SAHRDAYA AUTONOMOUS
COLLEGE OF ENGINEERING & TECHNOLOGY
A CENTRE OF EXCELLENCE IN SCIENCE & TECHNOLOGY | MANAGED BY IRINJALAKUDA DIOCESAN EDUCATION TRUST
Approved by AICTE & Affiliated to APJ Abdul Kalam Technological University | Accredited by:
Estd.2002

B. Tech

Curriculum (2024) and Syllabus - Semester I & II

Computer Science Engineering

Branch Code: CSE

(SHR/AC/Auto/ Acad. Council /B.Tech/3/Syll./CSE/S1-S2/R1)

Recommended by BoS on 30/08/2024

Approved by Academic Council on 31/08/2024

Amendments Recommended by BOS on 11/06/2025

Amendments Approved by Academic Council on 05/07/2025

FIRST SEMESTER (July-December)												
10 Days Compulsory Induction Program												
Sl. No:	**Slot**	**Course Code**	**Course Type**	**Course Title (Course Name)**	**Credit Structure**				**Total Marks**		**Credits**	**Hrs./ Week**
					L	**T**	**P**	**R**	**CIA**	**ESE**		
1	A	24MAT111	BSC	Calculus & Linear Programming	3	0	0	0	40	60	3	3
2	B	24PHC112	BSC-CLT	Physics for Information Science	3	0	2	0	50	50	4	5
3	C	24EST003	ESC	Engineering Graphics	3	0	0	0	40	60	3	3
4	D	24EST104R1	ESC	Foundations of Computing	3	0	0	0	40	60	3	4
5	F	24ESR105	ESC-PBL	Algorithmic Thinking with Python-PBL-1	2	0	2	1	50	50	4	5
6	I*	24HUT006	HMC	Professional Ethics and Sustainable Development	1	0	2	0	100	---	2	3
7	L	24ESL007	ESC	Computer Aided Drawing (CAD) & Manufacturing Workshop	0	0	2	0	50	---	1	2
8	J*	24SEK10N	SEC	Skill Enhancement Course 1							1	
Total											**21**	**25**

SECOND SEMESTER (January-June)												
Sl. No:	**Slot**	**Course Code**	**Course Type**	**Course Title (Course Name)**	**Credit Structure**				**Total Marks**		**Credits**	**Hrs./ Week**
					L	**T**	**P**	**R**	**CIA**	**ESE**		
1	A	24MAT211	BSC	Linear Algebra	3	0	0	0	40	60	3	3
2	B	24CYC012	BSC-CLT	Engineering Chemistry	3	0	2	0	50	50	4	5
3	C	24EST023	ESC	Fundamentals of Electrical & Electronics Engineering	4	0	0	0	40	60	4	4
4	D	24ESC204	ESC	Programming in C	3	0	2	0	40	60	4	5
5	D	24CSR205	PCC-PBL	Digital System Design	3	0	0	1	50	50	4	4
6	L	24ESL006	ESC	Basic Electrical and Electronics Engineering Workshop	0	0	2	0	50	---	1	2
7	I*	24HUT107	HMC	Communicative English	0	0	2	0	50	50	1	2
8	J*	24SEK10N	SEC	Skill Enhancement Course 2							1	
Total											**22**	**25**

No Grade Points will be awarded for the MOOC, I and J slot courses
***The self-learning (S) hours for each course is calculated based on the formulae,* S= (L*1+P*1+[R/2])**

SEMESTER-I
SYLLABUS

24MAT111	CALCULUS AND LINEAR PROGRAMMING	L	T	P	R	C	Year of Introduction
		3	0	0	0	3	2024

Preamble:
The course enables the students to understand basic concepts and tools of Calculus and Linear Programming. Topics like Multivariable Calculus and applications, Simplex method and Lagrange multipliers for optimization are included. This course helps the learners in modelling and analysing physical phenomena involving continuous changes of variables or parameters with the help of modern tools and has applications across all engineering domains.

Prerequisite: Calculus of univariate functions.

Course Outcomes: After the completion of the course the student will be able to

CO1	Interpret and compute rates of change for functions, recognizing their significance in various context. **[Apply]**
CO2	Analyse and represent functions of several variables, including their graphs, level curves and contour plots. **[Apply]**
CO3	Solve problems using the concept of directional derivative and gradient. **[Apply]**
CO4	Apply Simplex method and method of Lagrange multipliers in handling constrained equations and optimization. **[Apply]**

CO - PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3	2	3	2							
CO 2	3	3	2	3	2							
CO 3	3	3			2							
CO 4	3	3	2	2								

Assessment Pattern

Bloom's Category	Continuous Assessment Tools			End Semester Examination
	Test1	Test 2	Other tools	
Remember	√	√	√	√
Understand	√	√	√	√
Apply	√	√	√	√
Analyse				
Evaluate				
Create				

Mark Distribution of CIA					
Course Structure [L-T-P-R]	**Attendance**	**Theory [L]**			**Total Marks**
		Assignment	**Test-1**	**Test-2**	
3-0-0-0	5	10	12.5	12.5	40

Total Mark distribution			
Total Marks	**CIA (Marks)**	**ESE (Marks)**	**ESE Duration**
100	40	60	2.5 hours

End Semester Examination [ESE]: Pattern			
PATTERN	**PART A**	**PART B**	**ESE Marks**
PATTERN 1	8 Questions (2 Questions from each module),each question carries 3 marks Marks: (3x8 =24 marks)	2 questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 2 subdivisions. Each question carries 9 marks. Marks: (9x4 = 36 marks)	60

SYLLABUS

MODULE I: (Single variable Calculus and Applications)

(Text 1: Relevant topics from sections 1.1,1.2,1.3,1.5,2.2,2.3,2.4,2.6,2.7)
Limits of function values, The limit laws, Continuous functions, Rates of change, Second- and higher-order derivatives, Instantaneous rates of change, Derivative as a function, Chain rule and Implicit differentiation.

MODULE II: (Multivariable Calculus and Applications)

(Text 1: Relevant topics from sections 13.1,13.2,13.3, 13.8)
Functions of several variables, Graphs, Level curves and contours of functions of two variables, Limits for functions of two variables, Continuity for functions of two variables, Partial derivatives of functions, Second-order partial derivatives and Relative extrema, Second derivative Test for local Extreme Values.

MODULE III: (Multivariable Calculus and Applications)

(Text 1: Relevant topics from sections 13.5,13.6)
The Chain Rule for partial derivatives, Directional Derivatives in the plane, Interpretation of the Directional Derivative, Properties of Directional Derivative, Gradient and its properties.

MODULE IV: (Linear Programming and Optimization)

(Text 1: Relevant topics from section 13.9)
(Text 2: Relevant topics from sections 3.1,3.2,3.3,3.4,4.1,4.2,4.3,4.4)
Constrained Maxima and minima. The Method of Lagrange Multipliers, LPP-Formation, Simplex Method.

Textbooks

1. H. Anton, I. Biven,S. Davis, "Calculus", Wiley, 10th edition, 2015.
2. Hillier/Lieberman, "Introduction to Operation Research", McGraw Hill,7th edition,2019

Reference books

1. A textbook of Engineering Mathematics (8th Edition)- N.P.Bali, Dr. Manish Goyal (Lakshmi Publications India Ltd.) ,2019
2. Higher Engineering Mathematics - H.K.Dass, Er. Rajnish Verma (S. Chand & Company Pvt.Limited) ,2014
3. Operation Research (4th Edition) - S.Kalavathy (Vikas Publications House Pvt.Ltd.) ,2013
4. Operation Research - Ravindran, Philips, Solberg (Wiley India Pvt. Ltd.) , 2007
5. Peter V .O'Neil,Advanced Engineering Mathematics ,Indian edition
6. David C Lay.Linear Algebra and its applications, Pearson

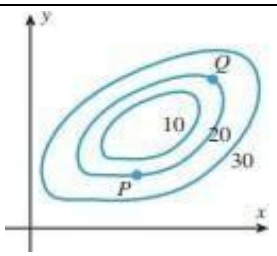
NPTEL/SWAYAM Courses for reference:

1. Dr. Joydeep Dutta, Calculus of Several Real Variables, IIT Kanpur, [NPTEL], https://nptel.ac.in/courses/111104125 (Relevant sections)
2. Prof. G. Sreenivasan, Linear Programming, IIT Madras, NPTEL, https://nptel.ac.in/courses/112106134 (Relevant sections)

No.	COURSE CONTENTS AND LECTURE SCHEDULE	No. of Hours [36 hours]
	MODULE 1 [9 hours]	
1.1	Limits of function values, The limit laws, Continuous functions	2
1.2	Rates of change	1
1.3	Second- and higher-order derivatives	1
1.4	Instantaneous rates of change	1
1.5	Derivative as a function	2
1.6	Chain rule and Implicit differentiation.	2
	MODULE II [9 hours]	
2.1	Functions of several variables, Graphs	1
2.2	Level curves and contours of functions of two variables	2
2.3	Limits for functions of two variables, Continuity for functions of two variables	1
2.4	Partial derivatives of functions	2
2.5	Second-order partial derivatives	1
2.6	Relative extrema, Second derivative Test for local Extreme Values.	2
	MODULE III [9 hours]	
3.1	The Chain Rule for partial derivatives	3
3.2	Directional Derivatives in the plane, Interpretation of the Directional Derivative	2
3.3	Properties of the Directional Derivative	2
3.4	Gradient and its properties.	2

MODULE IV [9 hours]		
4.1	Constrained maxima and minima	1
4.2	The Method of Lagrange Multipliers	2
4.3	LPP- Formation	2
4.4	Simplex Method	4

CO Assessment Questions	
CO1	1. Use implicit differentiation to find $\frac{dy}{dx}$ for the Folium of Descartes $x^3+y^3= 3xy$ 2. A spherical balloon is being inflated. Find a general formula for the instantaneous rate of change of the volume V with respect to the radius r, given that $V= \frac{1}{3}\pi r^3$ 3. Use the implicit plotting capability of a CAS(MATLAB/SCILAB) to graph the curve C whose equation is $x^3 - 2xy + y^3 = 0$.
CO2	1. An international airline has a regulation that each passenger can carry a suitcase having the sum of its width, length, and height less than or equal to 129 cm. Find the dimensions of the suitcase of maximum volume that a passenger can carry under this regulation. 2. Find three positive numbers whose sum is 48 and such that their product is as large as possible. 3. Use a CAS to generate a contour plot $of\ f(x, y) = 2y^2x - yx^2 + 4xy$ for $-5 \le x \le 5$ and $-5 \le y \le 5$, and use the plot to approximate the locations of all relative extrema and saddle points in the region. Check your answer using calculus, and identify the relative extrema as relative maxima or minima.
CO3	1. A heat-seeking particle is located at the point (2, 3) on a flat metal plate whose temperature at a point (x, y) is $T(x, y) = 10 - 8x^2 - 2y^2$. Find an equation for the trajectory of the particle if it moves continuously in the direction of maximum temperature increase. 2. Let $f(x, y) = x^2e^y$. Find the maximum value of a directional derivative at $(-2, 0)$, and find the unit vector in the direction in which the maximum value occurs. 3. The accompanying figure shows some level curves of an unspecified function f(x, y). Of the gradients at P and Q, which probably has the greater length? Explain.

	 4. (a) Use a CAS to graph f (x, y) = $(x^2 + 3y^2)\, e^{-(x2+y2)}$. (b) At how many points do you think it is true that $D_u f(x, y) = 0$ for all unit vectors u? (c) Use a CAS to find ∇f (d) Use a CAS to solve the equation ∇f(x, y) = 0 for x and y.
4	1. Work through the simplex method (in algebraic form) step by step to solve the following problem. Max $Z = 3x_1 + 4x_2 + 5x_3$, subject to $3x_1 + x_2 + 5x_3 \leq 150$, $x_1 + 4x_2 + x_3 \leq 120$, $2x_1 + 4x_2 + 2x_3 \leq 105$ and $x_1 \geq 0, x_2 \geq 0, x_3 \geq 0$. 2. Consider the following problem. Maximize $Z = 5x_1 + 4x_2$, subject to $3x_1 + 2x_2 \leq 6$, $2x_1 - x_2 \geq 6$ and $x_1 \geq 0, x_2 \geq 0$. (a) Demonstrate graphically that this problem has no feasible solutions. (b) Use a computer package based on the simplex method to determine that the problem has no feasible solutions. (c) Using the Big M method, work through the simplex method step by step to demonstrate that the problem has no feasible solutions.

Prepared by
Swapna Joseph
Asst Prof, ASH

24PHC112	PHYSICS FOR INFORMATION SCIENCE	L	T	P	R	C	Year of Introduction
		3	0	2	0	4	2024

Preamble:
Enable the students to enhance their fundamental knowledge of physics and its applications relevant to Computer Science and Engineering. This syllabus is designed to provide a comprehensive understanding of key principles in modern physics, emphasising superconductivity, electrical conductivity, quantum mechanics, semiconductor physics, laser and electromagnetism. The program is designed to develop scientific attitudes and enable the students to correlate the concepts of Physics with the core programmes.

Prerequisite: Basic knowledge in Physics and Mathematics.

Course Outcomes: After the completion of the course, the student will be able to

CO 1	Describe the principles of electrical conductivity, Fermi energy, energy bands and superconductivity.[Understanding]
CO 2	Apply the knowledge of basic Quantum Mechanics to the behaviour of matter at atomic and subatomic levels. [Apply]
CO 3	Apply the characteristics of intrinsic semiconductors in the derivation of electron and hole densities, intrinsic carrier concentration and formation of pn junctions. .[Apply]
CO 4	Apply the principles of laser in the construction and working of different lasers and understand the fundamentals of electromagnetic theory.[Apply]
CO 5	Apply basic knowledge of principles and theories in physics to conduct experiments.[Apply]

CO - PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3										2
CO 2	3	3										2
CO 3	3	3										2
CO 4	3	3										2
CO 5	3	3			2				2			2

Assessment Pattern for Theory Component

Bloom's Category	Continuous Assessment Tools			End Semester Examination
	Test1	Test 2	Other tools	
Remember	✓	✓	✓	✓

Understand	✓	✓	✓	✓
Apply	✓	✓	✓	✓
Analyse				
Evaluate				
Create				

Assessment Pattern for the Lab Component

Bloom's Category	**Continuous Assessment Tools**	
	Classwork	**Test1**
Remember	✓	✓
Understand	✓	✓
Apply	✓	
Analyse		
Evaluate		
Create		

Mark Distribution of CIA

Course Structure [L-T-P-R]	**Attendance**	**Assignment**	**Theory [L]**		**Practical [P]**		**Total Marks**
			Test-1	**Test-2**	**Lab work**	**Lab Exam**	
3-0-2-0	5	5	7.5	7.5	15	10	50

Total Marks distribution

Total Marks	**CIA (Marks)**	**ESE (Marks)**	**ESE Duration**
100	50	50	2 hours

End Semester Examination [ESE]: Pattern

PATTERN	**PART A**	**PART B**	**ESE Marks**
PATTERN 2	2 Questions from each module, 8 questions, each Question carries 3 marks. Answer any 6 Marks: (6x3 =18 marks)	2 questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 2 subdivisions. Each question carries 8 marks. Marks: (4x 8 = 32 arks)	50

SYLLABUS

MODULE I: Electrical conductivity and Superconductivity (9 hours)

Classical free electron theory, Electrical conductivity in metals, Fermi Dirac distribution, Variation of Fermi function with temperature, Fermi Energy, Energy bands, Classification of materials into conductor, semiconductor and insulator.

Superconductivity, Transition temperature, Critical field, Meissner effect, Type I and Type II Superconductors, BCS Theory, Applications of Superconductors

MODULE II: Quantum Mechanics (9 hours)

Introduction to Quantum Mechanics, Wave nature of particle, Uncertainty principle, Applications-Absence of electron inside the nucleus- Natural line broadening, Wave function- properties - physical interpretation, Formulation of time-dependent and time-independent Schrodinger equations, Particle in a one- dimensional box - Derivation of energy eigenvalues and normalised wave function, Quantum Mechanical Tunnelling (Qualitative), Quantum Computing (Qualitative)

MODULE III: Semiconductor Physics (9 hours)

Intrinsic Semiconductor, Derivation of the density of electron in the conduction band and density of holes in the valence band, Intrinsic carrier concentration, Variation of intrinsic carrier concentration with temperature, Extrinsic semiconductor(qualitative), Formation of pn junction, Fermi level in semiconductors-intrinsic and extrinsic, Energy band diagram of pn junction - Qualitative description of charge flow across a pn junction - Forward and reverse bias pn junctions, Diode equation (Derivation), I-V Characteristics of pn junction, Solar cells- IV Characteristics, Efficiency

MODULE IV : Laser and Electromagnetic Theory (9 hours)

Properties of laser, Absorption, Spontaneous emission and stimulated emission, Principle of laser - conditions for sustained lasing – Population inversion, Pumping, Metastable states, Basic components of laser - Active medium, Energy source, Optical resonant cavity, Construction and working of Ruby laser, Construction and working of Semiconductor laser (qualitative), Applications of laser.

Magnetic field and Magnetic flux density, Gauss's law for Magnetic flux density, Ampere's Circuital law, Faraday's law, Classification of magnetic materials -Para, Dia and Ferromagnetic materials, Gauss divergence theorem & Stokes' theorem, Equation of continuity, Derivation of Maxwell's Equations

Text books

1. M.N. Avadhanulu, P.G. Kshirsagar, TVS Arun Murthy "A Textbook of Engineering Physics", S.Chand &Co., Revised edition 2019.
2. H.K.Malik , A.K. Singh, "Engineering Physics" McGraw Hill Education, Second Edition 2017.
4. Md.N.Khan & S.Panigrahi "Principles of Engineering Physics 1& 2", Cambridge University Press, 2016.
5. Aruldhas G., "Engineering Physics", PHI Pvt. Ltd., 6th Edition 2015.
6. B Premlet ., "Advanced Engineering Physics", Phasor Books,11th edition ,2021.
7. I .Dominic and. A. Nahari, "A TextBook of Engineering Physics", Owl Books Publishers, Revised edition, 2016.

8. H.D Young and R.A Freedman, "University Physics with Modern Physics" 2020, 15th Edition, Pearson, USA.
9. B Premlet ,"Introduction to solid state devices", Phasor Books.
10. Griffiths "Introduction to Electrodynamics" 4th Edition, Pearson.

NPTEL/SWAYAM Courses for reference:

Module I - A brief course on Superconductivity
https://nptel.ac.in/courses/115103108
Module II - Quantum Mechanics and Applications
https://nptel.ac.in/courses/115102023
Quantum Mechanics I
https://nptel.ac.in/courses/115101107
Module III - Semiconductor Optoelectronics
https://nptel.ac.in/courses/115102103
Semiconductor Optoelectronics
https://nptel.ac.in/courses/115102026
Module IV - Introduction to LASER
https://nptel.ac.in/courses/115102124
Laser: Fundamentals and Applications
https://nptel.ac.in/courses/104104085
Electromagnetism
https://nptel.ac.in/courses/115106122

No.	COURSE CONTENTS AND LECTURE SCHEDULE	No. of Hours [36]
MODULE 1: Electrical conductivity and Superconductivity (9 hours)		
1.1	Classical free electron theory	1
1.2	Electrical conductivity in metals	1
1.3	Fermi Dirac distribution	1
1.4	Variation of Fermi function with temperature, Fermi Energy	1
1.5	Energy bands, Classification of materials into conductor, semiconductor and insulator.	1
1.6	Super conductivity, Transition temperature	1
1.7	Critical field, Meissner effect	1
1.8	Type I and Type II Superconductors	1
1.9	BCS Theory, Applications of Superconductors	1
MODULE II: Quantum Mechanics (9 hours)		
2.1	Introduction to Quantum Mechanics , Wave nature of particles	1
2.2	Uncertainty principle , Applications-Absence of electron inside the nucleus	1
2.3	Natural line broadening	1
2.4	Wave function- properties - physical interpretation	1
2.5	Formulation of time- dependent Schrodinger equations	1
2.6	Formulation of time-independent Schrodinger equations	1

2.7	Particle in a one- dimensional box - Derivation of energy eigenvalues and normalized wave function	1
2.8	Quantum Mechanical Tunnelling (Qualitative)	1
2.9	Quantum Computing (Qualitative)	1
MODULE III: Semiconductor Physics (9 hours)		
3.1	Intrinsic semiconductor	1
3.2	Derivation of the density of electrons in the conduction band and density of holes in the valence band	1
3.3	Intrinsic carrier concentration, Variation of intrinsic carrier concentration with temperature	1
3.4	Extrinsic semiconductor(qualitative)	1
3.5	Formation of pn junction, Fermi level in semiconductors- intrinsic and extrinsic	1
3.6	Energy band diagram of pn junction - Qualitative description of charge flow across a pn junction	1
3.7	Forward and reverse biased pn junctions	1
3.8	Diode equation (Derivation)	1
3.9	I-V Characteristics of pn junction	1
MODULE IV : Laser and Electromagnetic Theory (9 hours)		
4.1	Properties of laser, Absorption, Spontaneous emission and stimulated emission	1
4.2	Principle of laser - conditions for sustained lasing – Population inversion, Pumping, Metastable states	1
4.3	Basic components of laser - Active medium, Energy source, Optical resonant cavity, Construction and working of Ruby laser	1
4.4	Construction and working of Semiconductor laser (qualitative), Applications of laser	1
4.5	Magnetic field and Magnetic flux density	1
4.6	Gauss's law for Magnetic flux density, Ampere's Circuital law, Faraday's law	1
4.7	Classification of magnetic materials-Para, Dia and Ferromagnetic materials	1
4.8	Gauss divergence theorem & Stokes' theorem, Equation of continuity.	1
4.9	Derivation of Maxwell's Equations	1

LESSON PLAN FOR LAB COMPONENT

No.	Topic	No. of Hours	Experiment
		2	Determination of band gap energy of semiconductor.

1	Electrical conductivity and Superconductivity	2	Variation of the critical magnetic field with temperature using simulation lab.
2	Quantum Mechanics	2	Determination of the size of lycopodium powder using a laser.
		2	Quantum mechanical tunnelling using simulation.
		2	Particle in a 1D box using simulation.
3	Semiconductor Physics	2	V-I characteristics of solar cells.
		2	Diode characteristics.
		2	V-I Characteristics of Zener Diode.
4	Laser and Electromagnetic Theory	2	Laser-determination of wavelength using diffraction grating.
		2	Faraday's law of electromagnetic induction.
		2	CRO-Measurement of frequency and amplitude of wave forms.
(Any 2 experiments from each topic to be completed)			
CO Assessment Questions			
CO1	1. Explain Classical free electron theory. 2. What is Fermi Dirac distribution and explain variation of Fermi function with Temperature. 3. Apply Meissner effect to prove that superconductor is perfectly diamagnetic. 4. Distinguish between type I and type II superconductors with suitable diagrams and examples.		
CO2	1. Give the physical significance of wave function? 2. By applying Heisenberg's uncertainty principle prove the absence of electrons inside the nucleus. 3. An electron is confined to a one dimensional potential box of length 2Å. Calculate the energies corresponding to the first and second quantum states in eV. 4. Write down the Schrodinger equation for a particle in a one dimensional infinite square well potential and also derive the equation for normalised wave function and energy eigenvalues for a particle in 1 D Box.		
CO3	1. Explain the variation of intrinsic carrier concentration with temperature. 2. Derive the density of electrons in the conduction band and the density of holes in the valence band in the intrinsic semiconductor. 3. Explain the Energy band diagram of pn junction. 4. Apply the principle of pn junction and hence explain the construction and working of a solar cell		

CO4	1. Distinguish between spontaneous and stimulated emission. 2. Explain the construction and working of a ruby laser with the help of energy level diagrams by applying the concept of stimulated emission. 3. Compare the properties of paramagnetic, diamagnetic and ferromagnetic materials with two examples for each. 4. A magnetising field of 1800 A/m produces a magnetic flux of 3 x 10^{-5} Wb in an iron bar of cross-sectional area 0.2 cm^2. Calculate the permeability.
CO5	1. Determine the band gap energy of the semiconductor. 2. Determine the size of lycopodium powder using a laser. 3. By applying the principle of Diffraction determine the wavelength of a laser source using a diffraction grating arrangement. 4. Draw the V-I Characteristics of Zener Diode.

Prepared by
Ms.Jimi K J
Asst. Prof.,
ASH

24EST003	ENGINEERING GRAPHICS	L	T	P	R	C	Year of Introduction
		3	0	0	0	3	2024

Preamble:

Practicing Engineers require the ability to translate ideas into tangible designs and interpret existing drawings. "Engineering Graphics" covers fundamental principles such as orthographic projections, dimensioning, sectional views, surface development, isometric projections and conversion of isometric to orthographic projection. This course equips students with essential skills in engineering drawing, preparing them for careers in Engineering.

Prerequisite: Nil

Course Outcomes: After the completion of the course, the student will be able to

CO1	Translate the principles of orthographic projections to prepare projections of lines and solids.**[Apply]**
CO2	Prepare sectional views and develop surfaces of a given solid. **[Apply]**
CO3	Convert between 2D orthographic views and 3D isometric projections effectively. **[Apply]**

CO-PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2							2		
CO2	3	3	2							3		
CO3	3	3	2							3		

Assessment Pattern for Theory

Bloom's Category	Continuous Assessment Tools			End Semester Examination
	Test1	Test2	Other tools	
Remember			✓	
Understand			✓	
Apply	✓	✓	✓	✓
Analyze				
Evaluate				
Create				

Mark Distribution of CIA

		Theory[L-T]

Course Structure [L-T-P-R]	Attendance	Test-1	Test-2	Class work/ Assignment	Total Marks
3-0-0-0	5	10	10	15	40

Total Marks distribution			
Total Marks	**CIA(Marks)**	**ESE(Marks)**	**ESE Duration**
100	40	60	2hrs 30min

End Semester Examination [ESE]: Pattern			
	PARTA	**PARTB**	**ESE Marks**
PATTERN 3	NA	2 questions will be given from each module, out of which 1 question should be answered, each carrying 15 marks. Marks:(4x15=60marks)	60

SYLLABUS

MODULE I: Introduction to Engineering Drawing and Orthographic Projection of Points and Lines (11 Hours)

Introduction: Relevance of technical drawing in engineering field. Types of lines, Dimensioning, BIS code of practice for technical drawing. (No questions for the end semester examination)

Projection of points in different quadrants, Projection of straight lines inclined to one plane and inclined to both planes. Traces of a line. Inclination of lines with reference planes True length and true inclinations of line inclined to both the reference planes.(Questions limited to Lines in first quadrant , lines in first & second quadrants, lines in first & third quadrants, Lines in third quadrant)

MODULE II: Orthographic Projections of Solids (10 Hours)

Projection of Simple solids such as Triangular, Rectangle, Square, Pentagonal and Hexagonal Prisms, Pyramids, Cone, Cylinder and tetrahedron. Projection of solids in simple position. Projection of solids with axis inclined to one of the reference planes and with axis inclined to both reference planes.

MODULE III: Section of solids and Development of Surfaces (10 Hours)

Sections of Solids: Sections of tetrahedron, Prisms, Pyramids, Cone, Cylinder with axis in vertical position and cut by different section planes. True shape of the sections. (Exclude true shape given problems)

Development of Surfaces: Development of surfaces of the solids and solids cut by different section planes with axis of the solid perpendicular to HP. (Exclude problems with through holes and shortest distance between two points)

MODULE IV: Isometric Projection and Multi-view Projection (5 Hours)

Isometric Projection: Isometric scale- Isometric View and Projections of Prisms, Pyramids, Cone, Cylinder, Frustum of Pyramid, Frustum of Cone, Sphere, Hemisphere and their combinations.

Multi view Projection- Conversion of pictorial views to orthographic view(F.V,T.V & S.V)

Textbooks

1. P.I. Varghese, Engineering Graphics, Tata McGraw Hill Education
2. Prof. J Benjamin, Engineering Graphics, Pentex Publishers
3. John, K.C. Engineering Graphics, Prentice Hall India Publishers.
4. N.D. Bhatt, Engineering Drawing, Charotar Publishing House
5. Agrawal, B. And Agrawal, C.M., Engineering Drawing, Tata McGraw Hill Publishers.

Reference books

1. Luzaddff, W.J. and Duff, J.M., Fundamentals of Engineering Drawing, PHI.
2. Duff, J.M. and Ross, W.A., Engineering Design and Visualisation, Cengage Learning.

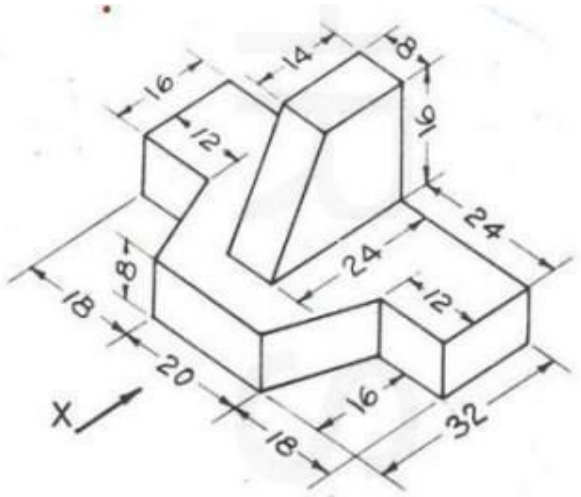
NPTEL/SWAYAM Courses for reference:

1. Engineering Drawing, Prof P.S. Robi, IIT Guwahati https://nptel.ac.in/courses/112103019
2. Engineering Graphics and Design, Naresh V Datla, Sunil R Kale, IIT Delhi https://archive.nptel.ac.in/courses/112/102/112102304/

No.	COURSE CONTENTS AND LECTURE SCHEDULE	No. of Hours (36)
	MODULE1 (11 Hours)	
1.1	Relevance of technical drawing in engineering field. Types of lines and their Uses	1
1.2	Dimensioning, BIS code of practice for technical drawing.	1
1.3	Orthographic Projection Concepts-Projection of points in different quadrants- Problems	1
1.4	Projection of straight lines parallel to both HP and VP- Problems	1
1.5	Projection of straight lines perpendicular to either HP or VP and parallel to other- Problems	1
1.6	Projection of straight lines inclined to either HP or VP and parallel to other- Problems	1

1.7	Trace of a line- Concept	1
1.8	Projection of straight lines inclined to both HP and VP – Line rotation method- Problems	2
1.9	Projection of straight lines inclined to both HP and VP – Plane rotation method- Problems	2
MODULE II(10 Hours)		
2.1	Types of Solids	1
2.2	Projection of solid in simple position- Problems	1
2.3	Projection of solid inclined to any one reference plane. – Problems	3
2.4	Projection of solid inclined to both reference plane. - Problems	5
MODULE III (10 Hours)		
3.1	Types of Section planes and True shape of section	1
3.2	Sectional view of solids when section plane is parallel to HP and Perpendicular to VP- Problems	1
3.3	Sectional view of solids when section plane is parallel to VP and Perpendicular to HP- Problems	1
3.4	Sectional view of solids and true shape of section when section plane is inclined to HP and Perpendicular to VP- Problems	1
3.5	Sectional view of solids and true shape of section when section plane is inclined to VP and Perpendicular to HP- Problems	1
3.6	Development of surfaces- concept	1
3.7	Development of surfaces- Prism	1
3.8	Development of surfaces- Pyramid	1
3.9	Development of surfaces- Cone and Cylinder	1
3.10	Development of sectioned solids-Problems	1
MODULE IV (5 Hours)		
4.1	Isometric Projection- Isometric Scale- Isometric Drawing	1
4.2	Isometric Projection/drawing of solids- Problems	1
4.3	Isometric Projection/drawing of Combination of solids –Problems	1
4.4	Isometric Projection/drawing of sphere & hemisphere –Problems	1
4.5	Multi-view Projection Concept -Problem	1
Total Hours		**36**
CO Assessment Questions		

CO1	1. The distance between end projectors of a line CD is 65mm. End C is 15mm above HP and 40mm in front of VP. Its front view and top view makes an angle of 40^0 and 45^0 respectively with XY- line. Draw the projections, find the true length and true inclinations with HP and VP, and locate its traces. The line is in the first quadrant. 2. The front view of a line AB measures 70mm and makes an angle of 50^0 with XY-line. The end A is in the HP and the VT of the line is 30mm above HP. The line is inclined at 40^0 to the VP. Draw the projections of the line, find its true length and true inclination to HP, and locate its HT. 3. One end point of line AB is 12 mm above HP and is 15 mm in front of VP. The other endpoint is 50 mm above HP and is 42 mm in front of VP. Draw the projections of line AB if its elevation measures 70 mm. Find out its true length and the true inclinations with respect to the reference planes. 4. A cone of base diameter 40 mm and axis 60 mm long touches the VP on a point of its base circle. The axis is inclined at 30^0 to VP and the front view of its axis is inclined at 45^0 to XY line. Draw its projections. 5. A square pyramid of base edge 30 mm and height 60 mm is resting on HP on its triangular face such that the square face edge on HP is inclined 30^0 to VP. Draw its projections. 6. A pentagonal prism 30 mm base edge and 60 mm height is on HP on one of its base edges so that the axis is inclined at 45^0 with HP and the base edge on which it rests is inclined at 30^0 with VP. Draw the projections of the solid.
CO2	1. A pentagonal pyramid side of base 30 mm, height 65 mm has its base on the ground and one of its base edge is parallel to and nearer to VP. This pyramid is cut by a section plane perpendicular to VP, passing through a point on the axis which is 20 mm below the apex and making an angle of 40^0 with HP. Draw the front view, sectional top view and true shape of the section. 2. A hexagonal prism of base side 35 mm and height 65 mm rests on its base on HP with one of the base edges parallel to VP. It is cut by a section plane inclined towards right at an angle of 30^0 to HP and perpendicular to VP. The section plane meets the axis of the prism at a height of 45 mm from the base. Draw the front view, sectional top view, and true shape of the section. 3. A pentagonal prism of base 30 mm and axis 60 mm long is kept with its base on HP with a base edge perpendicular to VP. It is cut by a plane inclined at 45^0 to HP, perpendicular to VP and passing through the midpoint of the axis. Draw the development showing the remaining portion of the solid.

CO3	1. A hemisphere of diameter 60 mm is placed centrally over a square slab of side 50mm and height 40 mm, with its flat surface facing upward. Draw the isometric view of the combination 2. A hexagonal pyramid of base edge 25 mm and height 40 mm is surmounted centrally over a cube of 50 mm side. The cube is lying on HP on one of its square faces so that one base edge of the cube and one base edge of the pyramid are parallel to VP. Draw the isometric view of the combination. 3. Draw the orthographic projections (front view, top view, and left side view) of the following figure. The front view direction is marked with a long arrow marking as X. Any missing dimension may be suitably assumed. All dimensions are in mm 

Prepared by
Dr Nixon K,
Principal Mr.
Mathews V J Asst.
Prof, ASH

24EST104R1	FOUNDATIONS OF COMPUTING	L	T	P	R	C	Year of Introduction
		3	0	0	0	3	2024

Preamble: The course enables students to understand the fundamental components and types of computer systems along with the boot process. It helps students apply number system conversions, binary arithmetic, and design basic digital logic circuits. Students will be able to explain computer architecture concepts, including CPU functions, instruction cycles, and different processor types. Additionally, the course equips students to use basic operating system commands, write simple shell scripts, and understand foundational computer networking and security principles.

Prerequisite: Nil

Course Outcomes: After the completion of the course, the student will be able to

CO 1	Describe types of computer systems, hardware components, and the computer boot process.(Understand)
CO 2	Apply number system conversions, binary arithmetic, and basic logic design using digital circuits.(Apply)
CO 3	Explain basic computer architecture, instruction cycle, and compare RISC and CISC architectures.(Understand)
CO 4	Demonstrate basic command-line usage, shell scripting, and explain computer network components and security basics.(Apply)

CO - PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	2				1	1	1	1	2	2	3
CO 2	3	3	2		2		1		2	2	2	3
CO 3	3	3	1	3	1				2	2	2	3
CO 4	2	2	2	3	3			2	3	3	3	2

Assessment Pattern for Theory Component

Bloom's Category	Continuous Assessment Tools			End Semester Examination
	Test1	Test 2	Other tools	
Remember	√	√	√	√
Understand	√	√	√	√
Apply	√	√	√	√
Analyze				
Evaluate				
Create				

Mark Distribution of CIA

Course Structure [L-T-P-R]	Attendance	Theory [L]			Total Marks
		Assignment	Test-1	Test-2	
3-0-0-0	**5**	10	12.5	12.5	**40**

Total Marks distribution

Total Marks	CIA (Marks)	ESE (Marks)	ESE Duration
100	40	60	2.5 hrs.

End Semester Examination [ESE]: Pattern

PATTERN	PART A	PART B	ESE Marks
Pattern 1	2 questions from each module. 8 Questions, each question carries 3 marks Marks: (3x8 =24 marks)	2 questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of two subdivisions. Each question carries 9 marks. Marks: (9x4 = 36 marks)	60

SYLLABUS

MODULE I: Overview of Computer Systems and Hardware (9 hours)

Introduction to Computer -Classification of Computer Systems: Based on size, functionality, and application (microcomputers, minicomputers, mainframes, supercomputers, embedded systems) Evolution of Computing: Computer generations and key developments Hardware Components:CPU and its components, Memory hierarchy: Registers, Cache, RAM, ROM, Virtual Memory, Motherboard and chipset overview, I/O Devices: Input, Output, and Hybrid Devices, Storage Devices: HDD, SSD, Optical Drives, System Bus, Interface Cards, and Firmware, Booting Process and BIOS/UEFI Basics of Device Management and I/O Communication.

MODULE II: Number Systems and Digital Logic (9 hours)

Number Systems: Binary, Octal, Decimal, Hexadecimal, Number Conversion and Representation (integers and characters),Binary Arithmetic: Addition, Subtraction, Multiplication, Division (overview),Digital Codes: ASCII, Unicode, BCD, Gray Code, Logic Gates: AND, OR, NOT, XOR, XNOR – truth tables and symbolic representation, Universal Gates: NAND and NOR – Implementation of logic gates, Basic Combinational Circuits: Half Adder and Full Adder,2:1 Multiplexer (MUX),2-to-4 Line Decoder.

MODULE III:Computer Architecture and Processors (9 hours)

Introduction to Computer Architecture, CPU Components: ALU, CU, Registers, Buses Instruction Cycle: Fetch, Decode, Execute, Instruction Format and Types, Assembly Language Basics ,Instruction Set Architectures: RISC vs. CISC, Introduction to Modern Processors: Microprocessors vs. Microcontrollers, Role of GPUs and SoCs (brief overview)

MODULE IV: System Software and Networking Fundamentals (9 hours)

System Software Overview: Operating Systems, Compilers, Linkers, Operating System Functions: Process, Memory, File, and Device Management, Introduction to Linux and Windows-Basic shell commands and file handling-Introduction to Bash scripting, Computer Networks: Network Types: LAN, MAN, WAN-Network Models: Client-Server vs. Peer-to-Peer-Topologies: Star, Ring, Bus, Mesh-IP Addressing Basics, DHCP, NAT, Introduction to DNS, VPN, Routers, Firewalls, Concepts of Network Security: Endpoint and Perimeter Security, The Internet, WWW, and Web Servers.

Reference books

1. *Fundamentals of Computers* by V. Rajaraman (6th Ed., 2018)
2. *Structured Computer Organization* by Andrew S. Tanenbaum (6th Ed., 2013)
3. *Modern Operating Systems* by Andrew S. Tanenbaum (4th Ed., 2014)
4. *Digital Fundamentals* by Thomas L. Floyd (11th Ed., 2015)
5. *Unix and Shell Programming* by B.A. Forouzan & R.F. Gilberg (1st Ed., 2003)

NPTEL/SWAYAM Courses for reference:

1. Computer System Organisation - Course
2. Digital Electronic Circuits - Course
3. Computer Networks And Internet Protocol - Course

No.	COURSE CONTENTS AND LECTURE SCHEDULE	No. of Hours (36)
	MODULE 1 [9 hours]	
1.1	Classification of Computer Systems	1
1.2	Evolution of Computers	1
1.3	CPU and Memory Hierarchy	1.5
1.4	Motherboard and Peripherals	1.5
1.5	Storage Devices & I/O Devices	1.5
1.6	Buses, Firmware, Interface Cards	1.5
1.7	Boot Process	1
	MODULE II [9 hours]	
2.1	Introduction to Number Systems	2
2.2	Representing Numbers and Characters	1
2.3	Binary Arithmetic	1
2.4	Digital Codes	1
2.5	Logic Gates	1
2.6	Universal Gates	1
2.7	Combinational Circuits	2
	MODULE III [9 hours]	
3.1	Introduction to Computer Architecture	1
3.2	Components of the CPU	1.5

3.3	Instruction Format and Types	1.5
3.4	Fetch–Decode–Execute Cycle	1
3.5	Assembly Language Basics	1.5
3.6	Instruction Set Architectures – RISC & CISC	1.5
3.7	Introduction to Modern Processors	1
MODULE IV [9 hours]		
4.1	System Software Overview Operating System Functions	1
4.2	Introduction to Linux and Windows Basic Shell Commands and File Handling Introduction to Bash Scripting	2
4.3	Network Types and Network Models	1
4.4	Topologies	1
4.5	IP Addressing and Protocols	1
4.6	DNS, VPN, Routers, Firewalls	1
4.7	Network Security Concepts:	1
4.8	The Internet, WWW, and Web Servers:	1
CO Assessment Questions		
CO1	1. Differentiate between microcomputers and mainframes in terms of performance and use-case. 2. Arrange the memory types in hierarchy based on speed and proximity to CPU: Cache, RAM, Registers, Virtual Memory, ROM 3. Compare HDD, SSD, and optical drives in terms of speed, cost, and durability 4. Describe the role of BIOS/UEFI in the booting process 5. Differentiate between interrupt-driven I/O and programmed I/O with examples	
CO2	1. Convert the following-$(1101)_2$ to decimal,$(58)_{10}$ to binary,$(2F)_{16}$ to decimal,$(73)_{10}$ to hexadecimal 2. Represent the decimal number -18 using 8-bit 2's complement form 3. Convert the decimal number 42 to its ASCII and BCD equivalents 4. Differentiate between XOR and XNOR gates with examples Explain the working of a 2-to-4 line decoder with a truth table.	
CO3	1. Differentiate between computer architecture and computer organization 2. Explain the role of registers in instruction execution. 3. Write a simple assembly language program to add two numbers. 4. Compare RISC and CISC architectures in terms of instruction complexity, memory usage, and execution speed. 5. Define GPU and SoC. Explain their roles in modern computing systems	

CO4	1. Explain the function of a linker in program execution. 2. Describe how an OS manages process scheduling. 3. List key differences between Linux and Windows file systems. 4. Compare LAN, MAN, and WAN based on coverage area and use 5. Explain how firewalls protect networks from external threats.

24ESR105	ALGORITHMIC THINKING WITH PYTHON	L	T	P	R	C	Year of Introduction
		2	0	2	1	4	2024

Preamble: The syllabus is prepared with the view of preparing the engineering graduates to be capable of writing readable Python programs to solve computational problems that they may have to solve in their professional lives. The course content is decided to cover the essential programming fundamentals, which can be taught within the given slots in the curriculum.

Prerequisite: NIL

Course Outcomes: After the completion of the course the student will be able to

CO 1	Analyze and develop an algorithm for solving computational problems. [Apply]
CO 2	Articulate in design programs with interactive input and output, utilizing arithmetic expression repetitions, and decision-making. [Understand]
CO 3	Utilize modular Python programs using functions and process stored data using List, Tuples, Sets, Dictionaries. [Apply]
CO 4	Understand and implement file operations for reading input and storing output. [Understand]

CO - PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3									3
CO2	3	3	3	2			3	3				3
CO3	3											3
CO4	3											3

Assessment Pattern for Theory Component

Bloom's Category	Continuous Assessment Tools			End Semester Examination
	Test1	Test 2	Other tools	
Remember	√	√		√
Understand	√	√		√
Apply	√	√	√	√
Analyze				
Evaluate				
Create				

Assessment Pattern for Practical Component

Bloom's Category	Continuous Assessment Tools	
	Class work	Test
Remember	√	√

Understand	√	√
Apply	√	√
Analyze		
Evaluate		
Create		

Assessment Pattern for Project Component

Bloom's Category	**Continuous Assessment Tools**		
	Evaluation 1	**Evaluation 2**	**Report**
Remember	√	√	
Understand	√	√	
Apply	√		
Analyze			
Evaluate			
Create			

Mark Distribution of CIA

		Theory [L]			**Practical [P]**		**Project [R]**			
Course Structure [L-T-P-R]	**Attendance**	**Assignment**	**Test-1**	**Test-2**	**Class Work**	**Test**	**Evaluation 1**	**Evaluation-2**	**Report**	**Total Marks**
2-0-2-1	5	5	7.5	7.5	7.5	5		7.5	5	50

Total Marks distribution

Total Marks	**CIA (Marks)**	**ESE (Mark)**	**ESE Duration**
100	50	50	2 hrs

End Semester Examination [ESE]

PATTERN	**PART A**	**PART B**
PATTERN 2	2 Questions from each module. Total of 8 Questions, Answer any 6 questions. Each carrying 3 marks (6x3 =18 marks)	2 questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 3 subdivisions. Each question carries 8 marks. (4x8 = 32 marks)

SYLLABUS

MODULE I : Fundamentals of Algorithms (5 Hours)

Problem Solving strategies — Problem analysis — formal definition of problem — Solution — top- down design — breaking a problem into sub problems- overview of the solution to the sub problems by writing step by step procedure (algorithm) - Implementation of algorithms — use of procedures to achieve modularity.

Examples for algorithms - At least 10 problems (starting with non-numerical examples, and numeric problems like factorial, largest among three numbers, largest among N, Fibonacci.

MODULE II: Variable Expression and Statements (6 Hours)

Introduction to Python-variables, expressions and statements, evaluation of expressions, precedence, string operations

Control statements, Boolean expressions and logical operators, conditional and alternative executions

MODULE III : Functions (6 Hours)

Functions, calling functions, Recursion, composition of functions, mathematical functions, user-defined functions, parameters and arguments.

MODULE IV : List, Dictionary Data Structures (6 Hours)

Strings and lists — string traversal and comparison with examples. List operations with examples tuples and dictionaries — operations and examples , Introduction to numpy, pandas, matplotlib , Files and exceptions - text files, directories, Introduction to classes and objects - attributes, instances(Basics Only)

Textbooks

1. Downey, A. et al., How to think like a Computer Scientist: Learning with Python, John Wiley, 2022
2. Reema Thereja., Computer Fundamentals and Programming in C, Oxford, 2023
3. Lambert K. A., Fundamentals of Python - First Programs, Cengage Learning India, 2019
4. Rajaraman, V., Computer Basics and C Programming, Prentice-Hall India

Reference books

1. Barry, P., Head First Python, O' Reilly Publishers
2. Dromy, R. G., How to solve it by Computer, Pearson India
3. Guzdial, M. J., Introduction to Computing and Programming in Python, Pearson India
4. Perkovic, L., Introduction to Computing Using Python, 2/e, John Wiley, 2015
5. Sprankle , M., Problem Solving & Programming Concepts, Pearson India
6. Venit, S. and Drake, E., Prelude to Programming: Concepts & Design, Pearson India
7. Zelle, J., Python Programming: An Introduction to Computer Science, Franklin, Beedle & Associates Inc.

NPTEL/SWAYAM Courses for reference:

1. The joy of Computing using Python - https://onlinecourses.nptel.ac.in/noc21_cs32/preview

No.	COURSE CONTENTS AND LECTURE SCHEDULE	No. of Hours (24)
	MODULE I : Fundamentals of Algorithms (5 Hours)	
1.1	Problem analysis — formal definition of problem	1
1.2	Solution — top- down design	1
1.3	breaking a problem into sub problems-	1
1.4	overview of the solution to the sub problems by writing step by step procedure (algorithm)	1
1.5	Examples	1
	MODULE II : Variable Expression and Statements (6 Hours)	
2.1	variables, expressions	1
2.2	statements, evaluation of expressions	1
2.3	Precedence, string operations	1
2.4	Control statements	1
2.5	Boolean expressions and logical operators	1
2.6	conditional and alternative executions	1
	MODULE III : Functions (7 Hours)	
3.1	Functions	1
3.2	Calling functions	1
3.3	Composition of functions	1
3.4	Recursion	1
3.5	Mathematical functions	1
3.6	User-defined functions	1
3.7	Parameters and arguments	1
	MODULE IV: List, Dictionary Data Structures (6 Hours)	
4.1	Strings and lists, string traversal and comparison	1
4.2	List operations with examples	1
4.3	tuples and dictionaries, operations and examples	1
4.4	Files and exceptions - text files, directories	1
4.5	Introduction to numpy, pandas, matplotlib	1
4.6	Introduction to classes and objects - attributes, instances	1

Project: Mini projects can be done in the respective engineering domain.

LESSON PLAN FOR LAB COMPONENT (8 Experiments mandatory)

No.	Topic	No. of Hours (12)
1	Simple desktop calculator using Python. Only the five basic arithmetic operators	1
2	Create, concatenate, and print a string and access a sub-string from a given string.	1
3	Familiarize time and date in various formats (Eg. "Thu Jul 11 10:26:23 IST 2024").	1
4	Program to find the largest of three numbers.	1
5	Convert temperature values back and forth between Celsius (c), and Fahrenheit (f). [Formula: c/5 =f-32/9]	1
6	Program to find the factorial of a number	1
7	Write program to check whether the given number is Armstrong or not	1
8	Write various programs to implement numpy, Pandas and matplotlib	3
9	Write a program to implement file operations	1
10	Write a program to demonstrate OOPs concepts in python	1

LESSON PLAN FOR PROJECT COMPONENT

No.	Topic	No. of Hours (12)
1	Introduction and awareness on various stages of a Mini Hackathon.	6
2	Final Mini Hackathon, Presentation and evaluation.	6

CO Assessment Questions

CO1	1. Write an algorithm to compute sum of series 1 – x2/2 +x4/4-x6/6+……. n 2. Give the algorithm for finding the largest and smallest numbers in each list of N numbers 3. Simple desktop calculator using Python. Only the five basic arithmetic operators

CO2	1. Evaluate the expression x ** y ** z. Given x = 2, y = 3, z=2 2. Write a python program to display all Armstrong numbers in each range 3. Write a python program to count the number of zeros and negative terms in each set of n numbers 4. Familiarize time and date in various formats (Eg. "Thu Jul 11 10:26:23 IST 2024").
CO3	1. Why do we need functions? What are the advantages of function 2. Write a python program to find the sum of digits of a number 3. What do you mean by mutability of data structure? Explain with example why we say that list is mutable while tuples are immutable 4. Program to find the factorial of a number
CO4	1. Write a python program to create a text file and to input a line of text to it. Display the line pf text with all punctuation mark removed. 2. Create a class rectangle with attributes length, breadth and method area () to calculate the area of the rectangle. Create two instances of the class and call the method for each instance. 3. Write a program to read numbers stored in one file and store the sorted numbers in another after deleting duplicates. 4. Write a program to implement file operations

Prepared
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24HUT006	PROFESSIONAL ETHICS AND SUSTAINABLE DEVELOPMENT	L	T	P	R	C	Year of Introduction
		1	0	2	0	2	2024

Preamble:
Engineering Ethics enables students to explore the ethical principles and responsibilities of engineers in their professional practice, using real-world case studies. Sustainable Development transform our world, recognize interdependence, enhance quality of life, enhance human responsibilities, eliminate pollution, conserve natural resources and uplift human-nature coexistence. Relevant case studies impart students, effective ways to practically apply their skills and their understanding of learned facts to a real-world situation. The presentation of case studies will provide an opportunity to read, understand and prepare technical report about sustainable, professional and socially responsible projects.

Prerequisite: NIL

Course Outcomes: After the completion of the course, the student will be able to

CO1	Understand key ethical principles and moral development theories that shape the ethical behavior of a professional.
CO2	Analyze the role and responsibility as engineers through real world case studies to solve moral and ethical problems.
CO3	Appreciate the relevance and necessity of sustainable development and recognize good practices and opportunities for an integrated approach to sustainable development
CO4	Understand case studies about sustainable and socially responsible projects which impart students an effective way to realize real-world situations

CO – PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1			1			3	2	3	2			3
CO2			1			3	2	3	2	3	2	3
CO3			1			3	3	2	2			3
CO4			1			3	3	2	2	3	2	3

Assessment Pattern

Bloom's Category	Continuous Assessment Tools			Case studies
	Test 1	Test 2	Assignment	
Remember	✓	✓		

Understand	✓	✓	✓	✓
Apply	✓	✓	✓	✓
Analyze				✓

Mark Distribution of CIA

Course Structure [L-T-P-R]	Attendance	Theory [L]			Practical [P]	Total Marks
		Assignment	Test-1	Test-2	Case Study	
1-0-2-0	5	5	20	20	50	100

SYLLABUS

MODULE 1

Introduction to Professional Ethics-Morals, Values and Ethics, Personal and Professional ethics
Key ethical Principles-Honesty, integrity, respect, responsibility
Moral Development Theories (Kohlberg's theory, Gilligan's theory)
Case studies on professional responsibility (Hyatt Regency Walkway Collapse, Ethical consideration in the design and deployment of autonomous vehicle)

MODULE 2

Engineering as Experimentation – Engineers as responsible Experimenters-Engineers as Managers, Consulting Engineers, Engineers as Expert witnesses and advisors Codes of Ethics- Plagiarism-Professional Rights-Employee right- IPR Discrimination. Ethical challenges posed by emerging technologies
Case Studies on emerging technologies (Artificial Intelligence)

MODULE 3

Introduction to Sustainable Development- Concept of Sustainability- pillars of sustainability- social- economic -environmental sustainability.
MDG - SDG- Nexus between Technology and sustainable development.
Case studies on SDGs. Case studies on Nexus between Technology and Sustainable development.

MODULE 4

Pathways for sustainable development - Social aspects - poverty- hunger - health - education- gender equality. Economic aspects- society- consumers - industries. Environmental aspects - renewable energy- zero waste - Carbon emission- conservation of ecosystem- global environmental issues
Case studies on Sustainable habitat, Sustainable Industry

Textbooks

1. Mike W Martin and Roland Schinzinger, Ethics in Engineering,4th edition, Tata McGraw Hill Publishing Company Pvt. Ltd, New Delhi,2014.
2. Our Common Journey: A Transition Toward Sustainability. National Academy Press.
3. Sustainable Development., Susan Baker, Taylor and Francis
4. Elliott, Jennifer. 2012. An Introduction to Sustainable Development. 4th Ed. Routledge, London
5. Rogers, Peter P., Kazi F. Jalal, and John A. Boyd. "An introduction to sustainable
6. development." (2012).

Reference books

1. Charles D Fleddermann, Engineering Ethics, Pearson Education/ Prentice Hall of India, New Jersey, 2004.
2. Charles E Harris, Michael S Protchard and Michael J Rabins, Engineering Ethics- Concepts and cases, Wadsworth Thompson Learning, United states,2005.
3. Guidelines for Professional Conduct for Civil Engineers ASCE, 2008
4. UN Millennium Project (2005) Investing in Development: A Practical Plan to Achieve the Millennium Development Goals, Overview.
5. World Bank (2006) Enhancing Agricultural Innovation: How to Go beyond the Strengthening of Research Systems, World Bank: Agriculture and Rural Development
6. World Commission on Environment and Development (1987) Our Common Future, Oxford, OUP.

NPTEL Course

1. Ethics in Engineering Practice https://nptel.ac.in/noc/individual_course.php?id=noc18-mg25
2. Non-Conventional Energy Sources https://nptel.ac.in/noc/individual_course.php?id=noc18-ge14
3. Education for Sustainable Development https://onlinecourses.nptel.ac.in/noc22_hs61/previe w

No.	COURSE CONTENTS AND LECTURE SCHEDULE	No. of Hours (36 hours)
	MODULE 1 (4 Hours)	
1.1	Introduction to Professional Ethics-Morals, Values and Ethics	1
1.2	Personal and Professional ethics	1

1.3	Key ethical principles-Honesty, integrity, respect, responsibility. Moral Development Theories (Kohlberg's theory, Gilligan's theory)	1
1.4	Case studies on professional responsibility (Hyatt Regency Walkway Collapse, Ethical consideration in the design and deployment of autonomous vehicle)	1
MODULE 2 (4 Hours)		
2.1	Engineering as Experimentation – Engineers as responsible Experimenters-Engineers as Managers	1
2.2	Consulting Engineers, Engineers as Expert witnesses and advisors	1
2.3	Codes of Ethics- Plagiarism-Professional Rights-Employee right- IPR Discrimination.	1
2.4	Ethical challenges posed by emerging technologies. Case Studies on emerging technologies (Artificial Intelligence	1
MODULE 3 (4 Hours)		
3.1	Introduction to Sustainable Development- Concept of Sustainability- pillars of sustainability- social- economic -environmental sustainability	1
3.2	MDG - SDG- Nexus between Technology and sustainable development	1
3.3	Case studies on SDGs	1
3.4	Case studies on Nexus between Technology and Sustainable development	1
MODULE 4 (4 Hours)		
4.1	Pathways for sustainable development, social aspects - poverty- hunger - health -education- gender equality	1
4.2	Economic aspects- society- consumers - industries	1
4.3	Environmental aspects - renewable energy- zero waste - Carbon emission- conservation of ecosystem- global environmental issues	1
4.4	Case studies on Sustainable habitat, Sustainable Industry	1
LESSON PLAN FOR CASE STUDIES		
No.	**Topic**	**No. of Hours (20)**
1	Do Case studies of emerging trends in technology, sustainable, socially and professionally responsible projects	5

2	Selection of a case study for presentation and prepare a technical report	15
No.	**Case Study Assessment**	**Marks**
1	Selection of case study - Relevance of topic to the Course	10
2	Preparation of case study	15
3	Submission of Technical Report on case study	25
CO Assessment Questions		
CO1	1. Define integrity and point out ethical values. 2. Discuss in detail about moral development theories 3. Investigate the responsibilities of a professional with case studies	
CO2	1. Illustrate the role of engineers as experimenters. 2. Exemplify the engineers as managers. 3. Investigate the ethics in emerging technologies with case studies	
CO3	1. Explain the necessity for Sustainable Development. 2. Enumerate SDG. Describe the challenges and barriers to sustainable development 3. Give any three examples for Nexus between Technology and Sustainable development.	
CO4	1. Describe Sustainable practices for achieving Economic sustainability 2. Enumerate global environmental issues 3. Investigate the Sustainable practices for sustainable habitat with case studies	

Prepared
by: Ms. Mini M, Asst. Prof., CE
Ms. Elsa Raju A, Asst. Prof., CSE Ms. Uma E S, Asst. Prof., CSE

24ESL007	COMPUTER AIDED DRAWING (CAD) & MANUFACTURING WORKSHOP	L	T	P	R	C	Year of Introduction
		0	0	2	0	1	2024

Preamble:

The course is designed to empower students to explore the full potential of computer-aided design, additive manufacturing, and other manufacturing techniques. Students will foster a team working environment to enhance the necessary skills for planning, preparing and executing an engineering project. In addition the students will be introduced to various tools, measuring devices, practices and different methods of manufacturing processes employed in industry for fabricating components.

Prerequisite: NIL

Course Outcomes: After the completion of the course the student will be able to

CO1	Identify mechanical operations in accordance with manufacturing of products. **[Understand]**
CO2	Application of advanced metrology instruments used in general workshop. Accomplish model making using modern manufacturing method**.[Apply]**
CO3	Execute 2D and 3D drawing using CAD software**.[Apply]**
CO4	Critically assess the advantages and limitations of 3D printing compared to traditional manufacturing methods. **[Understand]**

CO-PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2								2			
CO2					3				2			
CO3					2					3		
CO4					3							

Assessment Pattern

Bloom's Category	Continuous Assessment Tools	
	Classwork	Test1
Remember	√	√
Understand	√	√
Apply	√	√
Analyze	√	
Evaluate	√	
Create		

Mark Distribution of CIA

Course Structure [L-T-P-R]	Attendance	Classwork	Lab Exam	Total Marks
0-0-2-0	5	35	10	50

Total Mark distribution			
Total Marks	**CIA(Marks)**	**ESE(Marks)**	**ESE Duration**
50	50	0	-

SYLLABUS-DETAILS OF EXPERIMENTS

SECTION – 1 (Manufacturing Lab Experiments)
Minimum 5 experiments are mandatory

General study of manufacturing process – Foundry – Sheet metal – Fitting – Welding – Metrology – Modern manufacturing method – Power tools.

SECTION – 2 (CAD Lab Experiments)
Minimum 5 experiments are mandatory

Introduction to Computer Aided Drawing (CAD) – 2D Drafting – 3D Modeling

Textbooks

1. Mechanical Workshop Practice, K C John PHI Learning Edition 2, 2010
2. Engineering Materials, S C Rangwala Charotar Publishing House Pvt Limited Edition 43, 2019
3. Engineering Graphics Essentials with AutoCAD 202x Instruction Kirstie Plantenberg ,SDC Publication 2023

Reference Books

1. Elements of Workshop Technology Vol-1-Manufacturing Processes S K Hajra Choudhury A K Hajra Choudhury Nirjhar Roy MPP Media Promoters and Publishers2008
2. AutoCAD 3D Modeling: Exercise Workbook Steve Heather Industrial Press Inc.,U.S

LIST OF EXPERIMENTS

Manufacturing - 12Hrs

(Minimum 5 experiments are mandatory)

No.	Experiments
1	General-Introduction to workshop practice – safety precautions – Basic first aid knowledge – Study of workshop tools
2	Welding- Understanding arc welding process and components – Experiment on horizontal bead formation.
3	Metrology- Common measuring instruments used in workshop, experiments to measure using instruments like Vernier Caliper, micrometer, Vernier Height Gauge (Ordinary & Digital).
4	Modern manufacturing method-3D printing
5	Power Tools-Demonstration of the following power tools – Portable DC inverter welding set, portable power planer, Portable jig saw machine, Portable circular saw, Portable Drilling machine, Angle grinder.
6	Foundry- Understanding of foundry tools – Experiment on Bench moulding.
7	Fitting- Understanding the tools used for fitting and knowledge of at least one model

8	Sheet Metal: Understanding sheet metal working tools and knowledge of at least one model.
CAD LAB - 12Hrs ***(Minimum 5 experiments are mandatory)***	
1	Computer Aided Drawing (CAD): Introduction, Role of CAD in design and development of new products, Advantages of CAD. 2D Drawing Exercise I: Introduction to common drafting tools and annotations.
2	2D Drawing Exercise II: Introduction to common modification tools.
3	2D Drawing Exercise III: 2D drafting and property changing.
4	2D Drawing Exercise IV: 2D drafting using different drafting methods.
5	2D Drawing Exercise V: Drafting orthographic projection and isometric view.
6	3D Drawing: Introduction to different 3D modeling tools.
7	3D Drawing Exercise I: Introduction to solid editing.
8	3D Drawing Exercise II: Introduction to different modify tools.
CO Assessment Questions	
C01	1. Identify the tools given to you and demonstrate their proper use. 2. Choose a suitable manufacturing process to make the given model.
CO2	1. Identify the given measuring instrument and demonstrate its proper use. 2. Take the 3D printout of the given drawing.
CO3	1. Prepare 2D drawings using CAD software. 2. Prepare 3D drawings using CAD software.
CO4	1. Find the advantages of 3D printing compared to traditional manufacturing processes. 2. Find the limitations of 3D printing compared to traditional manufacturing processes.

Prepared by
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ASH Mr. Mathews V J, Asst. Prof, ASH
Mr Jojo P J, Lab
Instructor Mr Aashik P P,
Lab Instructor

SEMESTER-II
SYLLABUS

24MAT211	LINEAR ALGEBRA	L	T	P	R	C	Year of Introduction
		3	0	0	0	3	2024

Preamble:
This course enables the students to understand the basic concept of Linear algebra involving solution of linear system of equations and diagonalization occurring in Computer Science and Engineering. This course introduces the concept of vector space which is an abstract framework for studying linear operations using basis and linear transformations. Students utilize inner product space to perform least square approximations and orthogonal projections. Through this course, students practice modern engineering and IT tools to solve complex problems.

Prerequisite: Basic concepts in matrix theory.

Course Outcomes: After the completion of the course the student will be able to

CO 1	Apply Gauss elimination method to solve given systems of linear equations and determine whether a matrix is diagonalizable. **[Apply]**
CO 2	Develop analytical and critical thinking skills through solving problems using vector spaces. **[Apply]**
CO 3	Apply the concept of inner product spaces to do least square approximations and orthogonal projections. **[Apply]**
CO 4	Compute linear transformations and compositions using their matrix representations. **[Apply]**

CO - PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3	2	3	3							
CO 2	3	3	3	2	3							
CO 3	3	3	3	2								
CO 4	3	3	3	2	3							

Assessment Pattern

Bloom's Category	Continuous Assessment Tools			End Semester Examination
	Test1	Test 2	Other tools	
Remember	√	√	√	√
Understand	√	√	√	√
Apply	√	√	√	√
Analyse				
Evaluate				
Create				

Mark Distribution of CIA					
Course Structure [L-T-P-R]	**Attendance**	**Theory [L]**			**Total Marks**
		Assignment	**Test-1**	**Test-2**	
3-0-0-0	5	10	12.5	12.5	40

Total Mark distribution			
Total Marks	**CIA (Marks)**	**ESE (Marks)**	**ESE Duration**
100	40	60	2.5 hours

End Semester Examination [ESE]: Pattern			
PATTERN	**PART A**	**PART B**	**ESE Marks**
PATTERN 1	8 Questions (2 Questions from each module), each question carries 3 marks Marks: (3x8 =24 marks)	2 questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 2 sub-divisions. Each question carries 9 marks. Marks: (9x4 = 36 marks) Time: 3 hours	60

SYLLABUS

MODULE I: (Linear Algebra)

(Text 1: Relevant topics from sections 7.3,7.5,8.1,8.4)

Systems of linear equations, Solution by Gauss elimination. Row echelon form and rank of a matrix. Fundamental theorem for linear systems. Eigenvalues and eigenvectors. Diagonalization of matrices.

MODULE II: (Vector Spaces)

(Text 2: Relevant topics from sections 4.1,4.3,4.4,4.5,4.7)

Vector Spaces (R^n, m x n) , Subspaces. Linear independence, Linear span, Basis and dimension, coordinates, and change of basis.

MODULE III: (Inner product spaces)

(Text 2: Relevant topics from sections 6.1 , 6.2,6.3,6.4,6.5)

Length and dot product in R^n -Norm, length, distance, dot product, Angle, inner product spaces, Orthogonal projection, Orthogonal and Orthonormal sets, The least square problem, Orthogonal Subspaces.

MODULE IV: (Linear Transformation)

(Text 2: Relevant topics from sections 1.8,1.9)

Linear transformations, Kernel of Linear transformation, Range of Linear transformation, matrices for linear transformation, Composition of linear transformations.

Textbooks

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10thEdition, John Wiley & Sons, 2016
2. David C Lay, Linear Algebra and its Applications,3rd Edition, Pearson,2006

Reference books

1. Gilbert Strang, Linear Algebra and its Applications,4th Edition, Cengage 2006
2. Seymour Lipschutz, Marc Lipson, Schaum's outline of linear algebra, 3rd Edition, McGraw-Hill, New Delhi, 2017.
3. Peter V. O'Neil, Advanced Engineering Mathematics, Cengage, 7th Edition, 2012
4. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi,3rd Edition, 2008
5. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2015.
6. Jimmie Gilbert and Linda Gilbert, Linear Algebra and Matrix Theory, University of South Carolina at Spartanburg,1995

NPTEL/SWAYAM Courses for reference:

1. Prof. Arbind Kumar Lal. Linear Algebra, IIT Kanpur, [NPTEL], https://archive.nptel.ac.in/courses/111/104/111104137/ (Relevant sections)
2. Prof.Pranav Haridas,Linear Algebra, IIT Madras, [NPTEL], https://archive.nptel.ac.in/courses/111/106/111106135/
3. Prof. Gilbert Strang, Linear Algebra [MITOPENCOURSEWARE] https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/ (Relevant sections)

No.	COURSE CONTENTS AND LECTURE SCHEDULE	No. of Hours [36 hours]
	MODULE I [9 hours]	
1.1	Systems of linear equations	1
1.2	Solution by Gauss elimination	2
1.3	Row echelon form and rank of a matrix	2
1.4	Fundamental theorem for linear systems, eigenvalues and eigenvectors	2
1.5	Diagonalization of matrices	2
	MODULE II [9 hours]	
2.1	Vector Spaces(R^n, m x n)	2
2.2	Subspaces	1
2.3	Linear independence	1
2.4	Linear span	1

2.5	Basis and dimension	2
2.6	Co-ordinates and change of basis	2
MODULE III [10 hours]		
3.1	Length and dot product in R^n	1
3.2	Norm, length, distance	1
3.3	Dot product, Angle	1
3.4	Inner product spaces	2
3.5	Orthogonal projection	1
3.6	Orthogonal and Orthonormal sets	1
3.7	The least square problem	1
3.8	Orthogonal Subspaces	2
MODULE IV [8 hours]		
4.1	Linear transformations	2
4.2	Kernel of Linear transformation	1
4.3	Range of Linear transformation	1
4.4	Matrices for linear transformation	2
4.5	Composition of linear transformations	2
CO Assessment Questions		
CO1	1. Find the rank of the matrix $\begin{bmatrix} 0 & 1 & 0 \\ -1 & 0 & -4 \\ 0 & 4 & 0 \end{bmatrix}$ 2. Find the eigenvalues of the matrix $\begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix}$ 3. Use a CAS(MATLAB/SCILAB) to find the matrix of transformation that diagonalizes the matrix . Also, write the diagonal matrix. **Team Work**: Solve the following linear system of equations using the Gauss elimination method x+2y-z=3, 3x-y+2z=1, 2x-2y+3z=2 (using any programming language).	
CO2	1. Prove that the vectors (2,3,0). (1,2,0) and (8,13,0) are linearly dependent in R^3 2. Find the basis of the matrix $\begin{bmatrix} 1 & 1 & -2 \\ -1 & 2 & 1 \\ 0 & 1 & -1 \end{bmatrix}$ 3. Use a CAS(MATLAB/SCILAB) to prove that the set of vectors $V = \{(v_1, v_2, v_3) \in R^3 : -v_1 + v_2 + 4v_3 = 0\}$ is a vector space over the field R. Also find the dimension and the basis. **Team Work**: Consider the following two bases of R^3, S= {(1 ,1, 1),(0,2,3),(0,2,-1)}and T={(1,1,0),(1,-1,0)(0,0,1) }.Find the coordinate vector of x=(3,5,-2) relative to S and T. Illustrate your discussion with an example using any software. The team has to make a presentation elaborating the procedure.	

CO3	1. Show that (1,1,1), (1,0,-1),(1,-2,1) are mutually orthogonal. 2. For what values of k is the following an inner product in R^3 $\langle x,y\rangle = x_1y_1 - 3x_1y_2 - 3x_2y_1 + kx_2y_2$ 3. Find an orthonormal basis for the subspace spanned by the vectors (1,2,1), (1,0,1),(3,1,0) of R^3 4. Verify that the following is an inner product in R^2 : $\langle x,y\rangle = x_1y_1 - 2x_1y_2 - 2x_2y_1 + 5x_2y_2$
	1. Check which of the following is a linear transformation? (i) $T(x,y)=(x^2,y^2)$ (ii) $T(x,y) = (2x-y,x+3y)$ 2. Let $T : R^3 \rightarrow R^2$ be defined by $T((x,y,z))=(x, x)$.Find Ker T and
CO4	Range(T) 3. Let $T : R^3 \rightarrow R^2$ be a linear transformation and T(e1)=(2,-1), T(e2)=(1,3),T(e3)=(-1,2). Use a CAS(MATLAB/SCILAB) to find L(-1,4,2),where {e1,e2,e3} is the standard basis for R^3 4. The transformation T: $P_3[x] \rightarrow P_3[x]$ is defined by $T(p(x))=\frac{d^2(p(x)}{dx^2}$,Find the matrix of T with respect to the basis $\{1, x, x^2, x^3\}$.

Prepared by
Mrs Lickny I
Asst Prof.,
ASH

24CYC012	ENGINEERING CHEMISTRY	L	T	P	R	C	Year of Introduction
		3	0	2	0	4	2024

Preamble:
Provide students with comprehensive exploration of electrochemistry, corrosion mechanisms, materials for electronic applications, molecular spectroscopy, analytical techniques, and environmental chemistry. Students will gain insights into the fundamental concepts, advanced methodologies, and practical applications essential for addressing contemporary challenges in materials science and environmental sustainability. This course equips learners with the knowledge and skills necessary to analyze, innovate, and implement solutions in diverse engineering fields, ensuring a robust foundation for tackling complex real-world problems.

Prerequisite: Basic knowledge in Chemistry and Physics

Course Outcomes: After the completion of the course the student will be able to

CO1	Employ the fundamental principles of electrochemistry and corrosion, to explore their potential applications across different engineering sectors. **[Apply]**
CO2	Apply knowledge of different engineering materials to select and integrate appropriate materials in various electronic sectors through practical experimentation in the laboratory. **[Apply]**
CO3	Interpret various analytical techniques effectively across different engineering domains. **[Apply]**
CO4	Understand and apply the principles of environmental chemistry and waste management. **[Apply]**

CO - PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3	2	2					2			
CO 2	3	3		2					2			
CO 3	3	3		2					2			
CO 4	3	3	3	2		2	3		2			

Assessment Pattern For Theory Component

Bloom's Category	Continuous Assessment Tools			End Semester Examination
	Test1	Test 2	Other tools	
Remember	√	√	√	√
Understand	√	√	√	√
Apply	√	√	√	√
Analyse				

Evaluate				
Create				

Assessment Pattern for the Lab component

Bloom's Category	**Continuous Assessment Tools**	
	Class work	**Test1**
Remember	√	√
Understand	√	√
Apply	√	√
Analyse		
Evaluate		
Create		

Mark Distribution of CIA

Course Structure [L-T-P-R]	**Attendance**	**Assignment**	**Theory [L- T]**		**Practical [P]**		**Total Marks**
			Test-1	**Test-2**	**Continuous Assessment**	**Lab Exam**	
3-0-2-0	5	5	7.5	7.5	15	10	50

Total Marks distribution

Total Marks	**CIA (Marks)**	**ESE (Marks)**	**ESE Duration**
100	50	50	2 hours

End Semester Examination [ESE]: Pattern

PATTERN	**PART A**	**PART B**	**ESE Marks**
PATTERN 2	2 Questions from each module. Total of 8 Questions, Answer any 6 questions. Each carrying 3 marks (6x3 =18 marks)	2 questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 2 subdivisions. Each question carries 8 marks. Marks: (4x 8 = 32 marks)	50

SYLLABUS

MODULE I: Electrochemistry and Corrosion Science (9 Hours)

Electrochemical Cell- Electrode potential- Nernst equation for single electrode and cell (numerical problems), reference electrodes – SHE & Calomel electrode – construction and working, Electrochemical series – applications, glass electrode & pH measurement, conductivity- measurement. Li-ion battery: construction and working.
Corrosion –Electrochemical corrosion mechanism (acidic & alkaline medium), Galvanic series, Corrosion control methods - cathodic protection, sacrificial anodic protection and impressed current cathodic protection, electroplating of copper, electroless plating of copper.

MODULE II: Materials for Electronic Applications (9 Hours)

Nanomaterials - Classification based on dimension & materials, synthesis – sol gel & chemical reduction, Applications of nanomaterials – carbon nanotubes, fullerenes, graphene & carbon quantum dots – structure, properties & application.
Polymers - Fire retardant polymers- halogenated & non-halogenated polymers (examples only), Conducting polymers-classification, polyaniline & polypyrrole-synthesis, properties and applications.
Organic electronic materials and devices- construction, working and applications of Organic Light Emitting Diode (OLED) & dye-Sensitized Solar Cells (DSSC).

MODULE III: Molecular Spectroscopy and Analytical Techniques (9 Hours)

Spectroscopy-Types of spectra- molecular energy levels, Beer lambert's law– numerical problems, Electronic spectroscopy – principle, types of electronic transitions, role of conjugation in absorption maxima, instrumentation, applications, Vibrational spectroscopy – principle, number of vibrational modes, vibrational modes of CO_2 and H_2O – applications.
Thermal analysis: Dielectric Thermal Analysis (DETA) of polymers-working and application.
Electron Microscopic Techniques: SEM - principle, instrumentation and applications.

MODULE IV: Environmental Chemistry (9 Hours)

Water characteristics - Hardness - types of hardness, temporary and permanent, disadvantages of hard water, degree of hardness (numericals). Water softening methods-ion exchange process-principle, procedure and advantages. Water disinfection methods – chlorination, break point chlorination, ozone and UV irradiation. Dissolved oxygen (DO), BOD and COD- definition & significance.
Waste Management: Sewage water treatment- primary, secondary and tertiary, flow diagram, trickling filter and UASB process. E Waste, methods of disposal – recycle, recovery and reuse.
Chemistry of climate change- Greenhouse gases, Ozone depletion.

Text books

1. Dr. Muhammad Arif M, Smt. Kavitha P Nair, Dr. Annette Fernandez"Engineering Chemistry", Owl Books,2021
2. Engineering Chemistry- B. L. Tembe, Kamaluddin, M. S. Krishnan-2018
3. Instrumental Methods of Analysis- H. H. Willard, L. L. Merritt, CBS Publishers,7th Edition,2005

Reference books

1. Fundamentals of Molecular Spectroscopy C. N. Banwell McGraw-Hill, 4th edn., 2017
2. Principles of Physical Chemistry B. R. Puri, L. R. Sharma, M. S. Pathania Vishal Publishing Co 47th Edition, 2017
3. Engineering Chemistry- Jain & Jain, Dhanpath Rai Publishing Company,17th Edition, 2015
4. Introduction to Spectroscopy Donald L. Pavia Cengage Learning India Pvt. Ltd 2015
5. Polymer Chemistry: An Introduction Raymond B. Seymour, Charles E. Carraher Marcel Dekker Inc 4th Revised Edition, 1996
6. The Chemistry of Nanomaterials: Synthesis, Properties and Applications Prof. Dr. C. N. R. Rao, Prof. Dr. h.c. mult. Achim Müller, Prof. Dr. A. K. Cheetham Wiley-VCH Verlag GmbH & Co. KGaA 2014
7. Organic Electronics Materials and Devices Shuichiro Ogawa Springer Tokyo 2024
8. Instrumental Methods of Analysis- H. H. Willard, L. L. Merritt, CBS Publishers,7th Edition,2005

NPTEL/SWAYAM Courses for reference:

Module - I

1. https://archive.nptel.ac.in/courses/104/106/104106137/ Elementary Electrochemistry
2. https://archive.nptel.ac.in/courses/113/105/113105102/ Electrochemical Energy storage
3. https://archive.nptel.ac.in/courses/113/104/113104082/

Corrosion Module - II

1. https://archive.nptel.ac.in/courses/113/104/113104102/ Nanomaterials and their properties
2. https://archive.nptel.ac.in/courses/104/105/104105124/ Introduction to Polymer Science

Module III

1. https://nptel.ac.in/courses/104106122/ Fundamentals of spectroscopy Module IV

1. https://archive.nptel.ac.in/courses/122/106/122106030/Environmental chemistry and analysis

No.	COURSE CONTENTS AND LECTURE SCHEDULE	No. of Hours [36]
	MODULE 1: Electrochemistry and Corrosion Science (9 Hours)	
1.1	Electrochemical Cell- Electrode potential- Nernst equation for single electrode and cell (numerical problems), reference electrodes – SHE & Calomel electrode –construction and working.	3
1.2	Electrochemical series – applications, glass electrode & pH measurement, conductivity- measurement.	2
1.3	Li-ion battery: construction and working,	1
1.4	Corrosion –Electrochemical corrosion mechanism (acidic & alkaline medium), Galvanic series,	1

1.5	Corrosion control methods - cathodic protection, sacrificial anodic protection and impressed current cathodic protection, electroplating of copper, electroless plating of copper.	2
MODULE II: Materials for Electronic Applications (9 Hours)		
2.1	Nanomaterials - Classification based on dimension & materials, synthesis – sol gel & chemical reduction, Applications of nanomaterials – carbon nanotubes, fullerenes, graphene & carbon quantum dots – structure, properties & application.	3
2.2	Polymers - Fire retardant polymers- halogenated & non-halogenated polymers (examples only),	2
2.3	Conducting polymers-classification, polyaniline & polypyrrole-synthesis, properties and applications.	2
2.4	Organic electronic materials and devices- construction, working and applications of Organic Light Emitting Diode (OLED) & Dye-Sensitized Solar Cells (DSSC	2
MODULE III: Molecular Spectroscopy and Analytical Techniques (9 Hours)		
3.1	Spectroscopy-Types of spectra- molecular energy levels, Beer lambert's law – numerical problems.	1
3.2	Electronic spectroscopy – principle, types of electronic transitions, role of conjugation in absorption maxima, instrumentation, applications.	2
3.3	Vibrational spectroscopy – principle, number of vibrational modes, vibrational modes of CO_2 and H_2O – Applications.	2
3.4	Thermal analysis: Dielectric Thermal Analysis (DETA) of polymers-working and application.	2
3.5	Electron Microscopic Techniques: SEM - principle, instrumentation and applications.	2
MODULE IV: Environmental Chemistry (9 Hours)		
4.1	Water characteristics - Hardness - types of hardness, temporary and permanent, disadvantages of hard water, degree of hardness (numericals).	2
4.2	Water softening methods-ion exchange process-principle, procedure and advantages.	2
4.3	Water disinfection methods – chlorination, break point chlorination, ozone and UV irradiation. Dissolved oxygen (DO), BOD and COD- definition & significance.	2
4.4	Waste Management: Sewage water treatment- primary, secondary and tertiary, flow diagram, trickling filter and UASB process. E Waste, methods of disposal – recycle, recovery and reuse.	2
4.5	Chemistry of climate change- Greenhouse gases, Ozone depletion	1

LESSON PLAN FOR LAB COMPONENT

No.	Topic	No. of Hours	Experiment (24 hrs)
1	Electrochemistry and Corrosion Science	4	1)Calibration of pH meter and determination of pH of a solution.
			2)Determination of cell constant and conductance of solutions
2	Materials for Electronic Applications	6	1) Synthesis of polymers a) Urea-formaldehyde resin b) Phenol-formaldehyde resin
			2)Estimation of copper in brass
3	Molecular Spectroscopy and Analytical Techniques	6	1)Determination of wavelength of absorption maximum and colorimetric estimation of Fe^{3+} in solution
			2)Determination of molar absorptivity of a compound ($KMnO_4$ or any water-soluble food colorant)
4	Environmental Chemistry	8	1)Estimation of dissolved oxygen by Winkler's method
			2)Estimation of total hardness of water-EDTA method
			3)Estimation of chloride content in water
(Any 2 experiments from each topic are to be completed)			

CO Assessment Questions

CO1	1. A zinc electrode is placed in a 1 M $ZnSO_4$ solution at 25°C. Calculate the electrode potential given that $[Zn^{2+}]$ = 1 M and $E°(Zn^{2+}\|Zn)$ = -0.76 V. Discuss how this potential change with temperature and concentration variations. 2. Utilizing the electrochemical series, predict the feasibility of a reaction between iron metal and a copper(II) sulfate solution. Provide the relevant half-reactions and explain your reasoning. 3. Give the construction of Li-ion cell. Give the reactions that take place at the electrodes during charging and discharging. What happens to anodic material when the cell is 100% charged. 4. Calibrate the pH meter and determine pH of a given solution.

CO2	1. Explain three important applications of nanomaterials. 2. Discuss the structural differences between Graphene and Carbon Quantum Dots (CQDs). Explain how their unique properties such as conductivity and optical behavior influence their applications in electronics and biomedical fields. 3. Evaluate the conductivity and stability differences between Polyaniline and Polypyrrole. Discuss their synthesis methods and applications in electronic devices such as sensors and actuators. 4. Explain the construction and working principle of an Organic Light Emitting Diode (OLED). Compare OLEDs with traditional LED technologies in terms of energy efficiency.
	5. Synthesize Urea-formaldehyde resin and find its yield.
CO3	1. A dye solution of concentration 0.08M shows absorbance of 0.012 at 600 nm; while a test solution of same dye shows absorbance of 0.084 under same conditions. Calculate the concentration of the test solution. 2. Explain the working principle of Dielectric Thermal Analysis (DETA) in analyzing polymers. Describe how DETA measures changes in dielectric properties with temperature and frequency. Provide a schematic diagram illustrating the key components and their functions in a DETA setup. 3. Determine the wavelength of absorption maximum and colorimetric estimation of Fe^{3+} in solution.
CO4	1. Determine the temporary, permanent and total hardness of water solution using EDTA method. 2. Explain the ion exchange resins and the process for removal of hardness of water? How exhausted resins are regenerated? 3. Sketch the flow diagram of the different steps in sewage treatment. Explain the Each step. 4. Calculate the temporary and permanent hardness of a water sample which contains $[Ca^{2+}]$ = 160 mg/L, $[Mg^{2+}]$ = 192 mg/L and $[HCO_3^-]$ = 122 mg/L. 5. Estimate the amount of dissolved oxygen present in the given water sample.

Prepared by
Dr Sukhila
Krishnan Asst.Prof.
ASH

24EST023	FUNDAMENTALS OF ELECTRICAL & ELECTRONICS ENGINEERING	L	T	P	R	C	Year of Introduction
		4	0	0	0	4	2024

Preamble:
This course enables the students to understand the basic concepts of Electrical and Electronics Engineering. This course covers the topics related to analysis of various electrical circuits, elementary concepts of magnetic circuits, concepts behind the generation of alternating current, fundamental electronic devices and an overview of the evolution of modern electronics and its applications.

Prerequisite: Physics and Mathematics (Higher secondary level)

Course Outcomes: After the completion of the course the student will be able to

CO 1	Apply the concepts and laws to solve DC and AC electric circuits theoretically and using simulation tools **[Apply]**
CO 2	Apply the fundamental concepts and theorems to solve magnetic circuits **[Apply]**
CO 3	Analyze the principles of diodes, transistors, and FETs to make basic electronic circuits **[Analyze]**
CO 4	Understand communication systems, mobile technologies, and modern electronic applications **[Understand]**

CO - PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3			3							2
CO 2	3	3										2
CO 3	3	3										2
CO 4	2											2

Assessment Pattern

Bloom's Category	Continuous Assessment Tools			End Semester Examination
	Test1	Test 2	Other tools	
Remember	✔	✔		✔
Understand	✔	✔		✔
Apply	✔	✔	✔	✔
Analyse	✔	✔	✔	✔
Evaluate			✔	
Create				

Mark Distribution of CIA

		Theory [L- T]	

Course Structure [L-T-P-R]	Attendance	Assignment	Test-1	Test-2	Total Marks
4-0-0-0	5	10	12.5	12.5	40

Total Mark distribution			
Total Marks	**CIA (Marks)**	**ESE (Marks)**	**ESE Duration**
100	40	60	2.5 hours

End Semester Examination [ESE]: Pattern

PATTERN	PART A	PART B	ESE Marks
PATTERN 1	2 questions from each module.8 Questions. Answer any 6 questions Each question carries 3 marks Marks: (3x8 =24 marks)	2 questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 2 sub divisions. Each question carries 9 marks. Marks: (9x4 = 36 marks)	60

SYLLABUS

MODULE I: Analysis of DC circuits and Fundamentals of Magnetism (12 hours)

Elementary concepts of DC electric circuits: Ideal and non-ideal voltage and current sources; Ohm's law and Kirchhoff's laws; Resistances in series and parallel; Current and voltage division rules; Capacitors & Inductors: V-I relations and energy stored. Star-delta conversion (resistive networks only-derivation not required)-numerical problems

Analysis of DC Electric circuits: Mesh current method - matrix representation - Solution of network equations. Node voltage methods-matrix representation-solution of network equations - numerical problems and verification through simulation software.

Elementary Concepts of Magnetic circuits: Magnetic Circuits: Basic Terminology: MMF, field strength, flux density, reluctance - Comparison between electric and magnetic circuits.

Electromagnetic Induction: Faraday's laws, Lenz's law- statically induced and dynamically induced emf – Self-inductance and mutual inductance, coefficient of coupling - numerical problems.

MODULE II: Analysis of AC circuits (9 hours)

Alternating Current fundamentals: Generation of alternating voltages - Representation of sinusoidal, square and sawtooth waveforms: frequency, period, average value, RMS value, peak factor and form factor - numerical problems

Analysis of simple AC circuits: Purely resistive, inductive & capacitive circuits; Inductive and capacitive reactance, concept of impedance; RL, RC and RLC series circuits- power factor, active, reactive and apparent power - numerical problems and verification through simulation software.

Three phase AC systems: Generation of three phase voltages, advantages of three phase systems, star and delta connections (balanced only), relation between line and phase voltages, line and phase currents, 3-phase power (numerical problems excluded)

MODULE III: Introduction to Electronic devices (11 hours)

Passive and active components in electronics

Working of PN junction diode, V-I characteristics of PN Junction diode, Zener diode and avalanche breakdown. Basics of Zener voltage regulator, Block diagram of DC power supply, circuit and working of half wave and bridge rectifiers (with and without capacitor filters), Construction and working of BJT, Transistor as a switch,

Transistor as an amplifier (Circuit Diagram and working) Introduction to FET, Construction and working of N-channel and P-Channel MOSFETs Simscape Onramp,

Input output characteristics of CE configuration, Comparison of CE, CB and CC configurations, Simscape Onramp, Circuit Simulation Onramp

MODULE IV: Modern Electronics and its applications (10 hours)

Communication Systems: General block diagram of a Communication system, Block diagram of Fiber optic Communication system, Concept of AM and FM (No derivation required), Block diagram of FM superheterodyne receiver, Basic concepts of Wired and Wireless communication

Mobile Communication: Block diagram of GSM, Comparison of 3G, 4G and 5G communication technologies

Block diagrams of Electronic instrumentation system: Digital Multimeter, Function generator, CRO

Applications of modern electronics – IoT based smart homes, healthcare and agriculture (Case study only)

Text books

1. D P Kothari and I J Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D C Kulshreshtha, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
3. ChinmoySaha, Arindham Halder and Debarati Ganguly, Basic Electronics - Principles and Applications, Cambridge University Press, 2018.
4. M.S.Sukhija and T.K.Nagsarkar, Basic Electrical and Electronics Engineering, Oxford University Press, 2012.
5. Wayne Tomasi and Neil Storey, A Textbook On Basic Communication and Information Engineering, Pearson, 2010.

Reference books

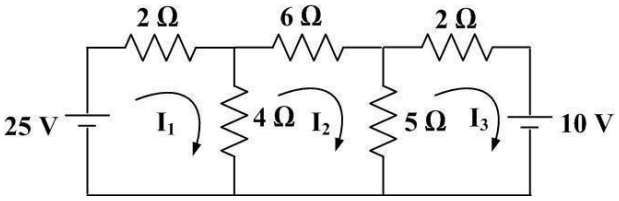
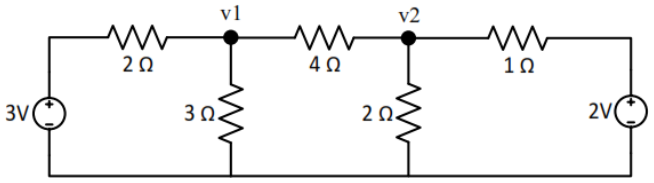
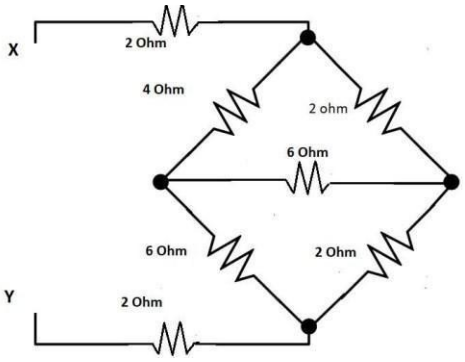
1. Del Toro V, "Electrical Engineering Fundamentals", Pearson Education.
2. T. K. Nagsarkar, M. S. Sukhija, "Basic Electrical Engineering", Oxford Higher Education.
3. Hayt W H, Kemmerly J E, and Durbin S M, "Engineering Circuit Analysis", Tata McGraw-Hill
4. Hughes, "Electrical and Electronic Technology", Pearson Education.
5. V. N. Mittle and Arvind Mittal, "Basic Electrical Engineering," Second Edition, McGraw Hill.
6. Parker and Smith, "Problems in Electrical Engineering", CBS Publishers and Distributors.
7. S. B. Lal Seksena and Kaustuv Dasgupta, "Fundamentals of Electrical Engineering", Cambridge University Press.
8. Anant Agarwal, Jeffrey Lang, Foundations of Analog and Digital Electronic Circuits, Morgan Kaufmann Publishers, 2005.
9. Bernard Grob, Ba sic Electronics, McGraw Hill.
10. A. Bruce Carlson, Paul B. Crilly, Communication Systems: An Introduction to Signals and Noise in Electrical Communication, Tata McGraw Hill, 5th Edition.

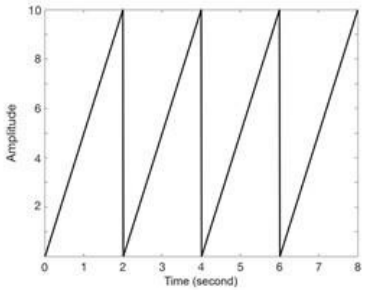
NPTEL/SWAYAM Courses for reference:

1. Prof. Ashok Kumar Pradhan, A Basic Course on Electric and Magnetic Circuits, IIT Kharagpur, [NPTEL], https://nptel.ac.in/courses/108105479 (Relevant sections)
2. Dr. Nagendra Krishnapura, Basic Electrical Circuits, IIT Madras, [NPTEL], https://nptel.ac.in/courses/108106172 (Relevant sections)
3. Mr. Abhijeet Lal & Dr. Onika Parmar, Fundamental of Electronic Engineering Chhattisgarh Swami Vivekanand Technical University (CSVTU) https://onlinecourses.swayam2.ac.in/nou24_ec08/preview
4. Prof. Sudeb Dasgupta, microelectronics: Devices to Circuits, IIT Roorkee, https://onlinecourses.nptel.ac.in/noc24_ee139/preview

No.	COURSE CONTENTS AND LECTURE SCHEDULE	No. of Hours [45 hours]
	MODULE 1 [13 hours]	
1.1	Ideal and non-ideal voltage and current sources; Ohm's law and Kirchhoff's laws	1
1.2	Resistances in series and parallel; Current and voltage division rules	1
1.3	Capacitors & Inductors: V-I relations and energy stored	1
1.4	Star-delta conversion (resistive networks only-derivation not required)-numerical problems	2
1.5	Mesh current method - matrix representation - Solution of network equations – numerical problems and verification through simulation software.	2
1.6	Node voltage methods-matrix representation-solution of network equations - numerical problems and verification through simulation software.	2
1.7	Magnetic Circuits - Basic Terminology: MMF, field strength, flux density, reluctance - Comparison between electric and magnetic circuits	2
1.8	Faraday's laws, Lenz's law- statically induced and dynamically induced emf – Self-inductance and mutual inductance, coefficient of coupling - numerical problems.	2
	MODULE II [9 hours]	
2.1	Generation of alternating voltages - Representation of sinusoidal waveforms: frequency, period, average value, RMS value and form factor - numerical problems	2
2.2	Analysis of simple AC circuits: Purely resistive, inductive & capacitive circuits; Inductive and capacitive reactance, concept of impedance	2
2.3	RL, RC and RLC series circuits- power factor, active, reactive and apparent power - numerical problems and verification through simulation software.	3

2.4	Generation of three phase voltages, advantages of three phase systems, star and delta connections (balanced only), relation between line and phase voltages, line and phase currents	2
MODULE III [13 hours]		
3.1	Working of PN junction diode, V-I characteristics of PN Junction diode	1
3.2	Basics of Zener diode, Zener and avalanche breakdown. Basics of Zener voltage regulator	2
3.3	Block diagram of DC power supply	1
3.4	Circuit and working of half wave and bridge rectifiers (with and without capacitor filters)	2
3.5	Construction and working of BJT, Input output characteristics of CE configuration	2
3.6	Comparison of CE, CB and CC configurations	1
3.7	Transistor as a switch, Transistor as an amplifier (Circuit Diagram and working)	1
3.8	Introduction to FET, Construction and working of N-channel and P-Channel MOSFETs	2
3.9	Simscape Onramp, Circuit Simulation Onramp	1
MODULE IV [10 hours]		
4.1	General block diagram of a Communication system, Block diagram of Fiber optic Communication system	1
4.2	Concept of AM and FM (No derivation required), Block diagram FM super heterodyne receiver	2
4.3	Basic concepts of Wired and Wireless communication	1
4.4	Block diagram of GSM, Comparison of 3G, 4G, 5G and 6G communication technologies	2
4.5	Block diagrams of Electronic instrumentation system: Digital Multi-meter	1
4.6	Function generator, CRO	1
4.7	IoT based smart homes	1
4.8	IoT based healthcare and agriculture	1
CO Assessment Questions		

CO1	1. Solve for the mesh currents in the given circuit.?  **2.** Find the node voltages v1 and v2 in the circuit given in Fig theoretically. Also find the power dissipated in the 4Ω resistor. Verify the same using any simulation tool.  3. Determine the equivalent resistance between terminal X-Y in the network  4. When applied across an L-R series circuit, A sinusoidal voltage of V= 325 sin314t causes a current of I = 14.14 sin (314t – 60°) flowing through the

	circuit. Calculate (i) the Impedance of the circuit, (ii) the value of L and R, (iii) the power consumed 5. A resistor of 10 Ω, an inductor of 0.3 H and a capacitor of 100 μF are connected in series across a 230 V, 50 Hz, single-phase AC supply. Determine (a) impedance, (b) current, (c) power in watts, (d) circuit power factor, (e) voltage across the inductor, and (f) apparent power. Verify the same through any simulation software. 6. Explain Kirchhoff's laws with suitable examples. 7. Derive the expression for energy stored in an inductor and a capacitor 8. An alternating current is represented by i(t)=14.14 sin (377t). Find (i)rms value, (ii) frequency, (iii)time period, and (iv)instantaneous value of the current at t=3ms.
CO2	1. Distinguish between statically induced EMF and dynamically induced EMF. 2. State and explain Faraday's laws of electromagnetic induction. 3. A coil of 200 turns carries a current of 4A. The magnetic flux linkage with the coil is 0.02Wb. Calculate the self-induced emf in the coil. 4. Explain the generation process of 3-phase alternating current 5. Two coils, A and B, of 500 and 750 turns, respectively, are connected in series on the same magnetic circuit of reluctance 1.55×10^6 AT/Wb. Assuming no flux leakage exists, calculate (i) the self-inductance of each coil and (ii) the mutual inductance between coils. 6. Find the average and rms values of the given triangular signal.  7. A conductor of length 0.5m kept at right angles to a uniform magnetic field of flux density $2Wb/m^2$ moves with a velocity of 75 m/s at an angle of 60^0 to the field. Calculate the emf induced in the conductor.
CO3	1. Analyze the frequency response of an RC-coupled amplifier. Identify the factors determining the lower and upper cutoff frequencies and explain their significance in the amplifier's bandwidth. 2. Analyze the output characteristics of a BJT and find out the significance of the BJT's operating regions and their impact on the transistor's functionality in different circuit applications. 3. Illustrate with the neat diagram the working of a zener voltage regulator. 4. Analyze potential barrier formation and current in a forward biased pn junction diode.
CO4	1. Compare and contrast between AM and FM.

	2. Draw and explain the block diagram of FM superheterodyne receiver. 3. Explain with a neat diagram the working of the function generator. 4. Compare the different types of communication technologies.

Prepared by,
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Mr. Sebin Davis K, Assistant Professor, Department of EEE
Dr. Vishnu Rajan, Associate Professor, Department of ECE
Ms. Chinchu Jose, Assistant Professor, Department of ECE
Dr. Annet Antony, Assistant Professor, Department of ECE

24ESC204	PROGRAMING IN C	L	T	P	R	C	Year of Introduction
		2	1	2	0	4	2024

Preamble: The syllabus is prepared with the view of preparing the Engineering Graduates capable of writing readable C programs to solve computational problems that they may have to solve in their professional life. The course content is decided to cover the essential programming fundamentals which can be taught within the given slots in the curriculum.

Prerequisite: NIL

Course Outcomes: After the completion of the course the student will be able to

CO 1	Analyze a computational problem and develop an algorithm/flowchart to find its solution. **[Analyze]**
CO 2	Develop readable C programs with branching and looping statements, which uses Arithmetic, Logical, Relational or Bitwise operators. **[Understand]**
CO 3	Write readable C programs with arrays, string, structure or union for storing the data to be processed and develop a readable multi-function C program by using recursion if required, to find the solution to the computational problem **[Apply]**
CO 4	Write readable C programs which use pointers for array processing and parameter passing and operation in files. **[Apply]**

CO - PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3	3	2								2
CO 2	3	3	3	3								2
CO 3	3	3	3	3							2	2
CO 4	3	3	3	3							3	3

Assessment Pattern for Theory Component

Bloom's Category	Continuous Assessment Tools			End Semester Examination
	Test 1	Test 2	Other tools	
Remember	√	√		√
Understand	√	√		√
Apply	√	√		√
Analyze	√	√		√
Evaluate				
Create				

Assessment Pattern for Lab Component

Bloom's Category	Continuous Assessment Tools		
	Evaluation 1	Evaluation 2	Report
Remember	√	√	√
Understand	√	√	√

Apply	√	√	√
Analyze			
Evaluate			
Create			

Mark Distribution of CIA

Course Structure [L-T-P-R]	Attendance	Theory [L- T]			Practical [P]		Total Marks
		Assignment	Test-1	Test-2	Continuous Assessment	Lab Exam	
2-1-2-0	5	5	7.5	7.5	15	10	50

Total Marks distribution

Total Marks	CIA (Marks)	ESE (Marks)	ESE Duration
100	50	50	2 hours

End Semester Examination [ESE]

PATTERN	PART A	PART B	ESE Marks
PATTERN 2	2 Questions from each module. Any full 6 Questions, each carrying 3 marks (6x3 =18 marks)	2 questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 3 subdivisions. Each question carries 8 marks. (4x8 = 32 marks)	50

SYLLABUS

MODULE I: Basics of Computer Hardware and Software

Processor, Memory, Input& Output devices
Application Software & System software: Compilers, interpreters, High level and low-level languages Introduction to structured approach to programming, Flow chart Algorithms, Pseudo code (*bubble sort, linear search - algorithms and pseudocode*

MODULE II: Program Basics

Basic structure of C program: Character set, Tokens, Identifiers in C, Variables and Data Types, Constants, Console IO Operations, printf and scanf
Operators and Expressions: Expressions and Arithmetic Operators, Relational and Logical Operators, Conditional operator, size of operator, Assignment operators and Bitwise Operators. Operators Precedence
Control Flow Statements: If Statement, Switch Statement, Unconditional Branching using goto statement, While Loop, Do While Loop, For Loop, Break and Continue statements. (Simple programs covering control flow)

MODULE III: Arrays, Strings and Functions

Arrays: Arrays Declaration and Initialization ,1-Dimensional Array, 2-Dimensional Array
String processing: In built String handling functions (strlen, strcpy, strcat and strcmp, puts, gets) **Introduction to modular programming**: writing functions, formal parameters, actual parameters Pass by Value, Recursion, Arrays as Function Parameters structure, union, Storage Classes, Scope and lifetime of variables, *simple programs using functions*

MODULE IV: Pointers and Files

Pointers: Declaring pointers, accessing data though pointers, NULL pointer, array access using pointers, pass by reference effect
File Operations: open, close, read, write, append, Sequential access and random access to files: In built file handling functions (*rewind() ,fseek(), ftell(), feof(), fread(), fwrite()*), *simple programs covering pointers and files.*

Textbooks

1. Schaum Series, Gottfried B.S.,Tata McGraw Hill,Programming with C, 1996
2. E. Balagurusamy, Mcgraw Hill, Programming in ANSI C, 8/e, 2019
3. Asok N Kamthane, Pearson, Programming in C, 3/e, 2015
4. Anita Goel, Pearson, Computer Fundamentals,2010.

Reference books

1. Anita Goel and Ajay Mittal, Pearson, Computer fundamentals and Programming in C
2. Brian W. Kernighan and Dennis M. Ritchie, Pearson, C Programming Language
3. Rajaraman V, PHI, Computer Basics and Programming in C
4. Yashavant P, Kanetkar, BPB Publications, Let us C

NPTEL/SWAYAM Courses for reference:

1. Introduction to Programming in C - https://archive.nptel.ac.in/courses/106104128/
2. Problem solving through programming in C - https://archive.nptel.ac.in/courses/106105171/
3. C Programming and Assembly Language - https://archive.nptel.ac.in/courses/106106210/

No.	COURSE CONTENTS AND LECTURE SCHEDULE	No. of Hours (36)
	Module 1: Basics of Computer Hardware and Software (7 Hours)	
1.1	Basics of Computer Architecture: Processor, Memory, Input& Output devices	2
1.2	Application Software & System software: Compilers, interpreters, High level and low-level languages	2
1.3	Introduction to structured approach to programming, Flow chart	1
1.4	Algorithms, Pseudo code (bubble sort, linear search - algorithms and pseudo code)	2

MODULE II: Program Basics (8 Hrs)		
2.1	**Basic structure of C program:** Character set, Tokens, Identifiers in C, Variables and Data Types, Constants, Console IO Operations, printf and scanf	2
2.2	**Operators and Expressions:** Expressions and Arithmetic Operators, Relational and Logical Operators, Conditional operator, sizeof operator, Assignment operators and Bitwise Operators. OperatorsPrecedence	2
2.3	**Control Flow Statements:** If Statement, Switch Statement, Unconditional Branching using go to statement, While Loop, Do	4
	While Loop, For Loop, Break and Continue statements. *(Simple programs covering control flow)*	
MODULE III: Arrays, Strings and Functions (11 Hours)		
3.1	Arrays Declaration and Initialization, 1-Dimensional Array, 2-Dimensional Array	2
3.2	**String processing:** In built String handling functions (*strlen, strcpy, strcat and strcmp, puts, gets*), *Simple programs covering arrays and strings*	3
3.3	Introduction to modular programming, writing functions, formal parameters, actual parameters	2
3.4	Pass by Value, Recursion, Arrays as Function Parameters	3
3.5	Structure, union, Storage Classes, Scope and lifetime of variables, simple programs using functions	3
MODULE IV: Pointers and Files (6 Hrs)		
4.1	**Basics of Pointer**: declaring pointers, accessing data though pointers, NULL pointer,array access using pointers, pass by reference effect	3
4.2	**File Operations**: open, close, read, write, append	4
4.3	**Sequential access and random access to files:** In built file handling functions (*rewind (), fseek(), ftell(), feof(), fread(), fwrite()*, *simple programs covering pointers and files.*	2

LESSON PLAN FOR LAB COMPONENT

No.	Topic	No. of Hours (24)	Experiment (8 Programs Mandatory)
1.	Familiarization of Hardware Components. Familiarization of Linux environment	2	1. Familiarization of Hardware Components of a Computer 2. Familiarization of Linux environment – How to do Programming in C with Linux
2.	Familiarization of console I/O and operators in C	2	Familiarization of console I/O and operators in C i) Display "Hello World" ii) Read two numbers, add them and display their sum iii) Read the radius of a circle, calculate its

			area and display it
3.	Basic structure of C program. Operators and Expressions	2	1. Read 3 integer values and find the largest among them. 2. Read a Natural Number and check whether the number is prime or not
4.	Arrays & Strings	4	Read n integers, store them in an array and find their sum and average Read two strings (each one ending with a $ symbol), store them in arrays and concatenate them without using library functions.
5.	Structure, Union	3	1. Read two input each representing the distances between two points in the Euclidean space, store
			these in structure variables and add the two distance values. 2. Using structure, read and print data of n employees (Name, Employee Id and Salary)
6.	Simple programs using functions	3	Find the factorial of a given Natural Number n using recursive and non-recursive functions
7.	Simple programs using Pointer	4	Do the following using pointers i) add two numbers ii) swap two numbers using a user defined function
8.	File Operations	4	Create a file and perform the following i) Write data to the file ii) Read the data in each file & display the file content on console iii) append new data and display on console
CO Assessment Questions			
1	1. Write short note on processor and memory in a computer. 2. What are the differences between compiled and interpreted languages? Give example for each. 3. With the help of a flow chart, explain the bubble sort operation. Illustrate with an example Display "Hello World" Program		
2	1. Write a C program to read a Natural Number through keyboard and to display the reverse of the given number. For example, if "3214567" is given as input, the output to be shown is "7654123". 2. Is it advisable to use *goto* statements in a C program? Justify your answer. 3. With suitable examples, explain various operators in C. 4. Read the radius of a circle, calculate its area and display it		

3	1. Write a function in C which takes a 2-Dimensional array storing a matrix of numbers and the order of the matrix (number of rows and columns) as arguments and displays the sum of the elements stored in each row. 2. Write a C program to check whether a given matrix is a diagonal matrix. 3. Without using any builtin string processing function like *strlen*, *strcat* etc., write a program to concatenate two strings 4. Find the factorial of a given Natural Number n using recursive and non-recursive functions
4	1. With an example, explain the different modes of opening a file. 2. Differentiate between sequential files and random-access files? 3. Using the prototypes explain the functionality provided by the followi functions. i)(*rewind(), ii)fseek() iii)ftell(), iv) fread(), v) fwrite()*
	With a suitable example, explain the concept of pass by reference. Create a file and perform the following i) Write data to the file ii) Read th in each file & display the file content on console iii) append new data and on console

Prepared
By Ms Minnuja S, Assistant Professor, CSE
Department Ms Anly A, Assistant Professor, CSE
Department

24CSR205	Digital System Design	L	T	P	R	C	Year of Introduction
		3	0	0	1	4	2024

Preamble:

The objective of the course is to familiarize learners with the basic concepts of Boolean algebra and digital systems. This course covers the design of simple combinational and sequential logic circuits, representation and arithmetic algorithms for Binary, BCD (Binary Coded Decimal) and Floating point numbers which in turn are helpful in understanding organization & design of a computer system and understanding how patterns of ones and zeros can be used to store information on computers, including multimedia data.

Prerequisite: Nil

Course Outcomes: After the completion of the course the student will be able to

CO 1	Illustrate decimal, binary, octal, hexadecimal and BCD number systems, perform conversions among them and do the operations - complementation, addition, subtraction, multiplication and division on binary numbers**[Understand]**
CO 2	Simplify a given Boolean Function and design a combinational circuit to implement the simplified function using Digital Logic Gates**[Apply]**
CO 3	Design combinational circuits - Adders, Code Convertors, Decoders, Magnitude Comparators, Parity Generator/Checker and design the Programmable Logic Devices - ROM and PLA.**[Apply]**
CO 4	Design sequential circuits - Registers, Counters and Shift Registers**[Apply]**

CO - PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3										3
CO 2	3	3	3			3						2
CO 3	3	3	2			2						3
CO 4	3	3	3			3						3

Assessment Pattern for Theory Component

Bloom's Category	Continuous Assessment Tools			End Semester Examination
	Test1	Test 2	Other tools	
Remember	√	√	√	√
Understand	√	√	√	√
Apply	√	√	√	√
Analyze				
Evaluate				
Create				

Assessment Pattern for Project Component

Bloom's Category	Continuous Assessment Tools		
	Evaluation 1	Evaluation 2	Report

Remember	√	√	
Understand	√	√	
Apply	√	√	
Analyze	√	√	
Evaluate	√	√	
Create			

Mark Distribution of CIA

Course Structure [L-T-P-R]	Attendance	Theory [L]			Project [R]			Total Marks
		Assignment	Test-1	Test-2	Evaluation 1	Evaluation 2	Report	
3-0-0-1	5	5	7.5	7.5	10	10	5	**50**

Total Marks distribution

Total Marks	CIA (Marks)	ESE (Marks)	ESE Duration
100	50	50	2 hrs.

End Semester Examination [ESE]: Pattern

PATTERN	PART A	PART B	ESE Marks
PATTERN 2	2 Questions from each module, 8 questions, each Question carries 3 marks. Answer any 6 Marks: (6x3 =18 marks)	2 questions will be given from each module, out of which 1 question should be answered. Each question can have a maximum of 2 subdivisions. Each question carries 8 marks. Marks: (4x 8 = 32 marks)	50

SYLLABUS

MODULE I: Number systems, Operations & Codes (7 Hours)

Decimal, Binary, Octal and Hexadecimal Number Systems- Number Base Conversions. Addition, Subtraction, Multiplication and Division of binary numbers. Representation of negative numbers- Complements, Subtraction with complements. Addition and subtraction of BCD, Octal and Hexadecimal numbers. Binary codes- Decimal codes, Error detection codes, Reflected code, Character coding schemes – ASCII, EBCDIC.

MODULE II : Boolean Algebra (9 Hours)

Postulates of Boolean Algebra. Basic theorems and Properties of Boolean Algebra. Boolean Functions - Canonical and Standard forms. Simplification of Boolean Functions- Using Karnaugh- Map Method (upto five variables), Don't care conditions, Product of sums Total Marks CIE Marks ESE Marks ESE Duration 150 50 100 3 simplification, Tabulation Method. Digital Logic Gates- Implementation of Boolean functions using basic and universal gates.

MODULE III : Combinational Logic Circuits(9 Hours)

Design Procedure & Implementation of combinational logic circuits- Binary adders and subtractors, Binary Parallel adder, Carry look ahead adder, BCD adder, Code converter, Magnitude comparator, Decoder, Demultiplexer, Encoder, Multiplexer, Parity generator/ Checker.

MODULE IV : Sequential logic circuits (9 Hours)

Flip-flops- SR, JK, T and D. Triggering of flip-flops- Master slave flip- flops, Edge-triggered flip- flops. Excitation table and characteristic equation. Registers- register with parallel load. Counter design: Asynchronous counters- Binary and BCD counters, timing sequences and state diagrams. Synchronous counters- Binary Up- down counter, BCD counter

Shift registers – Serial In Serial Out, Serial In Parallel Out, Bidirectional Shift Register with Parallel load. Ring counter. Johnson counter- timing sequences and state diagrams.

Arithmetic algorithms

Algorithms for addition and subtraction of binary numbers in signed magnitude and 2's complement representations. Algorithm for addition and subtraction of BCD numbers. Representation of floating point numbers, Algorithm for addition and subtraction of floating point numbers

Programmable Logic devices

ROM. Programmable Logic Array(PLA)- Implementation of simple circuits using PLA

Textbooks:

1. M. Morris Mano, Digital Logic & Computer Design, 4/e, Pearson Education, 2013 2.
2. Thomas L Floyd, Digital Fundamentals, 10/e, Pearson Education, 2009.
3. M. Morris Mano, Computer System Architecture, 3/e, Pearson Education, 2007.

Reference books

1. M. Morris Mano, Michael D Ciletti , Digital Design With An Introduction to the Verilog HDL, 5/e, Pearson Education, 2013.
2. Donald D Givone, Digital Principles and Design, Tata McGraw Hill, 2003

NPTEL/SWAYAM Courses for reference:

No.	COURSE CONTENTS AND LECTURE SCHEDULE	No. of Hours (34)
	MODULE 1: Number systems, Operations & Codes (7 Hours)	
1.1	Number Systems: Decimal, Binary, Octal and Hexadecimal number systems, Number Base Conversions.	1
1.2	Binary Arithmetic: Addition, Subtraction, Multiplication & Division of Binary Numbers. (Lecture 1)	1
1.3	Addition, Subtraction, Multiplication & Division of Binary Numbers. (Lecture 2)	1
1.4	Representation of Negative Numbers- Complements, subtraction with complements.	1

1.5	BCD Arithmetic: Addition and Subtraction of BCD Numbers	1
1.6	Octal and Hexadecimal Arithmetic: Addition & Subtraction of Octal	1
	and Hexadecimal Numbers.	
1.7	Binary Codes: Decimal Codes, Error detection codes, Reflected code, Character Coding Schemes-ASCII, EBCDIC	1
MODULE II:Boolean Algebra (9 Hours)		
2.1	Introduction to Boolean Algebra: Postulates of Boolean Algebra	1
2.2	Basic theorems and Properties of Boolean Algebra	1
2.3	Boolean Functions: Canonical and Standard Forms	1
2.4	Simplification of Boolean Functions: Karnaugh -Map Method (upto five variables), Don't care conditions (Lecture 1)	1
2.5	Simplification of Boolean Functions: Karnaugh -Map Method (upto five variables), Don't care conditions (Lecture 2)	1
2.6	Product of sums simplification	1
2.7	Tabulation method	1
2.8	Digital Logic Gates: AND, OR, NOT, NAND, NOR, XOR, XNOR, Implementation of Boolean functions using basic and universal gates. (Lecture 1)	1
2.9	Digital Logic Gates: AND, OR, NOT, NAND, NOR, XOR, XNOR, Implementation of Boolean functions using basic and universal gates. (Lecture 2)	1
MODULE III : Combinational Logic Circuits (9 Hours)		
3.1	Design Procedure & Implementation of Combinational Circuits	1
3.2	Binary Adders: Implementation of Half Adder, Full Adder	1
3.3	Binary Subtractors: Implementation of Half Subtractor, Full Subtractor	1
3.4	Implementation of Binary Parallel Adder ,Carry look ahead Adder, BCD Adder (Lecture 1)	1
3.5	Implementation of Binary Parallel Adder ,Carry look ahead Adder, BCD Adder (Lecture 2)	1
3.6	Implementation of Various Combinational Circuits: Code Converters, Magnitude Comparator	1
3.7	Implementation of Decoder, Demultiplexer	1
3.8	Implementation of Encoder, Multiplexer	1
3.9	Implementation of Parity Generator/Checker	1
MODULE IV:Sequential logic circuits: (9 Hours)		
4.1	Flip flops: SR, JK, T and D flip- flops (Lecture 1)	2
4.2	SR, JK, T and D flip- flops (Lecture 2)	1
4.3	Triggering of flip-flops- Master slave flip- flop, Edge- triggered flip-flops (Lecture 1)	1
4.4	Triggering of flip-flops- Master slave flip- flop, Edge- triggered flip-	2

	flops (Lecture 2)	
4.5	Excitation table and characteristic equations of flip- flops	2
4.6	Registers- Register with parallel load	1
4.7	Counter Design: Asynchronous counters- Binary and BCD	
	counters- timing sequences and state diagrams. (Lecture 1)	
4.8	Asynchronous counters- Binary and BCD counters- timing sequences and state diagrams. (Lecture 2)	
4.9	Synchronous counters- Binary Up- down counter, BCD counter	

LESSON PLAN FOR PROJECT COMPONENT

Topic	**No. of Hours (12)**
Students will be divided in to batches (3-4) and do projects on Design of different logic gates ,half adder, full adder, counters and shift registers in a span of 2 phases	
Phase 1 : First review will be conducted to assess the design of each project.	5
Phase 2 : Final review of the project with a demonstration of the complete design and execution.	7

CO Assessment Questions

CO1	1. Perform the following conversion a) Decimal to Binary $(57.375)_{10}$ b) Binary to Hexadecimal $(1001111011110011100)_2$ c) Octal to decimal $(2374.325)_8$ 2. Subtract 24.75 from 16.5 using 2's complement 3. Perform the following operations a) Perform the bcd addition of the given number 596 and 386 b) Perform the bcd subtraction of the given number using 9's complement 679.6-885.9 4. Perform the following operations a) Perform the hexadecimal addition of the given number $(DF)_{16} + (AC)_{16}$ $(98F.82)_{16}+(B11.94)_{16}$ b) Using 8's complement subtract $(144)_8$ from $(372)_8$

CO2	1. Simplify the following expressions using K-Map i) F(X,Y,Z)=XYZ+XY'Z+XYZ'+X'Y'Z ii) F(A,B,C,D)=∑(2,5,6,9,12,13) 2. Express the following function as sum of minterms i) F(XYZ)=X'+YZ+XZ'+XY'Z'+XYZ' ii) F(ABC)=B'+AC'+AB'C 3. Simplify the Boolean expression Y(A,B,C,D)=∏M (0, 1, 3, 5, 6, 7, 10, 14, 15) using K-map in Product of Sums form. 4. Simplify the boolean function using tabulation method F(W,X,Y,Z)= ∑(0,5,7,8,9,10,11,14,15)
CO3	1. Implement a full adder circuit using 3*8 decoder 2. Draw and explain the logic circuit of 4 bit full adder with look ahead carry. 3. Implement the following boolean functions using PLA F1=∑(0,1,3,4) F2=∑(1,2,3,4,5) 4. Design a code converter for converting BCD TO Excess 3 code
CO4	1. Implement JK flip flop Using D filp flop 2. Design a Synchronous counter with th efollowing repeated binary sequence 000,110,111,010,011 using T flip flop 3. Draw the block diagram of 4 bit ripple counter. 4. Explain how shift register is used as a converter from i) serial to parallel data ii) parallel to serial data

24ESL006	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING WORKSHOP	L	T	P	R	C	Year of Introduction
		0	0	2	0	1	2024

Preamble: Electrical Workshop is intended to impart skills to plan and carry out simple electrical wiring. It is essential for the practicing engineers to identify the basic practices and safety measures in electrical wiring.

Prerequisite: NIL

Course Outcomes: After the completion of course the student will be able to

CO1	Identify the tools and equipment used for electrical wiring and understand electrical safety measures.**[Understand]**
CO2	Design and develop lighting and power circuits and distribution board arrangement under various conditions for domestic buildings.**[Apply]**
CO3	Identify various electronic components. .**[Understand]**
CO4	Design simple electronic circuits on breadboard and PCB. .**[Apply]**

CO - PO MAPPING

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

Assessment Pattern

Bloom's Category	Continuous Assessment Tools	
	Classwork	Test1
Remember		
Understand	√	√
Apply	√	√
Analyse	√	
Evaluate	√	
Create	√	

Mark Distribution of CIA

Course Structure [L-T-P-R]	Attendance	Classwork	Lab Exam	Total Marks
0-0-2-0	5	25	20	50

Total Mark distribution

Total Marks	CIA (Marks)	ESE (Marks)	ESE Duration
50	50	0	-

SYLLABUS- DETAILS OF EXPERIMENTS

SECTION – 1 (Electrical Engineering Experiments) ***Minimum 5 experiments are mandatory***
Familiarize with tools and equipment required for wiring; Understand the electrical safety precautions; Identify different types of cables, wires, switches, fuses, fuse carriers, MCB, ELCB and MCCB, familiarize the ratings; Demonstrate the Pipe and Plate Earthing Schemes using Charts/Site Visit
Wiring of light circuits (light/ fan point and a 6A plug socket with individual control, Staircase wiring, fluorescent lamp) and power circuit (16 A Power plug socket with a control switch)
Wiring of power distribution arrangement using single phase MCB distribution board with ELCB, main switch and Energy meter.
Familiarization of Rheostat, Step-down Transformers, Measurement and representation of voltage and waveform to scale in graph sheet with the help of CRO; measurement of potential across resistance elements and introducing the concept of relative potential using a DC circuit; Identify battery specifications using different types of batteries
SECTION – 2 (Electronics Engineering Experiments) ***Minimum 5 experiments are mandatory***
Familiarization/Identification of electronic components with specification, Drawing of electronic circuit diagrams using BIS/IEEE symbols, Familiarization/Application of testing instruments and commonly used tools, Testing of electronic components using multimeter .
Printed circuit boards (PCB) - Types, Single sided, Double sided, PTH, Processing methods. Design and fabrication of a single sided PCB for a simple circuit. Inter-connection methods and soldering practice. Assembling of electronic circuit/system on general purpose PCB, test and show the functioning.
Text books 1. V N Mittal and Rohit Gupta, "Basic Electrical Engineering" 2. National Electric Code (NEC) by National Fire Protection Association 3. E A Reeves, "Electric Wiring Practices" 4. Basic Electronics: Principles and Applications, Chinmoy Saha, Arindham Halder and Debarati Ganguly 5. Basic Electronics and Linear Circuits, N N Bhargava D C Kulshreshtha and S. C. Gupta
Reference books 1. "Wiring Practices Manual" by International Brotherhood of Electrical Workers 2. "Electrical Wiring: A Practical Guide" by J F McPartland

LIST OF EXPERIMENTS

Electrical - 12 Hrs ***(Minimum 6 experiments are mandatory)***	
No	Experiments

.	
1	1. Identify different types of cables, wires, switches, fuses, fuse carriers, familiarize the ratings. Identify the various protection equipment used in electrical wiring (MCB, ELCB/RCCB and MCCB).
2	Wiring of a simple light circuit for two light/ fan points (PVC conduit wiring) with individual control.
3	Wiring of light/fan circuit using two way switches. (Staircase wiring)
4	Wiring of fluorescent lamp and a plug (6 A) socket with individual control.
5	Wiring of a simple power circuit for 16A power socket with a control switch.
6	Wiring of power distribution arrangement using single phase MCB distribution board with ELCB, main switch and Energy meter.
7	Familiarisation of step up and step down transformers, (use low voltage transformers) Measurement and representation of voltage and waveform to scale in graph sheet with the help of CRO
8	Familiarization of rheostats, measurement of potential across resistance elements and introducing the concept of relative potential using a DC circuit.
9	a) Identify battery specifications using different types of batteries.(Lead acid, Li Ion, NiCd etc.) b) Demonstrate the Pipe and Plate Earthing Schemes using Charts/Site Visit.
Electronics -12 Hrs ***(Minimum 5 experiments are mandatory)***	
1	Familiarization/Identification of electronic components with specification (Functionality, type, size, colour coding, package, symbol and cost of -Active, Passive, Electrical, Electronic, Electro-mechanical, Wires, Cables, Connectors, Fuses, Switches, Relays, Crystals, Displays, Fasteners, Heat sink etc.)
2	Drawing of electronic circuit diagrams using BIS/IEEE symbols and Interpret data sheets of discrete components and IC's.
3	Familiarization/Application of testing instruments and commonly used tools. - Multimeter, Function generator, Power supply, CRO, DSO. - Soldering iron, Desoldering pump, Pliers, Cutters, Wire strippers, Screw drivers, Tweezers, Crimping tool, Hot air soldering and de- soldering station.
4	Testing of electronic components using multimeter - Resistor, Capacitor, Diode, Transistor and JFET.
5	Printed circuit boards (PCB) - Types, Single sided, Double sided, PTH, Processing methods. Design and fabrication of a single sided PCB for a simple circuit.

6	Inter-connection methods and soldering practice. Bread board, Wrapping, Crimping, Soldering - types - selection of materials and safety precautions. Soldering practice in connectors and general purpose PCB, Crimping.
7	Assembling of electronic circuit/system on general purpose PCB, test and show the functioning (Any two)- ● Fixed voltage power supply with transformer ● Rectifier using diode ● Capacitor filter ● Zener/IC regulator ● Square wave generation using IC 555 timer in IC base.
8	Introduction to EDA tools.

CO Assessment Questions	
CO1	Identify the tools given with you and demonstrate its proper use
CO1	Demonstrate the electrical safety precautions as a team
CO2	Design and develop the wiring as per the given layout and obtain the output
CO3	A team work to fabricate the component as per the given design using available manufacturing methods and submit the report
CO3	Identify the electronic components in the given figure and assemble the component on a circuit board to enable the required function
CO4	Implement a simple circuit in a PCB and obtain the output.

Prepared by, Ms. Drisya K Sasi, Assistant Professor, Department of EEE Mr. Sebin Davis K, Assistant Professor, Department of EEE Ms. Anju Babu, Assistant Professor, Department of ECE Ms. Reshma P S, Assistant Professor, Department of ECE

24HUT007	COMMUNICATIVE ENGLISH	L	T	P	R	C	Year of Introduction
		0	0	2	0	1	2024

Preamble: This course aims to enhance the communicative English skills of engineering students. The course will cover the four main language skills: listening, reading, writing, and speaking. Students will engage in various activities, including practical sessions in the language lab, to improve their proficiency in English.

Prerequisite: NIL

Course Outcomes: After the completion of the course, the student will be able to

CO 1	Improve Listening Skills in English [Apply]
CO 2	Enhance Students' Reading Skills in English [Analyze]
CO 3	Develop Writing Skills in English [Create]
CO 4	Improve Speaking Skills in English [Evaluate]

CO - PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1								2	3		
CO 2	1	2								3		
CO 3	1		2	3					2	3		
CO 4	1								3	3		

Assessment Pattern for Lab Component

Bloom's Category	Continuous Assessment Tools	
	Classwork	Test
Remember		
Understand		
Apply	√	√
Analyze	√	√
Evaluate	√	√
Create	√	√

Mark Distribution of CIA

Attendance	Lab [P]				Total Marks
	Reading Test	Writing Test	Listening Test	Speaking Test	
5	25	25	20	25	100

Total Marks distribution

Total Marks	CIA (Marks)	ESE (Marks)	ESE Duration
100	100	0	-

SYLLABUS

MODULE I: Introduction and Listening Skills (4 hours)
Introduction To the Theory of Communication: Types of Communication, Modes of Communication **Listening Skills**: Listening: Importance and Benefits of Listening Skill, Different Types of Listening, understanding different accents and dialects, Note-taking strategies, Strategies for Improving Listening
MODULE II: Reading Skills (4 hours)
Reading: A Passive Skill – Its Importance, Ten Important Reading Strategies and their Benefits, Skimming and scanning techniques, identifying main ideas and supporting details
MODULE III: Writing Skills (4 hours)
Different Styles of Writing, Fundamentals of English Usages, understanding different types of charts, graphs, and diagrams, describing trends and comparing data Structuring an essay, developing arguments and supporting them with examples, Making Notes and Resumes, Report Writing, Fundamentals of Intonation, Correspondence Writing, Means to Enhance Vocabulary, Content Writing
MODULE IV: Speaking Skills and Integrated Review (8 hours)
Speaking Skills: The Importance of Speaking as an active skill; Grammar, Vocabulary, and Phonetics: Tools of Communicative English Developing fluency and coherence; Pronunciation and stress; Techniques for Effective Public Speaking; Group Discussion and Interview Skills; Presentation Skills; People Skills. **Integrated Skills and Review:** Business English, Comprehension, Summary and Paraphrasing, Research Methodology and Documentation
Textbooks 1. Effective Communication Skills/Kul Bhushun Kumar, P S Salaria, Khanna Book Publishing Co (P) Ltd, New Delhi 2. Communication Skills For Engineers & Scientists/ Sangeeta Sharma, Binod Mishra, PHI Learning Pvt Ltd, New Delhi 3. Humanities & Communication Skills/Pearson Education India Pvt Ltd, New Delhi 4. Adler B. Ronald and Russell F. Proctor II. Looking Out, Looking In. Cengage Learning.2017. 5. Dianna L.Vanblerkom. College Study Skills.Wadsworth.2003 6. Aggarwal, R. (2003). Effective Communication Skills. Jaipur: Sublime Publications 7. Davies, F. 1995, Introducing Reading. Penguin Books. 8. Downs, Lisa. Listening Skills Training. USA; ASTD, 2008. Print.

Reference books

1. Dawes, L. The Essential Speaking and Listening. Routledge, 2008.
2. Cornbleet, S., and Carter, R. The Language of Speech and Writing. Routledge, 2001.
3. Harvey, I. (1951). The Technique of Persuasion. London: The Falcon Press.
4. Anderson, A. and Lynch, T. (1988) Listening, Oxford: Oxford University, Press.
5. Riggenbach, Heidi. Perspectives on Fluency.University of Michigan Press, 2000.
6. Dianna L.Vanblerkom. College Study Skills.Wadsworth.2003
7. Crystal, D. (2003). English as a Global Language. 2nd edition. Cambridge: Cambridge University Press
8. Anderson, Marilyn, Pramod K. Nayar. Critical Thinking, Academic Writing and Presentation Skills. Dorling Kindersley. India 2010
9. David Crystal Mother-tongue India Talk for Lingua Franca (ABC, Australia), January 2005 http://www.globalenglish.com/blog/2014/06/10/indian-employers-report-

business-english-is-essential-totheir-workforce/ by 12/3/14 at 6:15 pm

10. Crystal, David (2003). The Cambridge Encyclopedia of the English Language (2nd Ed.). Cambridge University Press. ISBN 0-521-53033-4.

NPTEL/SWAYAM Courses for reference:

1. https://onlinecourses.swayam2.ac.in/cec24_lg08/preview:: Communicative English By Dr. Salia Rex

LESSON PLAN FOR LAB COMPONENT

No. Topic	Topic	No. of Hours (24)
1	Listening practice using audio resources	4
2	Reading comprehension exercises and quizzes	4
3	Writing practice and peer review	4
4	Essay writing/Resume writing/Report writing and feedback sessions	4
5	Speaking practice with peers and recording for self-assessment	8

CO Assessment Questions

CO1	Listening Test: You will have to listen to four recordings (conversations and monologues) and then answer the questions asked. The recordings are of native English speakers, and various accents are used. Remember, you can hear each recording only once. • **Recording 1:** You will listen to a dialogue in daily life and context. • **Recording 2:** You will listen to a monologue about everyday life or social context. For instance, a talk on the condition of streets in an area. • **Recording 3:** You will listen to a conversation between more than two people placed in a training or educational context. For instance, a teacher discusses an assignment with students. • **Recording 4:** You will listen to a monologue on any academic subject, such as a college lecture. Answer 6 question types, including: • Multiple choice • Matching • Plan/map/diagram labelling • Note completion • Short answer questions
CO 2	The Reading test is divided into three parts, each featuring a comprehensive passage from contemporary books, journals, magazines, and newspapers. These passages reflect topics relevant to academic and professional environments in English-speaking contexts. Answer 11 question types, including: • Multiple choice • Identifying information • Note completion • Matching headings • Matching sentence endings
	• Summary completion • Sentence completion • Flow-chart completion
CO 3	**Part 1:** You are presented with a graph, table, chart, or diagram and asked to describe, summarize, or explain the information in your own words. You may be asked to describe and explain data, describe the stages of a process, explain how something works, or describe an object or event. **Part 2:** You are asked to write an essay responding to a point of view, argument or problem.

CO 4	**Part 1:** (4–5 minutes) Introduction and interview. The examiner will ask you to introduce yourself and confirm your identity. Then, the examiner will ask you generic questions about family, studies, work, and interests. **Part 2:** (3–4 minutes) Individual long turn. The examiner will give you a task card with a topic written on it, with some points you may cover in your speech. You will have one minute to think and prepare the topic; a paper and pencil will be provided to jot down your notes. Once done ideating, you will have a time of one to two minutes to speak on the subject, followed by some questions on the same by the examiner. **Part 3:** (4–5 minutes) Two-way discussion. The examiner will ask more questions related to the topic provided in Part 2 of the Speaking test. You can use this opportunity to talk about more ideas.