underpin precision metrology, photonics and laser-based sensing technologies that drive innovation in industrial and communication infrastructure
CO3	calculate the numerical aperture of an optical fiber and the dielectric constant of a material	SDG 9	Industry, Innovation & Infrastructure	Numerical aperture characterization of optical fibres is fundamental to fibre-optic communication systems, while dielectric constant measurement supports the design of capacitors and insulating materials used in electronic and energy infrastructure, both central to SDG 9
CO4	determine energy band gap, forward voltage and currents from V-I characteristics of semiconductor diodes	SDG 7	Affordable & Clean Energy	Energy band-gap determination and diode/LED V-I characterization underpin the design of energy-efficient semiconductor devices and solid-state lighting, supporting affordable and clean-energy solutions
		SDG 9	Industry, Innovation & Infrastructure	PN junction diodes and LEDs are fundamental building blocks of electronic circuits; experimental characterization of their behaviour supports innovation in the electronics and semiconductor industry

DATA STRUCTURE THROUGH C LABORATORY			
Class: B. Tech. II – Semester		**Branch:**CSE (IoT)	
Course Code:	**U26IN207**	**Credits:**	**1**
Hours/Week (L-T-P- E):	**0-0-2-2**	**CIE:**	**40%**
Total Number of Teaching Hours:	**24 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1: develop and test basic data structures and array operations, including dynamic memory allocation to evaluate their performance and complexity

CO2 : apply the linear data structures such as stacks and queues and perform various operations using LIFO or FIFO order respectively

CO3: solve problems using various linked list representations for efficiently storing and retrieving the data

CO4: apply different sorting techniques on unsorted data and sort them in an order, able to store the data using hashing techniques to retrieve the data very effectively

Experiment-1

1. Program to implement initialization of array and perform traversal operations in both the directions
2. Program to implement searching operation on array using Linear Search
3. Program to display the count of occurrences of every number in an array

Experiment-2

1. Program to implement searching operation on array using Binary Search
2. Program to implement insertion operation on array
3. Program to implement deletion operations on array

Experiment-3

1. Program to implement initialization of arrays and traversal operation with DMA
2. Program to implement matrix addition and subtraction with DMA
3. Program to implement matrix multiplication with DMA

Experiment-4

1. Program to implement stack operations
2. Program to convert infix expression into postfix

Experiment-5

1. Program to evaluate given postfix expression
2. Program to define recursive function to solve tower of hanoi puzzle
3. Program to display the Fibonacci series with the help of recursive function
4. Program to implement MultiStack

Experiment-6

1. Program to implement queue operations using arrays
2. Program to implement circular queue operations using arrays
3. Program to implement double ended queue operations using arrays

Experiment-7

1. Program to create single linked list and implement its operations

Experiment-8

1. Program to create circular linked list and implement its operations
2. Program to create double linked list and implement its operations

Experiment-9

1. Program to create circular double linked list and implement its operations

Experiment-10

1. Program to implement stack operations using linked list
2. Program to implement queue operations using linked list

Experiment-11

1. Program to implement selection sort
2. Program to implement insertion sort

Experiment-12

1. Program to implement shell sort
2. Program to implement radix sort
3. Program to implement hash table

Textbook:

1. D.Samantha, *Classic Data Structure,* Prentice Hall India New Delhi, 2nd edition, 2009

Reference Book(S):

1. R .Thareja, *Data Structures Using C,* Oxford University Press, New Delhi, India, 2nd edition, 2014
2. E. Balagurusamy, *Data Structure Using C*, McGraw Hill Education, New Delhi, India: 1st edition, 2017
3. R. F. Gilberg and B. A. Forouzan, *Data Structures: A Pseudocode Approach with C*,Cengage Learning, Boston, MA, USA, 2nd edition 2007

Web and Video link(s):

1. *https://nptel.ac.in/courses/106106130; NPTEL Video Lecture on Programming and Data Structures Dr N S Narayana Swamy, CSE, IIT Madras*

Laboratory Manual (for Laboratory Component):

1. *Data Structure Through C Laboratory Manual and Record Book,* Department of CSN (IoT), KITSW

Course Articulation Matrix (CAM):		**U26IN207: DATA STRUCTURE THROUGH C LABORATORY**												
CO		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	**U26IN207.1**	2	2	2	1	-	-	1	1	1	-	1	2	2
CO2	**U26IN207.2**	2	2	2	2	-	-	1	1	1	-	2	2	2
CO3	**U26IN207.3**	2	2	2	2	-	-	1	1	1	-	2	2	2
CO4	**U26IN207.4**	2	2	2	2	-	-	1	1	1	-	2	2	2
U26IN207		**1**	**2**	**2**	**1.75**	**-**	-	**1**	**1**	**1**	**-**	**1.75**	**2**	**2**

CO–SDG Alignment Matrix				
CO	**CO Statement** *The student should be able to…*	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	develop and test basic data structures and array operations, including dynamic memory allocation to evaluate their performance and complexity	SDG 4	Quality Education	These experiments build core computational thinking — traversal, searching, and dynamic memory management Comparing linear vs binary search introduces algorithmic reasoning and efficiency trade-offs, directly reflecting SDG 4's goal of equipping learners with relevant, practical technical skills DMA-based matrix operations further develop disciplined, structured problem-solving essential for quality engineering education
CO2	apply the linear data structures such as stacks and queues and perform various operations using LIFO or FIFO order respectively	SDG 9	Industry, Innovation and Infrastructure	Stacks, queues, and expression evaluation are the structural foundation of compilers, OS schedulers, and runtime systems — real industrial infrastructure Infix-to-postfix conversion mirrors how compilers parse code; queues model network packet management and CPU job scheduling Recursion (Tower of Hanoi, Fibonacci) drives innovation in algorithm design, aligning strongly with SDG 9's emphasis on resilient, modern technological infrastructure
CO3	solve problems using various linked list representations for efficiently storing and retrieving the data	SDG 4	Quality Education	Linked list variants demand abstract thinking about pointers, dynamic memory, and node relationships — among the most cognitively demanding topics in undergraduate CS Mastering singly, circular, doubly, and circular-doubly linked lists builds deep structural understanding, reflecting SDG 4's focus on high-quality, skill-building education Reimplementing stacks and queues via linked lists reinforces conceptual reuse and flexible thinking
CO4	apply different sorting techniques on unsorted data and sort them in an order, able to store the data using hashing techniques to retrieve the data very effectively	SDG 9	Industry, Innovation and Infrastructure	Sorting algorithms and hash tables are indispensable in industry-grade systems — database query optimisation, search engine indexing, caching layers, and load balancers all depend on them Radix sort is used in network routing; hash tables power key-value stores like Redis and DNS lookups These experiments directly develop skills for building scalable, innovative digital infrastructure, the core of SDG 9

NETWORKING AND AI TOOLS LABORATORY			
Class: B Tech II – Semester		**Branch:** CSE (IoT)	
Course Code:	**U26IN208**	**Credits:**	**1**
Hours/Week (L-T-P- E):	**0-0-2-2**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1 : use Linux commands and system tools for file management, user administration, and system configuration

CO2 : configure, monitor, and troubleshoot network connectivity and wireless communication using networking and diagnostic tools

CO3 : utilize AI tools for technical writing, literature survey, academic content enhancement, and data analysis

CO4 : create and evaluate digital content using AI-powered tools for presentations, images, audio, video, and multimedia applications

Experiment-1

Linux Environment Familiarization and File Management: Navigate the Linux environment using commands for directory navigation, file handling, system information retrieval, and file management operations

Experiment-2

Linux User Administration and System Configuration: Create users and groups, manage permissions, configure user accounts, and perform basic administrative tasks using Linux system tools

Experiment-3

Network Connectivity Testing and Configuration: Configure network settings and use tools such as Ping, IPCONFIG/IFCONFIG, TRACERT/TRACEROUTE, and NSLOOKUP to verify connectivity and diagnose communication problems

Experiment-4

Network Diagnostic and Monitoring Tools: Explore tools such as Wireshark, Advanced IP Scanner, Resource Monitor, and network analyzers to observe network traffic and identify common networking issues

Experiment-5

Wireless Networking Configuration and Security: Configure Wi-Fi networks, mobile hotspots, passwords, and security settings Analyze common wireless connectivity issues and implement basic security measures

Experiment-6

Troubleshooting Internet and Software Installation Problems: Diagnose and resolve common issues such as internet disconnection, DNS failures, incorrect IP configuration, Wi-Fi authentication problems, insufficient permissions, missing software dependencies, storage limitations, and installation errors

Scenario-Based Activities:

- Internet connection unavailable
- DNS server not responding
- Incorrect network configuration
- Software installation blocked by permissions
- Missing application dependencies
- Firewall preventing application access

Experiment-7

AI-Assisted Technical Report Writing: Generate, refine, and format technical reports using AI tools such as ChatGPT, Gemini, Claude, and Copilot while evaluating the quality and accuracy of generated content

Experiment-8
AI-Based Literature Survey and Research Assistance: Use tools such as Consensus, Elicit, Perplexity, Semantic Scholar, ResearchRabbit, and Scholar AI to identify research papers, summarize findings, generate citations, and compare research contributions
Experiment-9
AI Tools for Academic Writing and Content Enhancement: Utilize AI tools for summarization, proofreading, grammar correction, paraphrasing, citation generation, plagiarism checking, and content improvement for academic documents
Experiment-10
AI-Powered Data Analysis and Presentation Development: Use AI-assisted spreadsheet tools and presentation platforms such as Excel Copilot, ChatGPT, Gamma, Canva AI, Tome, and Beautifulai to analyze data, generate charts, and create professional presentations
Experiment-11
AI Tools for Image, Audio, and Video Processing: Use AI platforms to generate and enhance images, remove backgrounds, perform speech-to-text conversion, text-to-speech synthesis, audio enhancement, subtitle generation, and AI-assisted video editing
Experiment-12
Integrated AI-Based Digital Content Creation Project: Develop a complete project involving literature review, report writing, presentation preparation, image generation, audio processing, and video creation using multiple AI tools Critically evaluate their effectiveness, limitations, ethical concerns, and responsible usage practices
Textbook(s): 1. Brian Ward, *How Linux Works: What Every Superuser Should Know*, No Starch Press, 3rd Edition, 2021 (Chapters 1–10) 2. William Shotts, *The Linux Command Line*, No Starch Press, 2nd Edition, 2019 (Chapters 1–12) 3. Pam Baker, *Generative AI for Beginners*, Apress, 1st Edition, 2024 (Chapters 1–8)
Reference Book(s): 1. David Both, *Using and Administering Linux: Volume 1*, Apress, 2020 2. Russell Dean Vines, *Wireshark for Network Analysis*, Packt Publishing, 2018 Ethem Alpaydin, *Artificial Intelligence: The Basics*, Routledge, 2nd Edition, 2021 3. Bernard Marr, *Generative AI in Practice*, Wiley, 2024
Laboratory Manual (for laboratory component): 1. *Laboratory Manual, Designed by Faculty of* Department of CSE (Networks), KITSW

Course Articulation Matrix (CAM):		**U26IN208 : NETWORKING AND AI TOOLS LABORATORY**												
CO		**PO1**	**PO2**	**PO3**	**PO4**	**PO 5**	**PO 6**	**PO 7**	**P O8**	**PO 9**	**PO 10**	**PO 11**	**PS O1**	**PS O2**
CO1	**U26IN208.1**	2	2	1	1	3	1	-	-	1	1	-	2	2
CO2	**U26IN208.2**	2	3	2	2	3	1	-	-	1	1	-	2	2
CO3	**U26IN208.3**	2	2	2	1	3	1	-	-	1	1	-	2	2
CO4	**U26IN208.4**	2	2	2	1	3	1	-	-	1	1	-	2	2
U26IN208		**2**	**2.25**	**1.75**	**1.25**	**3**	**1**	**-**	**-**	**1**	**1**	**-**	**2**	**2**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

CO-SDG Alignment Matrix				
CO	**CO Statement (The student should be able to…)**	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	use linux commands and system tools for file management, user administration, and system configuration	SDG 4	Quality Education	Develops digital literacy and computing skills essential for technical education and lifelong learning
CO2	configure, monitor, and troubleshoot network connectivity and wireless communication using networking and diagnostic tools	SDG 9	Industry, Innovation and Infrastructure	Builds competencies in networking technologies and digital infrastructure management
CO3	utilize ai tools for technical writing, literature survey, academic content enhancement, and data analysis	SDG 4	Quality Education	Enhances research, learning, and knowledge acquisition through responsible use of AI technologies
CO4	create and evaluate digital content using ai-powered tools for presentations, images, audio, video, and multimedia applications	SDG 8	Decent Work and Economic Growth	Develops digital productivity, creativity, and AI skills that improve employability and workplace readiness

BASIC ELECTRICAL & ELECTRONICS ENGINEERING LABORATORY			
Class: B. Tech. II – Semester		**Branch:** Common to CSE,CSE-Allied, IT	
Course Code:	**U26EE209A**	**Credits:**	**1**
Hours/Week (L-T-P- E):	**0-0-2-2**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1 : validate mesh and nodal analysis

CO2 : determine the impedance of the series RL, RC circuits

CO3 : determine the efficiency of transformer by conducting load test and verify Kirchoff's laws using PSPICE

CO4 : determine the characteristics of BJT and parameters of a rectifier circuit

List of Experiments

1. Verification of voltage divider rule and current divider rule
2. Verification of Mesh Analysis
3. Verification of Nodal Analysis
4. Determination of internal parameters of a choke coil
5. Impedance calculations and phasor representation of R-L series circuit
6. Impedance calculations and phasor representation of R-C series circuit
7. Load test on 1-phase transformer
8. Single phase bridge rectifier using R load
9. Zener diode as voltage regulator
10. Input and output characteristics of BJT
11. Verification of Kirchoff's laws using PSPICE / MATLAB
12. Interfacing Sensors with Arduino using TINKER CAD
    a. LED blinking
    b. IR Sensor
    c. Ultrasonic Sensor
    d. Voltage Sensor
    e. Current Sensor
    f. Speed Sensor

Textbook(s):

1. K. Uma Rao, *Basic Electrical Engineering*, 5th ed, 2011, Pearson Education, Delhi (*Chapters 1 to 9*)
2. S Salivahanan& N Suresh Kumar, *Electronic Devices and Circuits*, 5th ed, 2006, Tata McGraw Hill, Delhi (*Chapters 1 to 6, 8 to 13*)

Reference Book(s):

1. B.L. Thereja, AKThereja, *Electrical Technology Vol I & II*, 2005, SChand& Company Ltd

2. Chakravarthy A, Sudhipanath and Chandan Kumar, *Basic Electrical Engineering*, 3rd ed., 2009, Tata McGraw Hill, Delhi

Laboratory Manual (for laboratory component):

1. *Basic Electrical & Electronics Engineering Laboratory Manual*, Department of EEE, KITSW

Course Articulation Matrix (CAM):		U26EE209A: BASIC ELECTRICAL & ELECTRONICS ENGINEERING LABORATORY												
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U26EE209A.1	3	3	2	2	1	-	-	-	2	2	-	2	1
CO2	U26EE209A.2	3	2	2	3	1	-	-	-	2	2	-	2	1
CO3	U26EE209A.3	2	2	3	2	3	-	-	-	2	2	-	3	2
CO4	U26EE209A.4	3	2	2	2	1	-	-	-	2	2	-	3	2
U26EE209A		**2.75**	**2.25**	**2.25**	**2.25**	**1.5**	**-**	**-**	**-**	**2**	**2**	**-**	**2.5**	**1.5**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

CO–SDG Alignment Matrix				
CO	**CO Statement (The student should be able to)**	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	validate mesh and nodal analysis along with voltage and current divider rules	**SDG 4**	Quality Education	Performing circuit analysis experiments builds foundational knowledge in electrical engineering, enhancing quality technical education and analytical skills
CO2	determine the impedance of series RL and RC circuits and represent phasor diagrams	**SDG 9**	Industry, Innovation and Infrastructure	Impedance calculations and phasor analysis are essential for AC circuit design, power factor correction, and industrial electrical infrastructure development
CO3	determine the efficiency of a single-phase transformer by load test and verify Kirchhoff's laws using PSPICE	**SDG 7&SDG 9**	Affordable and Clean Energy; Industry, Innovation and Infrastructure	Transformer efficiency testing promotes energy conservation (SDG 7); simulation using PSPICE / MATLAB encourages digital innovation in engineering (SDG 9)
CO4	determine the input-output characteristics of BJT and parameters of a rectifier circuit including zener diode as voltage regulator	**SDG 9**	Industry, Innovation and Infrastructure	BJT characteristics and rectifier circuits form the backbone of power supplies, sensor interfaces, and reliable electronic infrastructure for industrial applications

IDEA LAB MAKERSPACE			
Class: B. Tech. II – Semester		**Branch:** Common to all branches	
Course Code:	**U26AE210**	**Credits:**	**1**
Hours/Week (L-T-P-E):	**0-0-2-2**	**CIE:**	**40%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE:**	**60%**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to …

CO1 : develop technical skills such as 3D printing, Laser engraving, Wood carving and Robotics

CO2 : apply the techniques and principles of welding, carpentry and foundry to produce required prototype/model

CO3 : design and build a IoT based and PCB system for a given application

CO4 : engage in project-based learning which reinforces theoretical knowledge through practical application

S No	Creative Fabrication Technology	List of Experiments
1.	3D Printing	Prepare a key chain on 3D printer with the given dimensions
2.		Prepare a Spur Gear on 3D printer with the given dimensions
3.	Laser Engraving	Perform key chain by using CO_2 laser cutting machine
4.	Welding	Prepare a Single V-Butt joint on mild steel plates using AC arc welding machine
5.	CNC Wood Router	Perform wood carving using CNC (Computer numerical Control) Wood Router
6.	Carpentry	Prepare a half lap dovetail joint
7.	Foundry	Prepare a sand mould using single piece pattern
8.	Injection Moulding	Prepare a plastic product using Injection moulding machine
9.	Printed Circuit Board (PCB)	Design and fabricate a PCB (Printed Circuit Board) for a given application
10.	Internet of Things (IoT)	Measure the temperature and humidity by using DHT11 sensor and Arduino UNO
11.		Create a Smart Plant Watering System using IoT (Internet of Things) technology
12.	Robotics	Perform basic pick-and-place operation using robot
Course Project		• Students are required to create an affordable prototype as their final project for the end semester exam (ESE), based on the knowledge and skills acquired during the course • Students have to present and submit their prototypes to demonstrate their ability to apply classroom learning practically, showcasing their creativity and technical aptitude

Textbook(s):

1. Hajra Choudhury SK, Hajra Choudhury AK and Nirjhar Roy, "*Elements of Workshop Technology*", Media Promoters and publishers Pvt Ltd, India, Vol-I-2008 &Vol-II-2010

Reference Book(s):

1. Ian Gibson, David Rosen, Brent Stucker, Mahyar Khorasani, "Additive Manufacturing Technologies-3D Printing, Rapid Prototyping, and Direct Digital Manufacturing" Springer Nature, 2nd Edition 2021
2. R.S. Khandpur, "Printed Circuit Boards: Design, Fabrication, Assembly and Testing", New Delhi Tata Mc Graw Hill-2008
3. Sudeep Mishra, Anandarup mukherjee and Arijit Roy, "Introduction to IoT", New Delhi: University Cambridge Press, 2021

Laboratory Manual (for laboratory component):

1. *Workshop practice laboratory manual & record book prepared by the faculty of department of Mechanical engineering, KITSW, Revised version 4, July-2026*

Course Articulation Matrix (CAM):		U26AE210: IDEA LAB MAKERSPACE												
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO1	U26AE210.1	2	2	1	1	2	1	1	1	1	1	1	1	2
CO2	U26AE210.2	2	2	1	1	2	1	1	1	1	1	1	1	2
CO3	U26AE210.3	2	2	1	1	2	1	1	1	1	1	1	1	2
CO4	U26AE210.4	2	2	1	1	2	1	1	1	1	1	1	1	2
U26AE210		**2**	**2**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**

CO–SDG Alignment Matrix				
CO	**CO Statement** *The student should be able to*	**Relevant SDG**	**SDG Description**	**Mapping Justification**
CO1	develop technical skills such as 3D printing, Laser engraving, Wood carving and Robotics	SDG 4	Quality Education	Development of modern fabrication and automation skills enhances technical competency, creativity, innovation and employability of students through hands-on learning and skill-oriented education
CO2	apply the techniques and principles of welding, carpentry and foundry to produce required prototype/model	SDG 9	Industry, Innovation and Infrastructure	Practical exposure to manufacturing and prototyping techniques promotes industrial skills, innovation capability and infrastructure-oriented engineering practices required for sustainable industrial development
CO3	design and build a IoT based and PCB system for a given application	SDG 11	Sustainable Cities and Communities	IoT and embedded system development supports smart technologies, automation, efficient resource monitoring and sustainable solutions for modern industries & communities
CO4	engage in project-based learning which reinforces theoretical knowledge through practical application	SDG 8	Decent Work and Economic Growth	Project-based learning improves problem-solving, teamwork, innovation and practical engineering skills, preparing students for productive employment and entrepreneurship in emerging technologies

ARDUINO PROGRAMMING			
Class: B.Tech. Syllabi of exit course for UG certificate in CSE(IOT)		**Branch:** CSE(IOT)	
Course Code:	**U26IN211X**	**Credits:**	**3**
Hours/Week (L-T-P-O-E):	**2-0-2-0-4**	**CIE Marks (%):**	**60**
Total Number of Teaching Hours:	**32 Hrs**	**ESE Marks (%):**	**40**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1: identify sensors, actuators and IoT boards in real time environment
CO2: make use of syntax of i/o functions for problem solving
CO3: compare analog, and digital communications with Arduino
CO4: design a real time application using sensors, actuators and Arduino board
CO5: develop arduino programming for problem solving
CO6: develop arduino programming with LED, button and switch
CO7: interpret analog and digital communications with arduino
CO8: develop arduino programming for connecting sensors and actuators to control the applications

THEORY COMPONENT

UNIT-I	4 Hrs

Introduction: Introduction to IoT, Evolution of IoT, challenges and applications, IoT versus M2M and IoT versus CPS, Sensors: characteristics, Deviations, Types-scalar, Multimedia, Hybrid and virtual, Actuators: Types-Hydraulic, Pneumatics, Electric, Thermal or Magnetic, Mechanical

Classification of IoT boards: Microcontroller boards, Single board controller, System on chipboard

UNIT-II	4 Hrs

Programming with Arduino: Introduction to Arduino, String objects; Time, I/O function, Display, Random numbers, GPIO, Controlling LEDs-Blinking led without delay, Connecting an external led, Working with buttons-Connecting a button, Button with no resistor

UNIT-III	4 Hrs

Analog and Digital Communication with Arduino: Interfacing LCD character display, UART protocol

I2C Communication: I2C protocol, SPI Communication: SPI protocol, SD card interfacing

UNIT-IV	4 Hrs

Integration of Sensors with Arduino: Interfacing with potentiometer, Temperature sensor, Detecting motion using PIR sensor, Measuring distance using infrared and ultrasonic sensor

Integration of Actuators with Arduino: DC motor, Servo motor, Stepper motor

LABORATORY COMPONENT

List of Experiments

1. Introduction of Arduino IDE, write an Arduino program to demonstrate all the statements and functions
2. Write an Arduino program to demonstrate if statements, switch case, loops and arrays
3. Write an Arduino program to demonstrate string object, time based functions, digital and analog I/O functions.
4. Write an Arduino program to demonstrate light an LED with button and 7-segement display

5. Write an Arduino program to demonstrate I2C and SPI communication protocol
6. Write an Arduino program for interfacing with potentiometer and temperature sensor
7. Write an Arduino program for interfacing with PIR sensor and infrared and ultrasonic sensor
8. Write an Arduino program for interfacing with DC motor

Textbook(s):

1. Sudeep Mishra, Anandarup mukherjee and Arijit Roy, *Introduction to IoT*, New Delhi: University Cambridge Press, 2021. (Chapter 4)
2. Cornel Amariei, *Arduino Development Cook Book*, Birmingham: Packt Publishing Ltd., 2015. (Chapter 2-6)

Reference Book(s):

1. Arshdeep Bahga and Vijay Madisetti, *Internet of Things: A Hands-On Approach,* Hyderabad: University Press, 2015.
2. Marco Schwartz, *Internet of Things with ESP8266*, Birmingham: Packt Publishing Ltd., 2016.
3. Rajesh Singh, Anita Gehlot, Lovi Raj Gupta, Bhupendra Singh, Mahendra Swain, *Internet of things With Raspberry Pi and Arduino*, Boca Raton: CRC Press, Taylor & Francis Group,2020.
4. Brian Evans, *Beginning Arduino Programming*, New York: Apress, 2011.

Web and Video link(s):

https://onlinecourses.nptel.ac.in/noc24_cs115/; *NPTEL Video Lecture on Fundamentals of Internet of Things by Prof. Sudip Misra, Professor of CSE, IIT Kharagpur.*

Laboratory Manual (for laboratory component):

Fundamentals of Internet of Things laboratory manual, Department of CSE(N), KITSW

Course Articulation Matrix (CAM):		**U24IN211X: ARDUINO PROGRAMMING**												
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**
CO1	**U24IN211X.1**	2	2	2	2	2	1	1	1	-	1	-	2	2
CO2	**U24IN211X.2**	2	2	2	2	2	1	1	1	-	1	-	2	2
CO3	**U24IN211X.3**	2	2	2	2	2	1	1	1	-	1	-	2	2
CO4	**U24IN211X.4**	2	2	2	2	2	1	1	1	-	1	-	2	3
CO5	**U24IN211X.5**	2	2	2	2	2	1	1	1	-	1	-	1	2
CO6	**U24IN211X.6**	2	2	2	2	2	1	1	1	-	1	-	1	2
CO7	**U24IN211X.7**	2	2	2	2	2	1	1	1	-	1	-	2	2
CO8	**U24IN211X.8**	2	2	2	2	2	1	1	1	-	1	-	2	2
U26IN211		**2**	**2**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**

CO–SDG ALIGNMENT MATRIX				
CO	**CO STATEMENT (THE STUDENT SHOULD BE ABLE TO…)**	**RELEVANT SDG**	**SDG DESCRIPTION**	**MAPPING JUSTIFICATION**
CO1	identify sensors, actuators and iot boards in a real-time environment	SDG 4	Quality Education	Develops fundamental knowledge of IoT hardware, embedded systems, and real-time applications through experiential learning
CO2	make use of syntax of i/o functions for problem solving	SDG 4	Quality Education	Enhances programming and computational thinking skills through practical implementation of embedded programming concepts
CO3	compare analog and digital communications with arduino	SDG 9	Industry, Innovation and Infrastructure	Builds knowledge of communication techniques used in embedded systems and IoT-based industrial applications
CO4	design a real-time application using sensors, actuators and arduino board	SDG 11	Sustainable Cities and Communities	Enables the development of smart IoT applications for automation, environmental monitoring, and sustainable community solutions
CO5	develop arduino programming for problem solving	SDG 4	Quality Education	Strengthens practical programming and problem-solving skills through hands-on Arduino application development
CO6	develop arduino programming with led, button and switch	SDG 9	Industry, Innovation and Infrastructure	Provides practical experience in embedded hardware interfacing and automation system development
CO7	interpret analog and digital communications with arduino	SDG 9	Industry, Innovation and Infrastructure	Enhances the ability to analyze communication methods used in embedded and IoT systems for reliable data exchange
CO8	develop arduino programming for connecting sensors and actuators to control applications	SDG 11	Sustainable Cities and Communities	Facilitates the design and implementation of smart control systems that support sustainable automation and IoT-enabled infrastructure

WEB DEVELOPMENT			
Class: B.Tech. Syllabi of exit course for UG certificate in CSE(IOT)		**Branch:** CSO	
Course Code:	**U24IN212X**	**Credits:**	**3**
Hours/Week (L-T-P-O-E):	**2-0-2-0-4**	**CIE Marks (%):**	**60**
Total Number of Teaching Hours:	**32 Hrs**	**ESE Marks (%):**	**40**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1: create static web pages using HTML Tags, CSS properties and Java scripts.
CO2: *:* create dynamic web pages using java server page concepts.
CO3: develop web server side applications using PHP concepts.
CO4: develop enterprise databases for web-based applications using PHP and MySQL.
CO5 : build static webpages using HTML Tags, CSS properties and Javascripts
CO6 : build dynamic web pages using JSP concepts.
CO7 : develop server side scripts for web applications using PHP.
CO8 : develop databases for web-based applications using PHP and MySQL, XML.

THEORY COMPONENT

UNIT-I	4 Hrs

HTML WITH CSS: Document Structure, Basic Tags, Working with Images, Tables, Frames, Forms, CSS (Cascading style sheet) rules and properties, Types: Inline, External and Internal Style Sheets.

JAVASCRIPT: JavaScript syntax, Embedding JavaScript in HTML Page. Usage of variables, Working with Operators, Control-Flow Statements, Functions and Array, Creating Objects, Handling Events.

UNIT-II	4 Hrs

JSP: Syntax and Semantics, JSP Development Model, Components of JSP page: Directives, Comments, Expressions, Scriptlets, Declarations, Implicit Objects, Standard Actions, Tag Extensions, A Complete JSP Example. Session and Thread Management: Session Tracking, Session API, Thread Management. Application Event Listeners.

JDBC: Database access with JDBC, Overview, JDBC drivers, connecting to database with Driver Manager, Statement Interfaces: Statement, Prepared statement, Callable statement, Result Sets.

UNIT-III	4 Hrs

Introduction to PHP: Overview of PHP, Advantages of PHP over scripting languages, Creating and running a PHP script, handling errors. Controlling Program Flow: Conditional Statements, Looping Statements. Working with Functions, Arrays, Files and Directories.

Working with Forms: Web Forms and Form Elements, Processing a Web Form, Validating a Web Form.

UNIT-IV	4 Hrs

Database using PHP: Exploring Relational Database Model, Records and Primary Keys. Working with SQL Statements. Using PHP and MySql: Checking Configuration, Connecting to Database, Selecting a Database, Adding and Altering a Table in a Database, Inserting and modifying Data in a Table, Retrieving Data from a Table.

XML: Introduction to XML, XML Basics: Syntax, Declaration, Valid XML Documents, Viewing XML, XML Technologies, Document Object Model(DOM).

LABORATORY COMPONENT

List of Experiments

1.Design the following static web pages with the following attributes:

a) Basic Tags.

b) Heading Tags.
c) List (Ordered and Un-Ordered).
d) Textbox, Buttons.

2. Design a CATALOGUE PAGE:

The catalogue page should contain the details of all the books available in the web site in a table. The details should contain the following:

- Snapshot of Cover Page.
- Author Name and Publisher.
- Price and Add to cart button.

Logo	WebsiteName			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIV		Book: Web Technologies Author: Kogent Publication:DreamtechPress	$50	Add to Cart
		Book:JSPCompleteReference Author: Phil Hanna Publication: McGraw Hill	$28.5	
		Book: Web Technologies Author: Uttam K. Roy Publication:Oxford HigherEd	$40	Add to Cart
				Add to Cart

2. Write a program to embed Java Script in HTML pages.
3. Write a HTML file to create a simple form with 5 input fields (Name, Password, Email, Pin code, Phone No. and a Submit button) and demonstrate required field validations to validate that all input fields are required and display error messages if the above validations do not hold using JSP
4. Create Database Connectivity with JSP page with different JDBC Drivers.
5. Create a CRUD operation for JSP Page using MySQL.
6. Write a PHP which does the following job:
   Insert the details of the 3 or 4 users who register with the web site by using student registration form (experiment-32) authenticate the user when he submits the login form using the UserName and Password from the database(instead of cookies).
7. Create tables in the database which contain the details of items (books in our case like Bookname, Price, Quantity,Amount) of each category. Modify your catalogue page in such a way that you should connect to the database and extract data from the tables and display thèm in the catalogue page using PHP.

8. Design a form which upload & display image using PHP.

Textbook(s):

1. Kogent, *Web Technologies* 1st ed., Dream tech Press (Black Book), 2013.
2. Phil Hanna, *JSP: The Complete Reference*, 2nd ed., McGraw-Hill, 2001.

Reference Book(s):

1. Ivan Bayross, *Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP*, 4th ed., BPB Publications, 2009.
2. Uttam K. Roy, *Web Technologies*, 7th ed., Oxford Higher Education, 2010.
3. Luke Welling, Laura Thomson, *PHP and MySQL Web Development*, 3rded., Sams Publications, 2005.
4. Jayson Falkner, Kevin Jones, *Servlets and Java Server Pages*, 1st ed., Pearson, 2003.

Web and Video link(s):

https://youtu.be/YOXwcbwSEUo?si=YHrGYJTYkphU7t5j NPTEL Video Lecture on WEB PROGRAMMING by Prof.I.Sengupta, Department of Computer Science & Engineering ,IIT Kharagpur..

Laboratory Manual (for laboratory component):

Web Programming, laboratory manual, Department of CSN, KITSW

Course Articulation Matrix (CAM):		U24IN212X WEB DEVELOPMENT											
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO1	U24IN212X.1	2	2	2	1	2	1	-	1	2	1	2	1	2
CO2	U24IN212X.2	2	2	2	1	2	1	-	1	2	1	2	1	2
CO3	U24IN212X.3	2	2	2	1	2	1	-	1	2	1	2	1	2
CO4	U24IN212X.4	2	2	2	1	2	1	1	1	2	1	2	1	3
CO5	U24IN212X.5	2	2	2	1	1	-	-	1	2	1	-	2	2
CO6	U24IN212X.6	2	2	2	2	3	-	-	1	2	1	-	2	2
CO7	U24IN212X.7	2	2	2	2	3	-	-	1	2	1	-	2	2
CO8	U24IN212X.8	2	2	2	2	3	-	-	1	2	1	-	2	2
U24IN212X		**2**	**2**	**2**	**1.3**	**2.25**	**0.5**	**0.125**	**1**	**2**	**1**	**1**	**1.5**	**2**

CO–SDG ALIGNMENT MATRIX				
CO	**CO STATEMENT (THE STUDENT SHOULD BE ABLE TO…)**	**RELEVANT SDG**	**SDG DESCRIPTION**	**MAPPING JUSTIFICATION**
CO1	create static web pages using html tags, css properties and javascript	SDG 4	Quality Education	Develops fundamental web development skills and enhances students' ability to design user-friendly web interfaces
CO2	create dynamic web pages using java server pages (jsp) concepts	SDG 9	Industry, Innovation and Infrastructure	Builds expertise in dynamic web technologies required for developing scalable and interactive web applications
CO3	develop web server-side applications using php concepts	SDG 9	Industry, Innovation and Infrastructure	Enhances server-side programming skills for developing secure and efficient web-based software solutions
CO4	develop enterprise databases for web-based applications using php and mysql	SDG 9	Industry, Innovation and Infrastructure	Promotes database design and management skills essential for enterprise-level web applications and digital infrastructure
CO5	build static web pages using html tags, css properties and javascript	SDG 4	Quality Education	Strengthens practical skills in front-end web development through hands-on implementation
CO6	build dynamic web pages using jsp concepts	SDG 9	Industry, Innovation and Infrastructure	Provides practical experience in developing interactive and dynamic web applications using enterprise technologies
CO7	develop server-side scripts for web applications using php	SDG 9	Industry, Innovation and Infrastructure	Develops practical competencies in server-side scripting for robust and scalable web application development
CO8	develop databases for web-based applications using php, mysql and xml	SDG 9	Industry, Innovation and Infrastructure	Enhances practical skills in database integration and data management for enterprise web applications

RASPBERRY PI PROGRAMMING			
Class: B.Tech. Syllabi of exit course for UG certificate in CSE(IOT)		**Branch:** CSO	
Course Code:	**U26IN213X**	**Credits:**	**3**
Hours/Week (L-T-P-O-E):	**2-0-2-0-4**	**CIE Marks (%):**	**60**
Total Number of Teaching Hours:	**32 Hrs**	**ESE Marks (%):**	**40**

Course Learning Outcomes (COs)

After completion of this course, the students should be able to,

CO1: *analyze instruction formats and addressing modes of assembly language*

CO2: *classify hardwired & CISC style processors and solve arithmetic operations using signed and unsigned integers*

CO3: *categorize cache memory mapping techniques and examine data transfer between processor, memory & I/O*

CO4: *analyze different modes of data transfer, classify interconnection structures and distinguish CPU vs. GPU architectures & computations*

CO5 : *develop python programs using operators, control statements & functions*

CO6 : *apply namespaces, packages, string handling methods of Python for writing programs*

CO7 : *implement architecture of raspberry pi using linux commands*

CO8 : *build python programs using pi to interface with sensors, actuators, led's, cloud, camera and display unit*

THEORY COMPONENT

UNIT-I	4 Hrs

Introduction: Writing and executing python programs with indentation

Python Preliminaries: Literal constants, Variables and identifiers, Data types, Input operation, Comments, Reserved words, Operators, Expressions in python, Type conversion

Decision Control Statements: Selection/conditional branching statements, Loop structures/ iterative statements, Nested loop, The continue statement, The else statement used with loops

Functions: Function definition, Function call, Variable scope and lifetime, The return statement, Decorator functions, Lambda functions, Recursive functions

UNIT-II	4 Hrs

Modules and Name Spaces: The from…import statement, Naming module, Packages in python, Standard library modules

Python Strings: String operations, String formatting operator, slice operation, Comparing strings

Data Structures: Arrays**,** Sequences, Lists, Tuple, Sets, Dictionaries

UNIT-III	4 Hrs

Raspberry Pi: Introduction, architecture, components of Pi, Peripherals, GPIO connectors, Accessories; Software- Pi operating system and software development tools, Installing OS and designing systems using Raspberry Pi, Introducing essential packages of python for Pi

Linux Commands: ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo, cron, chown, chgrp, ping and process related commands

UNIT-IV	4 Hrs

Raspberry with Python: Installing Pip and invoking python interpreter, Using object oriented code and controlling digital output's of LED's, Interface sensors and actuators with Raspberry Pi, Collecting sensor data and storing it on cloud

Image Processing with Pi: Interfacing camera with Pi, Interfacing display with Pi

LABORATORY COMPONENT

List of Experiments

1. Installation of Python, write a program to demonstrate importance of indentations. Purposefully raise Indentation Error and correct it.
2. Write a program to find circulating 'n' values and module using import statement.
3. Write python program on file operations for the following

i.To open and read data from a file
ii.To write data into a file
iii.To compute number of characters, words, lines in a file

4. Installation of OS onto Raspberry Pi, Start Raspberry Pi and try various Linux commands in command terminal window:
   i. ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip
   ii. cat, more, less, ps ,sudo, cron, chown, chgrp, Ping,process-related commands etc.
5. Write a program to demonstrate LED with two buttons and light an LED through web.
6. Get input from DHT sensor, ultrasonic sensor, PIR sensor and upload on cloud.
7. Working with 7-segment display using Raspberry Pi
8. Interfacing Camera with Pi for image processing and design a program to demonstrate DC motor.

Textbook(s):

[1] ReemaThareja, *Python Programming using problem solving approach*, New Delhi: Oxford University Press, 2017.(*Chapter 1 to 7*)

[2] Matt Richardson,*Shawn Wallace,Getting Started with Raspberry Pi*, O'Reilly (SPD), 3rd ed., New Delhi:2016.(*Chapter 2 to 4*)

Reference Book(S):

[1] Dr.Charles, R. Severance, *Python for Everybody-Exploring Data Using Python*, New Delhi: open book, 2016.

[2] David Beazley, *Python Cookbook*, 3rd ed.California: O'Reilly Media, Inc., 2013.

[3] Caleb Hattingh, *20 Python Libraries You Aren't Using (But Should)*, 2nd ed.California: O'Reilly Media, Inc., 2016.

[4] Magnus Lie Hetland, *Beginning: from Novice to Professional*,New York City: Apress, 2005.

Web and Video link(s):

#nptel #pythonprogramming #skumaredu *NPTEL Video Lecture on PROGRAMMING IN PYTHON by* Dr. Rizwan Rehman , *Assistant Professor of* Dibrugarh University.

Laboratory Manual (for laboratory component):

1. *RASPBERRY PI PROGRAMMING Laboratory Manual*, Dept. of CSE (IoT), KITSW.

Course Articulation Matrix (CAM):		U26IN213X: RASPBERRY PI PROGRAMMING											
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**
CO1	**U26IN213X.1**	2	2	1	1	2	1	-	1	1	1	-	1	2
CO2	**U26IN213X.2**	2	2	2	1	2	1	-	1	1	1	-	1	2
CO3	**U26IN213X.3**	2	2	2	2	3	1	-	1	1	1	-	1	2
CO4	**U26IN213X.4**	2	2	2	2	3	1	-	1	1	1	-	1	2
CO5	**U26IN213X.5**	2	2	2	2	2	1	-	1	1	1	-	1	2
CO6	**U26IN213X.6**	2	2	2	2	2	1	-	1	1	1	-	1	2
CO7	**U26IN213X.7**	2	2	2	2	3	1	-	1	1	1	-	1	2
CO8	**U24IN213X.8**	2	2	2	2	3	1	-	1	1	1	-	1	2
U24IN213X		**2**	**2**	**1.87**	**1.75**	**2.5**	**1**	**-**	**1**	**1**	**1**	**-**	**1**	**2**

CO–SDG ALIGNMENT MATRIX				
CO	**CO STATEMENT (THE STUDENT SHOULD BE ABLE TO…)**	**RELEVANT SDG**	**SDG DESCRIPTION**	**MAPPING JUSTIFICATION**
CO1	analyze instruction formats and addressing modes of assembly language	SDG 4	Quality Education	Develops foundational knowledge of computer organization and programming, strengthening analytical and technical skills
CO2	classify hardwired & cisc style processors and solve arithmetic operations using signed and unsigned integers	SDG 9	Industry, Innovation and Infrastructure	Enhances understanding of processor architectures and computational techniques essential for modern computing systems
CO3	categorize cache memory mapping techniques and examine data transfer between processor, memory and i/o.	SDG 9	Industry, Innovation and Infrastructure	Builds competency in efficient memory management and computer architecture for high-performance computing systems
CO4	analyze different modes of data transfer, classify interconnection structures and distinguish cpu vs. gpu architectures and computations	SDG 9	Industry, Innovation and Infrastructure	Promotes knowledge of advanced computing architectures and efficient system design for innovative technological applications
CO5	develop python programs using operators, control statements and function	SDG 4	Quality Education	Strengthens programming proficiency and problem-solving skills through practical software development
CO6	apply namespaces, packages and string handling methods of python for writing programs	SDG 4	Quality Education	Enhances software development skills by applying modular programming concepts and Python libraries
CO7	implement the architecture of raspberry pi using linux commands	SDG 9	Industry, Innovation and Infrastructure	Develops practical skills in embedded systems and Linux-based computing platforms for industrial applications
CO8	build python programs using raspberry pi to interface with sensors, actuators, leds, cloud, camera and display unit	SDG 11	Sustainable Cities and Communities	Enables the development of IoT-enabled smart applications for automation, monitoring, and sustainable infrastructure