SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)
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SCMS SCHOOL OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

VIDYA NAGAR, PALISSERY, KARUKUTTY

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE



2026 Scheme

Syllabus

Semester 1

B.Tech in Computer Science and Engineering (Data Science)

Branch Code – CD

SEMESTER 1 (S1)

Sl.	Slot	Course Code	Type	Cat.	Course Title	Cr.	Hour Structure				Total Hrs.	Internal Test		CIA	SEE	Overall Marks
							L	T	P	SL		IAT 1	IAT 2			
1	A	26GAMAT101	BSC	GC	Calculus and Optimization	3	45	0	0	45	90	40	40	40	60	100
2	B	26GAPHT121 / 26GXCYT122	BSC	GC	Physics for Information Science/ Chemistry for Information Science and ElectricalScience	4	45	0	30	45	120	40	40	40	60	100
3	C	26GXEST103	ESC	GC	Engineering Graphics	3	30	0	30	30	90	40	40	40	60	100
4	D	26GXEST104	ESC	GC	Introduction to Electrical & Electronics Engineering	4	60	0	0	60	120	40	40	40	60	100
5	E	26UCEST105	ESC	UC	Programming in C	4	45	0	30	45	120	40	40	40	60	100
6	F	26GXESL106	ESC	GC	Basic Electrical and Electronics Engineering Workshop	1	0	0	30	0	30	-	-	100	-	100
7	G	26UCHWT127	HWP	UC	Health and Wellness	1	0	0	30	0	30	-	-	50	-	50
		26UCHUT128	HMC		Life Skills and Professional Communication									100	-	100
8		26UCSEM129	SEC	UC	MOOC Course/Communicative English (8 WEEKS)	0	0	0	0	0	0	-	-	-	-	-
TOTAL						**20**	**225**	**0**	**150**	**225**	**600**					
Bridge Course : Total 15 Hours																

Course Code	26GAMAT101		
Course Name	CALCULUS AND OPTIMIZATION		
Teaching Hours	L:45 T:0 P:0 SL:45	**Course Credits**	3
Continuous Internal assessment Marks	40	**Semester End Exam Marks**	60
Exam Hours	2½ Hours	**Total Marks**	100
Course Type	BSC: Theory	**Course Category**	GC: Group A
Prerequisites	Basic knowledge in single variable calculus.		

Preamble

This course provides the mathematical foundation for the analysis of multivariable functions and optimization techniques, which are widely used in engineering, scientific computing, and data-driven applications.

Course Objectives

- To enable students to analyze multivariable functions using appropriate mathematical tools.
- To develop the ability to determine the maximum and minimum values of functions.
- To provide knowledge of optimization methods for solving engineering problems.
- To enhance analytical, critical thinking, and problem-solving skills.
- To establish a strong mathematical foundation for advanced engineering applications.

Course Outcomes (COs)

CO#	CO Statement	Knowledge Level
CO1	Apply the concepts of limits, continuity, differentiation, and higher-order derivatives to determine the behavior of single-variable functions.	K1, K2, K3
CO2	Apply partial differentiation, the chain rule, and Taylor's formula to evaluate and approximate functions of several variables.	K2, K3
CO3	Apply directional derivatives, gradients, and derivative tests to determine local and absolute extrema of functions of two variables..	K3
CO4	Apply Lagrange multipliers and the steepest descent method to solve constrained optimization problems.	K3
CO5	Formulate and solve linear programming problems using the graphical method for engineering decision-making.	K2, K3

Course Articulation Matrix

CO-PO-PSO Mapping

	PROGRAM OUTCOMES											PSOs		
CO #	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	3	2	-	-	-	-	-	-	-	-	1	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	1	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	1	-	-	-
CO4	3	3	1	-	-	-	-	-	-	-	1	-	-	-
CO5	3	3	1	-	-	-	-	-	-	-	1	-	-	-
Avg	**3**	**2.6**	**1**	-	-	-	-	-	-	-	**1**	-	-	-

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Course Syllabus

Module: 1	**Contact Hours: 11**
Limits of Function Values, Continuity at a point, Continuous Functions, Rates of Change: Derivative at a Point, Derivative as a Function, Second and Higher-Order Derivatives, Instantaneous Rates of Change, Chain Rule, Implicit Differentiation, Tangents and Normal Lines, Linearization, Concavity: The Second Derivative Test for Concavity. [Relevant topics from: Text 1- sections 2.2, 2.5, 3.1, 3.2, 3.3, 3.4, 3.6, 3.7, 3.9, 4.4]	

Module: 2	**Contact Hours: 11**
Functions of Several Variables: Domain and Range, Level Curves of Two Variables, Limits and Continuity for Functions of Two Variables, Partial Derivatives of Functions of Several Variables, Higher- Order Partial Derivatives, The Mixed Derivative Theorem, The Chain Rule: Functions of Two and Three Variables. Taylor's Formula for Two Variables. [Relevant topics from: Text 1- sections 14.1, 14.2, 14.3, 14.4, 14.9]	

Module: 3	**Contact Hours: 11**
Directional Derivatives in the Plane, Interpretation of the Directional Derivative, Gradient, Properties of the Directional Derivative, Local Extreme Values for Functions of Two Variables: Relative extrema, First derivative theorem for local extreme values, Critical point, saddle point, Hessian matrix and Second Derivative Test for Local Extreme Values, Absolute Maxima and Minima on Closed Bounded Regions. [Relevant topics from: Text 1- sections 14.5, 14.7]	

Module: 4	Contact Hours: 12
Lagrange Multipliers (one and two constraints), Steepest Descent Method (foundation of Gradient Descent), Linear Programming Problem formulation, Graphical Solution of LPP, [Relevant topics from: Text-1 section 14.8, Text-2 sections 22.1, 22.2]	

Continuous Internal Assessment (CIA)

Attendance	CTA	IAT 1 (MOD 1&2)	IAT 2 (MOD 3&4)	Total
5	15	10	10	40

Suggested Assignments for Course Teacher's Assessment (CTA) Through Self-Learning Component:

- Explore the applications of limits, continuity, and derivatives in everyday life and engineering. Using an AI tool, identify and explain any three applications, such as speed measurement, population growth, water flow, or electrical circuits. Briefly describe the mathematical concept involved.
- Use an AI tool or graphing software to study a function of two variables. Plot its surface and contour (level curve) graphs, compute the partial derivatives, and explain what the graphs indicate.
- Explore the applications of gradients and optimization in everyday situations. Using an AI tool, identify an example such as finding the shortest path, locating the highest point on a hill, or minimizing travel distance, and explain how gradients help solve the problem.
- Study the concept of optimization in engineering. Using AI-assisted resources, explain how the Steepest Descent Method helps find the minimum value of a function. Describe one practical application, such as minimizing cost, reducing travel time, or improving energy efficiency.
- Formulate a simple Linear Programming Problem (LPP) based on a real-life situation such as selecting a healthy diet, planning a study timetable, or allocating a monthly budget. Solve the problem using the graphical method and compare your answer with the solution obtained using an AI tool.

Text Books

- Thomas' Calculus, M. D. Weir, J. Hass, C. Heil, and P. Bogacki, Pearson, 15th edition, 2023.
- Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 10th edition, 2016.

Reference Books and Extended Learning

- Calculus, H. Anton, I. Bivens, and S. Davis, John Wiley & Sons, 10th edition, 2012. .
- Optimization: Algorithms and Applications, R. K. Arora, CRC Press, 1st edition, 2015.
- NPTEL Video Repository: https://nptel.ac.in/courses/111106146
- NPTEL Video Repository: https://nptel.ac.in/courses/111107108

Course Code	26GAPHT121		
Course Name	PHYSICS FOR INFORMATION SCIENCE		
Teaching Hours	L:45 T:0 P:30 SL:45	**Course Credits**	4
Continuous Internal assessment Marks	40	**Semester End Exam Marks**	60
Exam Hours	2½ Hours	**Total Marks**	100
Course Type	BSC: Integrated: Theory & Lab	**Course Category**	GC: Group A
Prerequisites	Students should have a basic understanding of higher secondary Physics.		

Preamble

Engineering Physics A provides the scientific foundation for modern engineering technologies. The course covers electrical conductivity, quantum mechanics, semiconductor physics, superconductivity, semiconductor devices, and fibre optics, emphasizing their applications in emerging fields such as quantum computing, spintronics, photonics, and renewable energy, while developing analytical thinking and problem-solving skills.

Course Objectives

- To introduce students to quantum wave equations and the foundational principles of modern physics.
- To familiarize students with material band structures and electron transport mechanisms in semiconductor technology.
- To explain advanced phenomena, including superconducting materials and optoelectronic components.
- To provide students with a solid theoretical and practical foundation in fiber optic communication systems for engineering applications.

Course Outcomes (COs)

CO#	CO Statement	Knowledge Level
CO1	Explain the electron transport mechanisms, quantum statistical distributions, and energy band formation in solids, and describe the theoretical frameworks, properties, and technological applications of Type I and Type II superconductors.	K2
CO2	Formulate time-dependent and time-independent Schrödinger equations, derive energy eigenvalues and normalized wave functions for a particle in a box, and	K3

	analyze quantum phenomena like tunneling, the uncertainty principle, and emerging concepts in quantum computing and spintronics.	
CO3	Analyze the behavior of charge carriers in intrinsic and extrinsic semiconductors by interpreting density equations, evaluating the impact of temperature on carrier concentration, and distinguishing qualitative differences in doping mechanisms.	K3
CO4	Analyze the physics of p-n junction formation, interpret energy band diagrams under different biasing conditions, and derive the ideal diode equation to evaluate its I-V characteristics.	K3
CO5	Explain the construction, working principles, and parameters of optoelectronic devices, solar cells, and photo-detectors, and describe the propagation characteristics, classifications, and key parameters of optical fibers.	K2
CO6	Apply basic knowledge of principles and theories in physics to conduct experiments.	K3

Course Articulation Matrix

CO-PO-PSO Mapping

	PROGRAM OUTCOMES											**PSOs**		
CO #	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	3	2	-	-	-	-	-	1	-	-	2	-	-	-
CO2	3	2	-	-	-	-	-	1	-	-	2	-	-	-
CO3	3	2	-	-	-	-	-	1	-	-	2	-	-	-
CO4	3	2	-	-	-	-	-	1	-	-	2	-	-	-
CO5	3	2	-	-	-	-	-	1	-	-	2	-	-	-
CO6	3	2	-	-	-	-	-	3	-	-	2	-	-	-
Avg	3.0	2.0	-	-	-	-	-	1.33	-	-	2.0	-	-	-

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Course Syllabus

Module: 1	**Contact Hours: 11**
Electrical conductivity: Classical free electron theory, Electrical conductivity in metals, Fermi Dirac distribution, Variation of Fermi function with temperature, Fermi Energy, Energy bands.	

Super conductor: Superconductivity, Properties of superconductor, Type I and Type II Super conductors. BCS Theory, High temperature superconductors (Qualitative), Applications of superconductors: Josephson effect, SQUID, Magnetic Levitation and Cryotron.

Module: 2	**Contact Hours: 12**
Quantum Mechanics: Introduction, Uncertainty principle (statement only), Application of uncertainty principle (no derivation), Wave function, properties, physical interpretation, Formulation of time dependent and time independent Schrodinger equations, Particle in a one- dimensional box - Derivation of energy Eigen values and normalized wave function, Quantum Mechanical Tunnelling (Qualitative), Quantum computing (Qualitative), Concept of spin and Spintronics (Qualitative).	

Module: 3	**Contact Hours: 11**
Semiconductor Physics: Intrinsic semiconductor, Density of electrons in conduction band and density of holes in valence band (no derivation), Intrinsic carrier concentration, Variation of Intrinsic carrier concentration with temperature, Extrinsic semiconductor (qualitative). Fermi level in semiconductors-intrinsic and extrinsic. Formation of p-n junction, Energy band diagram of p-n junction - Qualitative description of charge flow across a p-n junction - Forward and reverse biased p-n junctions, Diode equation (derivation), I-V Characteristics of p-n junction	

Module: 4	**Contact Hours: 11**
Semiconductor Devices: Semiconductor Laser (Construction and working), Applications, Photo detectors (Junction and PIN photodiodes), Solar cells- IV Characteristics, Efficiency, Stringing of Solar cells to solar panel, Light Emitting Diode. **Fibre Optics:** Optic fibre-Principle of propagation of light, Types of fibres-Step index and Graded index fibres - Multimode and single mode fibers, Acceptance angle, Numerical aperture –Derivation, Applications of optical fibres - Fibre optic communication system (block diagram)	

Sl No.	**List of Experiment**	**Contact Hours: 30 hrs.**
1.	Perform an error analysis for the measurements obtained using the Vernier calipers, screw gauge, travelling microscope, and spectrometer by calculating the mean value, absolute error, relative error, and percentage error from repeated observations	

2	Compare the variation of current with potential difference, for a metal, filament bulb and semiconductor diode.
3	Diode and Zener characteristics
4	Half and full wave rectifier
5	Determination of band gap energy of a semiconductor
6	Characteristics of LED
7	Solar Cell- V-I and Intensity Characteristics
8	Laser – Determination of wavelength using diffraction grating
9	Determination of dielectric constant
10	CRO -Measurement of frequency and amplitude of wave forms
11	Photo diode - V-I Characteristics
12	Optical fiber characteristics- Measurement of Numerical aperture

Continuous Internal Assessment (CIA)

Attendance	CTA	IAT 1 (MOD 1&2)	IAT 2 (MOD 3&4)	IAT 3 (Lab)	Total
5	5	10	10	10	40

Suggested Assignments for Course Teacher's Assessment (CTA) Through Self-Learning Component:

The following self-learning activities are indicative and not exhaustive. Course instructors shall facilitate, mentor, and monitor student groups in planning, implementing, and documenting these activities to achieve the intended Course Outcomes.

- Generate a Python script simulating how the Fermi-Dirac distribution function changes with temperature. Instruct the AI to add a secondary module comparing standard electron drift against a zero-resistance Cryotron switch, plotting both results for verification.
- Prompt an AI tool to construct a conceptual markdown matrix comparing classical bits with quantum bits (qubits). Use AI to generate a clear flowchart explaining how a particle tunnels through a potential barrier, a key phenomenon limiting modern CPU transistor scaling.

- Use AI to generate a comparative analysis of energy band shifting in a p-n junction under forward and reverse bias. Command the AI to provide the exact Shockley diode equation derivations, then audit the mathematical logic for structural accuracy.

- Prompt an AI image generator or ASCII tool to design a complete block diagram of a Fiber Optic Communication system. Instruct a text AI to calculate the maximum data throughput variations based on differing Numerical Apertures.

Text Books

- M. N. Avadhanulu, P. G. Kshirsagar, T. V. S. Arun murthy (2018). A Textbook of Engineering Physics, 11th Edition S. Chand,
- Gaur, R. K., & Gupta, S. L. (2022). Engineering physics. Dhanpat Rai Publications.
- D.K. Bhattacharya & Poonam Tandon (2024)A Textbook of Engineering Physics. Oxford University Press

Reference Books and Extended Learning

- S.O. Pillai (2022). Solid State Physics, 10th Edition, New age international publishers.
- Arthur Beiser (2003). Concepts of Modern Physics, 6th Edition, Tata McGraw Hill Publications.
- Charles Kittel (2019). Introduction to Solid State Physics, Wiley India Edition
- NPTEL Video Repository:https://nptel.ac.in/courses/115102023
- NPTEL Video Repository: https://nptel.ac.in/courses/108106181
- NPTEL Video Repository: https://nptel.ac.in/courses/115107095
- NPTEL Video Repository: https://nptel.ac.in/courses/115103108

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Course Code	26GXCYT122		
Course Name	CHEMISTRY FOR INFORMATION SCIENCE AND ELECTRICAL SCIENCE		
Teaching Hours	L:45 T:0 P:30 SL:45	**Course Credits**	4
Continuous Internal assessment Marks	40	**Semester End Exam Marks**	60
Exam Hours	2½ Hours	**Total Marks**	100
Course Type	BSC: Integrated: Theory & Lab	**Course Category**	GC: Group A & B
Prerequisites	Concepts of Chemistry introduced at the plus two level		

Preamble

Chemistry is a fundamental science that underpins advancements in engineering, materials, energy, healthcare, environmental sustainability, and emerging technologies. For Computer Science and Engineering students, a sound understanding of chemistry provides opportunities to apply computational techniques to solve complex scientific problems, including molecular modelling, materials informatics, chemical data analysis, and simulation of chemical systems. This course is designed to provide students with the necessary chemical knowledge and laboratory skills required for interdisciplinary engineering applications. The curriculum also promotes awareness of environmental sustainability and the United Nations Sustainable Development Goals (SDGs), encouraging students to develop responsible engineering solutions. A mini project integrated into the course enhances research aptitude, innovation, technical writing, teamwork, and presentation skills through the investigation of real-world engineering problems, thereby preparing graduates for lifelong learning, multidisciplinary collaboration.

Course Objectives

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

- To introduce the fundamental concepts electrochemistry, electrochemical and energy storage devices
- To familiarize students with basic spectroscopic and instrumental techniques helpful for future computational and software applications.
- To create basic idea about quantum computing technologies, nanomaterials and Organic electronic materials and devices

- To impart knowledge about environmental challenges aligned with the SDGs and the role of Engineers and digital technologies in sustainable solutions.

Course Outcomes (COs)

CO#	CO Statement	Knowledge Level
CO1	Understand the fundamental principles of chemistry and their applications in computing technologies and electrical and electronic systems.	K2
CO2	Understand the fundamentals of nanomaterials and modern battery technologies and recognize their importance in computational, electrical and electronic systems.	K2
CO3	Understand environmental issues related to the United Nations Sustainable Development Goals (SDGs), waste management, and appreciate the role of digital technologies in sustainable engineering.	K2
CO4	Understand the basics of spectroscopy and molecular structure and relate them to computational modelling and future software developing applications.	K2
CO5	Apply basic knowledge of principles and theories in chemistry to conduct experiments.	K3
CO6	Able to identify and investigate engineering problems using chemistry concepts, computing tools, and appropriate research methods.	K3

Course Articulation Matrix

CO-PO-PSO Mapping

	PROGRAM OUTCOMES											PSOs		
CO#	1	2	3	4	5	6	7	8	9	10	11	1	2	3
CO1	3	2	-	-	-	-	-	-	-	-	2	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	2	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	2	-	-	-
CO4	3	3	-	-	-	2	3	-	-	-	2	-	-	-
CO5	3	3	-	-	-	3	2	-	-	-	3	-	-	-

CO6	3	3	3	3	2	3	3	2	3	3	2	-	-	-
Avg	**3**	**2.8**	**3.0**	**3.0**	**2**	**2.67**	**2.66**	**2.00**	**3.0**	**3.0**	**2.17**	-	-	-

Course Syllabus

Module 1	**Contact Hours: 11**

Electrochemistry and Energy Storage Devices

Introduction to electrochemistry -Electrode Potential-Origin of Single electrode potential, EMF of a cell, notation and conventions, Nernst equation for single electrode and cell, Reference electrode with special reference to Glass Electrode & pH Measurement. Electrochemical series - Applications

Energy Storage Devices - Li-ion battery–Silicon carbon battery, construction and working, solid state battery (elementary knowledge), Na- ion battery

Electrochemical degradation of engineering materials – anodic and cathodic processes, galvanic effects, Protection and control methods (any two), Emerging corrosion inhibition methods (any two)

Module 2	**Contact Hours: 12**

Fundamentals of Molecular Spectroscopy and Applications

UV–Visible Spectroscopy- Principles of electronic spectroscopy and types of electronic transitions. Effect of conjugation on absorption maxima. Instrumentation of a UV–Visible spectrophotometer and its applications.

IR Spectroscopy-Principles of vibrational spectroscopy. Vibrational degrees of freedom and the number of vibrational modes in CO_2 and H_2O, Applications of IR spectroscopy

^1H NMR Spectroscopy-Principle, Chemical shift, peak intensity and splitting - significance in spectral interpretation of molecules**,** NMR spectral problems of simple molecules, MRI

Module 3	Contact Hours: 12

Advanced Functional Materials and Their Role in Quantum Computing

Nanomaterials - Classification based on Dimension & Materials- Synthesis – Chemical Reduction and Sol gel, SEM –- Principle and instrumentation (block diagram). Applications of nanomaterials- Graphene, Carbon Quantum Dots

Organic electronic materials and devices- Construction, working and applications of Organic Light Emitting Diode (OLED) & Dye-Sensitized Solar Cells (DSSCs), Perovskites Solar cells - Construction, working and applications.

Quantum Computing Technology- Introduction to quantum computing technologies, super capacitors, Spintronics

Module: 4	Contact Hours: 10

Environment and Sustainability

E-waste - Sources, environmental impact, disposal and management, Energy, water consumption and carbon footprint of large scale of AI data centers and infrastructures, battery disposals -hazards and regulations, Sustainable Development Goals: An Engineering Perspective.

Water quality parameters, Water Treatment Technologies: Water softening by ion-exchange process—principle, procedure, and advantages. Reverse osmosis (RO)—principle, process, and applications. Water disinfection methods—chlorination, ozonation, and UV irradiation.

Sl No.	List of Experiments	Contact Hours: 28 (including skill test)
1	Calibration of pH meter and determination of pH of a solution	
2	To determine the strength of given HCl solution via potentiometric method	
3	Estimation of iron in iron ore	
4	Estimation of copper in brass	
5	Determination of wavelength of absorption maximum and colorimetric estimation of Fe^{3+} in solution	

6	Determination of molar absorptivity of a compound (KMnO4 or any water-soluble food colorant)
7	Analysis of IR spectra - Identification of unknown (any three) organic compounds
8	Identification of unknown (any three) organic compounds via proton NMR
9	Synthesis of nanomaterial via reduction method (any industrially important nanomaterial)
10	Construction of DSSC (Through Industrial visit)
11	Estimation of total hardness of water-EDTA method
12	Estimation of dissolved oxygen by Winkler's method
13	Estimation of chloride ion in a given water sample
14	Determination of turbidity in a given sample of water
15	Identification of drugs using TLC

Continuous Internal Assessment (CIA)

Attendance	Continuous Assessment	IAT-1	IAT-2	Lab Assessment	Total
5	5	10	10	10	40

Suggested Continuous Assessment Topics for Course Teacher's Assessment (CTA) Through Self-Learning Component:

- How to calculate standard reduction potential of Zn/Cu by coupling it with a calomel electrode.
- Explain the construction and working principle of supercapacitors. Discuss the different types of supercapacitors and compare their performance with conventional rechargeable batteries in terms of energy density, power density, charging time, cycle life, and applications.
- Emerging methods that can be adopted for prevention of corrosion.
- Discuss the role of green chemistry and sustainable engineering in achieving the United Nations Sustainable Development Goals (SDGs). Provide examples of technologies that minimize environmental impact.
- Explain the recent advancements in Dye-Sensitized Solar Cells (DSSCs) with emphasis on novel sensitizers, nanomaterials, and solid-state electrolytes.

Text Books

- Principles of Physical Chemistry by B.R. L.R. Puri Sharma, M.S.Pathania, 50th Edition
- Engineering Chemistry, B. L. Tembe, Kamaluddin, M. S.,Krishnan, NPTEL Web-book,2018
- Physical Chemistry,P. W. Atkins, Oxford University Press, International Edition-2018
- Standard Methods for the Examination of Water and Wastewater, APHA, AWWA, WEF, American Public Health Association, 24th Edition, 2023.

Reference Books and Extended Learning.

- Physical Chemistry P. W. Atkins, Oxford University Press, International Edition- 2018.
- Sunita and Ratan Practical Engineering Chemistry, S.K Kataria & Sons, 2013
- Environmental Chemistry, Stanely E Manahan, Lewis Publishers e print 2009.
- E-waste: From Generation to Management – Practices, Challenges and Solutions, Prashant Shukla , Sachi Choudhary, P. S. Ranjit , Akarsh Verma, Springer Nature ,2025

NPTEL Video Repository

Module 1

1. https://nptel.ac.in/courses/104106137 ,https://www.youtube.com/watch?v=BeSxFLvk1h0
2. https://onlinecourses.nptel.ac.in/e-learning/preview/noc21_mm34

Module 2

1. https://www.youtube.com/watch?v=czG3YjLpVkM
2. https://nptel.ac.in/courses/103108139
3. https://nptel.ac.in/courses/104108078

Module 3

1. https://nptel.ac.in/courses/113104102
2. https://www.youtube.com/watch?v=o6Afp-MI_tQ

Module 4

1. https://www.youtube.com/watch?v=_r5rHyMHKEg
2. https://onlinecourses.nptel.ac.in/e-learning/preview/noc23_hs57
3. https://www.youtube.com/watch?v=6Ot2t9YyzKU
4. https://www.youtube.com/watch?v=_RMzcMWc9mk

Course Code	26GXEST103		
Course Name	ENGINEERING GRAPHICS		
Teaching Hours	L:30 T:0 P:30 SL:30	**Course Credits**	3
Continuous Internal assessment Marks	40	**Semester End Exam Marks**	60
Exam Hours	2½ Hours	**Total Marks**	100
Course Type	ESC	**Course Category**	GC
Prerequisites	NA		

Preamble

Engineering Graphics is the universal visual language of the engineering profession. Before any structure is built, device manufactured, or system assembled, it must first be conceived, conceptualized and precisely communicated through standardized graphical representations. This introductory course establishes foundational principles of technical drawing, spatial visualization, and geometric construction, bridging the gap between abstract design ideas and tangible physical reality.

Course Objectives

- To enable the students to prepare engineering drawings by learning the principles and techniques of dimensioning
- To develop the ability of students to accurately interpret and understand engineering drawings.

Course Outcomes (COs)

CO#	CO Statement	Knowledge Level
CO1	Understand the basic drawing standards, different types of scales and the projection of points and lines located in different quadrants	K2
CO2	Apply the concepts of projections in formulating various solid parts in engineering systems.	K3
CO3	Draw projections of sectioned solids and develop full and sectioned surfaces of a given object.	K3

CO4	Draw pictorial drawings using the principles of isometric projection.	K3

Course Articulation Matrix

CO-PO-PSO Mapping

	PROGRAM OUTCOMES											PSOs*		
CO #	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	3	2	-	-	1	-	-	-	3	-	2	-	-	-
CO2	3	2	2	-	1	-	-	-	3	-	2	-	-	-
CO3	3	2	2	-	1	-	-	-	3	-	2	-	-	-
CO4	3	2	2	-	1	-	-	-	3	-	2	-	-	-
Avg	**3**	**2**	1.5	-	1	**-**	**-**	**-**	**3**	**-**	2	**-**	**-**	**-**

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation,

Course Syllabus

Module: 1	**Contact Hours: 15**
Introduction to Engineering Graphics: Drawing instruments and their uses-familiarization with current BIS code of practice for general engineering drawing. **Scales**-Plain Scales-Diagonal Scales (3 Hrs.) **Orthographic projections of points and lines**: -Projections of points in different quadrants- Projections of straight lines parallel to one plane and inclined to the other plane-straight lines inclined to both the planes-true length and inclination of lines with reference planes using line rotation and plane rotation methods – Traces of lines. (12 Hrs.)	

Module: 2	**Contact Hours: 15**
Orthographic projections of solids: -Projections of prisms, cones, cylinders, pyramids with axis parallel to one plane and parallel or perpendicular to the other plane-the above solids with their axes parallel to one plane and inclined to the other plane –axis inclined to both the reference planes-use change of position method. (15 Hrs.)	

Module: 3	**Contact Hours: 15**
Sections of solids: -Sections of prisms, cones, cylinders, pyramids with axis parallel to one plane and parallel or perpendicular or inclined to the other plane with section planes perpendicular to one plane and parallel, perpendicular or inclined to the other plane –Finding true shapes of sections. (Exclude True shape given problems) (8 Hrs.)	

Developments of surfaces of simple solids like prisms, pyramids, cylinder and cone, sectioned regular solids. (7 Hrs.)

Module: 4	**Contact Hours: 15**
Isometric Projections:-Isometric Scales-Isometric views and projections of plane figures, simple & truncated solids such as prisms, pyramids, cylinder, cone, sphere, hemisphere and their combinations with axis parallel to one the planes and parallel or perpendicular to the other plane. (15 Hrs.)	

Continuous Internal Assessment (CIA)

Attendance	CTA	IAT 1 (MOD 1&2)	IAT 2 (MOD 3&4)	Total
5	15	10	10	40

Suggested Assignments for Course Teacher's Assessment (CTA) Through Self-Learning Component:

- Assignment 1: Engineering Scales & Orthographic Projections of Points, Lines (Covers: Plain/Diagonal + Projections of points, lines)
- Assignment 2: Orthographic Projections of Solids (Covers: Prisms, pyramids, cylinders, cones with axes inclined to both reference planes)
- Assignment 3: Sections of Solids & Development of Surfaces (Covers: Sectional views, true shapes, surface developments of full and sectioned solids)
- Assignment 4: Isometric Projections (Covers: Isometric views of truncated solids projections)

Summary Table for Course Teacher's Assessment Rubrics (CTA Evaluation Criteria)

Assessment Criteria	Excellent (5)	Good (4)	Satisfactory (3)	Needs Improvement (2)
Accuracy of Construction	All measurements are exact; lines meet precisely at points.	Minor (<1mm) deviations in measurements.	Noticeable (>2mm) errors in dimensions.	Major inaccuracies; incorrect geometry.

Assessment Criteria	Excellent (5)	Good (4)	Satisfactory (3)	Needs Improvement (2)
Line Work & BIS Standards	Perfect line differentiation (thick/thin/construction); neat lettering.	Good differentiation; minor crowding of text.	Acceptable lines; poor lettering consistency.	Indistinct lines; no standard followed.
Method/Procedure	Correct sequence followed; all construction lines retained.	Sequence correct; few construction lines missing.	Sequence partially correct; many construction lines erased.	Incorrect method used; no clear procedure.
Completeness & Presentation	All views/developments complete; title block filled.	One minor view missing; title block incomplete.	Multiple views missing; poor sheet layout.	Task incomplete; sheet dirty/torn.

Text Books

- Engineering Graphics-P I Varghese, VIP Publishers
- Engineering Graphics- John, K. C, Prentice Hall India Publishers

Reference Books and Extended Learning

- Engineering Drawing-N D Bhatt, Charotar Publishing House Pvt Ltd.
- Engineering Graphics with AutoCAD, Kulkarni, D. M., Rastogi, A. P. and Sarkar, A. K., Prentice Hall India Publishers
- Engineering Drawing & Graphics -Venugopal, K., New Age International Publishers

Extended Learning

- https://onlinecourses.nptel.ac.in/e-learning/preview/noc21_me128
- https://nptel.ac.in/courses/112103019

Course Code	26GXEST104		
Course Name	INTRODUCTION TO ELECTRICAL AND ELECTRONICS ENGINEERING		
Teaching Hours	L:60 T:0 P:0 SL:60	**Course Credits**	4
Continuous Internal Assessment Marks	40	**Semester End Exam Marks**	60
Exam Hours	2½ Hours	**Total Marks**	100
Course Type	ESC	**Course Category**	GC
Prerequisites	Nil		

Preamble

This course introduces the fundamental concepts of Electrical and Electronics Engineering, including DC and AC circuits, magnetic circuits, and basic circuit analysis. It covers semiconductor devices, digital electronics, communication systems, and electronic systems. The course also provides an understanding of sensors and instrumentation, forming a foundation for advanced studies in electrical, electronics, and allied engineering disciplines.

Course Objectives

- To understand the fundamental concepts of DC circuits and applying it in circuit analysis.
- To describe the fundamental concepts of AC circuits and applying it in circuit analysis.
- To explain the operating principles and characteristics of basic electronic components, semiconductor devices, rectifier circuits, transistors, and digital electronic circuits.
- To understand the fundamental principles of communication systems, including modulation, demodulation, transmitters, and receivers.
- To describe the basic concepts of electronic systems, sensors, sensor characteristics, and their applications in instrumentation and measurement systems.

Course Outcomes (COs)

CO#	CO Statement	Knowledge Level
CO1	Apply fundamental concepts and circuit laws to solve simple DC electric circuits	K3
CO2	Describe fundamental concepts to solve simple AC electric circuits	K3

CO3	Describe the fundamental concepts of Electronic Components and Devices	K2
CO4	Outline the principles of Communication Systems	K2
CO5	Describe the basic concepts of Electronic Systems and Sensors.	K2

Course Articulation Matrix

CO-PO-PSO Mapping

	PROGRAM OUTCOMES											PSOs		
CO#	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	3	2	-	-	-	-	-	-	-	-	2	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	2	-	-	-
CO3	2	1	-	-	-	-	-	-	-	-	2	-	-	-
CO4	2	-	-	-	-	-	-	-	-	-	2	-	-	-
CO5	2	2	1	-	2	2	1	-	-	-	2	-	-	-
Avg	**2.4**	**1.75**	**1**	**-**	**2**	**2**	**1**	**-**	**-**	**-**	**2**	**-**	**-**	**-**

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation.

Course Syllabus

PART-A (Introduction to Electrical Engineering)

Module: 1	**Contact Hours: 15**
Elementary concepts of DC electric circuits: Current and Voltage Division Rule - Relative potential Capacitors & Inductors: V-I relations and Energy stored. Ohms Law and Kirchhoff's laws - numerical problems. 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 by matrix methods - numerical problems. **Elementary Concepts of Magnetic circuits: Magnetic Circuits**: Basic Terminology: MMF, field strength, flux density, reluctance - Comparison between electric and magnetic circuits - Series and parallel magnetic circuits with composite materials (numerical problems not needed)	

Self Study: Ohms Law and Kirchoff's Law

Module: 2	**Contact Hours: 15**

Electromagnetic Induction: Faraday's laws, Lenz's law- statically induced and dynamically induced emf – Self-inductance and mutual inductance, coefficient of coupling (numerical problems not needed).

Alternating Current fundamentals: Generation of alternating voltages - Representation of sinusoidal wave forms: frequency, period, average value, RMS value and form factor - numerical problems
AC Circuits: Phasor representation of sinusoidal quantities, Trigonometric, Rectangular, Polar and complex forms.

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

Self Study: Faradays Law, Definitions of Magnetic Circuit, Comparison of Electric and Magnetic Circuits

PART-B (Introduction to Electronics Engineering)

Module: 3	**Contact Hours: 15**

Introduction to Electronic Devices: Passive and active components in electronics, Working of PN junction diode, V-I characteristics of PN Junction diode, Zener diode, Zener and avalanche breakdown, Basics of Zener voltage regulator.
Block diagram of DC power supply, Working of Half wave, Full wave and Bridge rectifiers (No analysis required).
Construction and working of BJT, Input Output characteristics of CE configuration. Transistor as a switch, Transistor as an amplifier (Circuit Diagram and working).

Number Systems: Representation, Conversions: Decimal, Binary and Hexadecimal Conversions. Signed and Unsigned Numbers, BCD.

Introduction to Digital Circuits: Basic gates.

Module: 4	**Contact Hours: 15**
Communication Systems: Introduction, Modulation and Demodulation, Transmitters, Receivers (AM and FM). **Electronic Systems**: Introduction, Systems, System Inputs and Outputs, Physical Quantities and Electrical Signals, System Block diagrams. **Sensors**: Basic Block Diagram and Explanation, Describing sensor performance: Range, Sensitivity, Resolution, Accuracy, Precision, Linearity (Basic idea). Temperature Sensors: Resistive Thermometers, Thermistors, PN Junctions. Light Sensors: Photovoltaic, Photoconductive. Force Sensors: Strain Gauge, Piezoelectric. Displacement Sensors: Potentiometers, Inductive Sensors, Switches, Opto-switches, Absolute position encoders, Incremental position encoders, other counting techniques. Sound Sensors: Carbon microphones, Capacitive microphones, Moving-coil microphones, Piezoelectric microphones. Sensor Interfacing: Resistive devices, Switches.	

Continuous Internal Assessment (CIA)

Attendance	CTA	IAT1 (MOD 1&3)	IAT2 (MOD 2&4)	Total
5	15	10	10	40

Suggested Assignments for Course Teacher's Assessment (CTA) Through Self-Learning Component:

- Ohms Law and Kirchoff's Law
- Faradays Law, Definitions of Magnetic Circuit, Comparison of Electric and Magnetic Circuits
- Identify ten real-life applications of logic gates (e.g., burglar alarm, automatic doors, traffic lights, elevators). Explain which gates are used and why.
- Identify sensors used in a smart home (temperature, motion, smoke, light, gas, etc.). Explain their working principle and application with photographs.

Text Books

MODULE 1 & 2 (Introduction to Electrical Engineering)

- D. P. Kothari and I. J. Nagrath (4th Edition, 2019), *Basic Electrical Engineering*, Tata McGraw Hill.
- J. J. Cathey and Syed A. Nasar (3rd Edition, 2010)**,** *Schaum's Outline of Basic Electrical Engineering*, Tata McGraw Hill**.**

- Chinmoy Saha, Arindham Halder, and Debarati Ganguly (1st Edition, 2018), *Basic Electronics: Principles and Applications*, Cambridge University Press**.**
- D. P. Kothari and I. J. Nagrath (2nd Edition, 2020)**.,** *Basic Electrical and Electronics Engineering*, McGraw Hill.

MODULE 3 & 4 (Introduction to Electronics Engineering)

- Neil Storey (4th Edition, 2011), *Electronics: A Systems Approach*, Pearson.
- Rajendra Prasad (1st Edition, 2017)**,** *Fundamentals of Electronic Engineering*, Cengage Learning.

Reference Books and Extended Learning

- Del Toro V (2nd Edition, 2019), *Electrical Engineering Fundamentals*, Pearson Education**.**
- T. K. Nagsarkar and M. S. Sukhija (3rd Edition, 2017), *Basic Electrical Engineering*, Oxford Higher Education
- Dr. S. K. Bhattacharya and Dr. Renu Vig (3rd Edition, 2000)**,** *Principles of Electronics*, S. K. Kataria & Sons
- Robert L. Boylestad and Louis Nashelsky (11th Edition, 2015), *Electronic Devices and Circuit Theory*, Pearson
- G. K. Mithal (1st Edition)**,** *Electronic Devices and Circuits*, Khanna Publishers**.**
- Dennis Roddy and John Coolen (4th Edition, 2008), *Electronic Communication*, Pearson**.**
- Kennedy and Davis (6th Edition, 2017)**,** *Electronic Communication Systems*, McGraw Hill**.**
- https://onlinecourses.nptel.ac.in/noc21_ee55
- https://onlinecourses-archive.nptel.ac.in/noc18_ee3
- https://nptel.ac.in/courses/108105376

Course Code	**26UCEST105**		
Course Name	PROGRAMMING IN C		
Teaching Hours	L:45 T:0 P:30 SL:45	**Course Credits**	4
Continuous Internal Assessment Marks	40	**Semester End Exam Marks**	60
Exam Hours	2½ Hours	**Total Marks**	100
Course Type	ESC	**Course Category**	UC
Prerequisites	Nil		

Preamble

The Programming in C course is designed to equip first-year engineering students with a strong foundation in computational thinking, structured problem-solving, and procedural programming fundamentals. This course serves as a foundational programming course common to all engineering disciplines, requiring no prior programming background. It bridges theoretical concepts and hands-on software development using the C programming language. Students will transition from basic algorithmic logic to designing, debugging, and managing modular, memory-efficient applications.

Course Objectives

- To introduce the fundamentals of problem-solving and C programming.
- To enable students to analyse computational problems, design algorithms, and develop efficient, modular, and C programs using appropriate programming constructs.
- To promote students for logical thinking, debugging skills, and good programming practices.

Course Outcomes (COs)

CO#	CO Statement	Knowledge Level
CO1	**Design** and represent efficient solutions for given problem scenarios using algorithms and flowcharts.	K2
CO2	**Explain** the scope, lifetime, and memory layout of variables, operators and control structures across different memory segments in C programs.	K2
CO3	**Apply** the appropriate arrays, strings to develop C programs for given problem scenarios.	K3
CO4	**Apply** modular programming principles using functions, parameter passing mechanisms, and recursion to design structured and reusable software solutions.	K3
CO5	**Utilize** user-defined data types, structures, and unions and appropriate storage classes to efficiently organize complex data and manage memory allocation.	K3

CO6	**Develop** C programs using pointers, dynamic memory allocation, and file handling techniques to solve computational problems efficiently.	K3

Course Articulation Matrix

CO-PO-PSO Mapping

	PROGRAM OUTCOMES											PSOs		
CO#	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	-	1	-	-	-	-	1	2	-	-	-
CO2	3	2	-	-	1	-	-	-	-	–	2	-	-	-
CO3	3	3	2	-	2	-	-	-	-	–	2	-	-	-
CO4	3	3	3	-	2	-	-	-	-	1	2	-	-	-
CO5	3	2	3	-	2	-	-	-	-	–	2	-	-	-
CO6	3	3	3	-	2	-	-	-	-	1	2	-	-	-
Avg	**3**	**2.5**	**2.6**	**-**	**1.7**	**-**	**-**	**-**	**-**	**1.0**	**2**	**-**	**-**	**-**

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation,

Course Syllabus

Module: 1	**Contact Hours: 11**
Introduction to a structured approach to programming, Flow chart, Algorithms, Pseudo code. C Fundamentals - Character set, Tokens, Variables, and Data types, scope of variables, Operators and its precedence, Expressions, Type conversions, Statements - Input and Output statements, Structure and memory layout of a C program. Control Statements - if, if-else, nested if, switch, while, do-while, for, break & continue, nested loops.	

Module: 2	**Contact Hours: 11**
Arrays - Single-dimensional arrays, Defining an array, Array initialization, accessing array elements, Enumerated data type, Type Definition, Two-dimensional arrays – Defining a two-dimensional array, Programs for matrix processing, Programs for sequential search, Bubble sort.	

Strings - Declaring a string variable, Reading and displaying strings, String-related library functions – Programs for string matching.

Module: 3	**Contact Hours: 11**
Functions - Function definition, Function call, Function prototype, Parameter passing, Recursion, Passing an array to a function, Command-line arguments. Structures - Defining a Structure variable, accessing members, Array of structures, Passing structure to function, Union. Storage Class - Storage Classes associated with variables - automatic, static, external and register.	

Module: 4	**Contact Hours: 12**
Pointers - Declaration, Operations on pointers, passing a pointer to a function, accessing array elements using pointers, processing strings using pointers, pointer to pointer, array of pointers, pointer to function, pointer to structure. Practical Implementation & Basics of Dynamic Memory Allocation. Files- Different types of files in C, Opening and Closing a file, writing to and Reading from a file, processing files, Library functions related to file.	

Continuous Internal Evaluation (CIE)

Theory based course with 40:60 marks (Lab course)

Attendance	Continuous Assessment	Internal Exam-1 (MOD 1 and 2)	Internal Exam-2 (MOD 3 and 4)	Internal Exam-3 (Lab)	Total
5	10	10	10	5	40

Suggested Assignments for Course Teacher's Assessment (CTA) Through Self-Learning Component:

- **Develop a Mini Software Application**
  Design and develop a menu-driven, modular C application for a real-world problem such as Banking Management, Library Management, Student Information Management, Hospital Management, Inventory/Stock Management, or Employee Payroll etc. The application shall incorporate appropriate data structures, user-defined functions, file handling, error checking, and modular programming principles.

- **Performance Analysis of Function Calls**
  Investigate and compare the implementation, execution efficiency, memory utilization, and practical applications of inline functions, macros, and user-defined functions in C through experimental analysis and performance benchmarking. Prepare a comparative technical report based on the observations.

- **Robust Error Handling in C Programs**
  Develop a comprehensive C application demonstrating robust error handling techniques using standard library functions, user-defined error codes, file operation errors, command-line argument validation, dynamic memory allocation errors, and common exit status codes.

- **Data Processing Using File Handling**

  Develop a file-based application that reads large datasets, performs searching, sorting, filtering, and statistical analysis, and generates formatted reports.

Text Books

- Brian W. Kernighan and Dennis Ritchie, The C Programming Language, Pearson 2/e, 2015.
- Herbert Schildt, C The Complete Reference, Mc Graw Hill, 4/e, 2017.

Reference Books and Extended Learning

- Byron S Gottfried, Programming with C, Mc Graw Hill, 4/e, 2018.
- Jeri R. Hanly, Elliot B. Koffman, Problem Solving and Program Design in C, Pearson, *8*/e, 2016.
- Stephen G, Kochan Programming in C, Addison-Wesley, 4/e, 2015.
- Web Resource: http://www.digimat.in/nptel/courses/video/106104128/L01.html
- Web Resource: www.w3schools.com/c/

Course Code	26GXESL106		
Course Name	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING WORKSHOP		
Teaching Hours	L:0 T:0 P:30 SL:0	**Course Credits**	1
Continuous Internal Assessment Marks	100	**Semester End Exam Marks**	-
Exam Hours	2½ Hours	**Total Marks**	100
Course Type	ESC	**Course Category**	GC
Prerequisites	NIL		

Preamble

The Basic Electrical and Electronics Engineering Workshop is a foundation laboratory course designed to provide first-year B. Tech. students with essential practical skills in electrical and electronics engineering. The course introduces students to safe engineering practices, electrical wiring techniques, electronic components, measuring instruments, and basic circuit assembly.

Course Objectives

1. To create awareness and familiarity with electrical wiring and safety measures to be taken.
2. To identify various electronic components and to operate various measuring instruments.
3. Learn to setup simple electronic circuits on breadboard and PCB.

Course Outcomes (COs)

CO#	CO Statement	Knowledge Level
CO1	Demonstrate electrical safety practices and protective measures against electrical shocks during workshop activities.	K2
CO2	Explain the functions of rheostats, batteries, earthing systems, and electrical protection devices.	K2
CO3	Illustrate the connection diagram and identify the suitable accessories necessary for wiring simple electric circuits.	K3
CO4	Identify various electronic components and operate various measuring instruments.	K2

CO5	Apply the design procedure of simple electronic circuits on breadboard and PCB.	K3

Course Articulation Matrix

CO-PO-PSO Mapping

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PS O 2	PSO 3
CO1	-	-	-	-	-	3	-	-	-	-	2	-	-	-
CO2	1	-	-	-	-	2	1	-	-	-	2	-	-	-
CO3	2	-	-	-	-	1	-	-	-	-	2	-	-	-
CO4	3	-	-	-	-	-	-	-	3	-	-	-	-	-
CO5	3	-	2	1	-	-	-	-	3	-	-	-	-	-
Average	**2.25**	**-**	**2**	**1**	**-**	**2**	**1**	**-**	**3**	**-**	**2**	**-**	**-**	**-**

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation, NA: Not Applicable

Course Syllabus

Sl. No.	Electrical Workshop Syllabus (Minimum of 7 Experiments to be done)	Contact Hours: 15
1	Safety Precautions.	
2	Study of Symbols.	
3	Identify different types of Cables, wires, switches, fuses, fuse carriers, MCB,ELCB and MCCB.	
4	Wiring of a simple light circuit - One lamp controlled by one switch.	
5	Wiring of light circuit using two way switches (Stair case wiring).	
6	Wiring of LED tube and socket with a control switch.	
7	Familiarization of rheostats, measurements of potential across resistance elements and introducing the concept of relative potential using a DC circuit.	
8	Identify battery specifications using different types of batteries.	
9	Familiarize different types of earthing and ground enhancing materials.	
10	Wiring of Power distribution arrangement using single phase MCB distribution board with ELCB, Main switch and Energy meter.	

Sl.	Electronics Workshop Syllabus (Minimum of 7 Experiments to be done)	Contact Hours: 15

No.		
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, Trainer kit. 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 diode, Capacitor filter, Zener/IC regulator Square wave generation using IC 555 timer in IC base.	
8	Assembling of electronic circuits using SMT (Surface Mount Technology) stations.	
9	Introduction to EDA tools (such as KiCad or XCircuit)	

Continuous Internal Assessment (CIA)

Attendance	Preparation/Pre-Lab Work, experiments, Viva and Timely completion of Lab Reports / Record (Continuous Assessment)	Total
10	40	50

CIA Exam:

Procedure/ Preparatory work/Design/ Algorithm	Conduct of experiment/ Execution of work/ troubleshooting/ Programming	Result with valid inference/ Quality of Output	Viva voce	Record	Total
10	15	10	10	5	50

Reference Books and Extended Learning

- Electrical Design Estimating and Costing, K B Raina and S.K.Bhattacharya, New Age

International Publishers.
- Basic Electronics and Linear Circuits, NN Bhargava, D.C. Kulshreshtha and S C Gupta, McGraw Hill Publishers.

Continuous Assessment with equal weightage for both specializations (40 Marks)

- **Preparation and Pre-Lab Work (10 Marks)**

  a. Pre-Lab Assignments: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
  b. Understanding of Theory: Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.

- **Conduct of Experiments (10 Marks)**

  a. Procedure and Execution: Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
  b. Skill Proficiency: Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.
  c. Teamwork: Collaboration and participation in group experiments.

- **Lab Reports and Record Keeping (10 Marks)**

  a. Quality of Reports: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
  b. Timely Submission: Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.

- **Viva Voce (10 Marks)**

  a. Oral Examination: Ability to explain the experiment, results and underlying principles during a viva voce session.

Evaluation Pattern for Semester End Examination with equal weightage in both specializations (50 Marks)

- **Procedure/Preliminary Work/Design/Algorithm (10 Marks)**

  a. Procedure Understanding and Description: Clarity in explaining the procedure and understanding each step involved.
  b. Preliminary Work and Planning: Thoroughness in planning and organizing materials/equipment.
  c. Algorithm Development: Correctness and efficiency of the algorithm related to the experiment.
  d. Creativity and logic in algorithm or experimental design.

- **Conduct of Experiment/Execution of Work/Programming (15 Marks)**

  a. Setup and Execution: Proper setup and accurate execution of the experiment or programming task.

- **Result with Valid Inference/Quality of Output (10 Marks)**

  a. Accuracy of Results: Precision and correctness of the obtained results.
  b. Analysis and Interpretation: Validity of inferences drawn from the experiment or quality of program output.

- **Viva Voce (10 Marks)**

  a. Ability to explain the experiment, procedure results and answer related questions.
  b. Proficiency in answering questions related to theoretical and practical aspects of the subject.

- **Record (5 Marks)**

  a. Completeness, clarity, and accuracy of the lab record submitted.

Course Code	26UCHWT127		
Course Name	HEALTH AND WELLNESS		
Teaching Hours	L:0 T:0 P:30 SL:0	**Course Credits**	1
Continuous Internal assessment Marks	50	**Semester End Exam Marks**	0
Exam Hours	Nil	**Total Marks**	50
Course Type	HWP: Activity-based learning	**Course Category**	UC: Common Course (For all branches)
Prerequisites	None		

Preamble

Health and Wellness is a multidisciplinary course designed to develop students' understanding of the principles and practices essential for leading a healthy and balanced life. The course emphasizes the importance of physical fitness, mental well-being, proper nutrition, healthy lifestyle habits, and disease prevention. It provides learners with knowledge of the human body, exercise principles, stress management, yoga, first aid, and personal health management. Through a combination of theoretical concepts and practical applications, the course encourages students to adopt lifelong healthy behaviors, enhance their quality of life, and develop the skills necessary to respond effectively to common health and emergency situations. The course also promotes social responsibility, emotional resilience, and overall well-being, enabling students to contribute positively to their personal, academic, and professional lives.

Course Objectives

- To provide students with fundamental knowledge of physical activity, health, and overall wellness.
- To develop an understanding of human body systems, principles of exercise, nutrition, mental health, and the prevention and management of common lifestyle diseases.
- To create awareness about the benefits of yoga, the harmful effects of substance abuse, and the importance of basic first aid and emergency response skills.
- To encourage students to adopt healthy lifestyle practices that promote lifelong physical, mental, and social well-being.
- To enable students to plan, design, and implement safe, effective, and personalized exercise and fitness programs based on individual needs and goals.

- **Course Outcomes (COs)**

CO#	CO Statement	Knowledge Level
CO1	Explain the concepts of physical activity, health, wellness, and the functioning of major human body systems.	K2
CO2	Apply the principles of exercise, fitness, nutrition, and healthy lifestyle practices to improve personal health and well-being.	K3
CO3	Demonstrate awareness of mental health, stress management, yoga practices, and the prevention of substance abuse.	K4
CO4	Perform basic first aid procedures and identify appropriate responses to common health emergencies.	K3
CO5	Design and recommend safe, effective, and personalized exercise and fitness programs based on individual needs, goals, and health conditions.	K4

Course Articulation Matrix

CO-PO-PSO Mapping

	PROGRAM OUTCOMES											PSOs		
CO #	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	-	-	-	2	-	3	3	3	2	-	2	-	-	-
CO2	-	-	-	2	-	3	2	2	-	-	2	-	-	-
CO3	-	-	-	-	-	3	3	-	-	-	2	-	-	-
CO4	-	-	-	2	-	3	-	-	-	-	2	-	-	-
CO5	-	-	-	2	-	2	-	-	-	-	2	-	-	-
Avg	**-**	**-**	**-**	**2**	**-**	**2.8**	**2.67**	**2.5**	**2**	**-**	**2**	**-**	**-**	**-**

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Course Syllabus

Module: 1	**Contact Hours: 8**
Human body systems related to physical activity and their functions: Respiratory System, Cardiovascular System, Musculoskeletal System and the major muscle groups of the human body. Quantifying Physical Activity: Energy expenditure and Metabolic Equivalent of Task (MET). Exercise Continuum: Light-intensity physical activity, Moderate-intensity physical activity and Vigorous-intensity physical	

activity. Concept of Physical Activity, Exercise, Health and Wellness: Health and wellness differentiation, factors affecting health and wellness

Module: 2	**Contact Hours: 7**
Defining Physical Activity, Aerobic Physical Activity, Anaerobic Physical Activity, Exercise and Health-Related Physical Fitness. FITT principle for designing an exercise programme. Components of Health-Related Physical Fitness: Cardiorespiratory fitness, Muscular strength, Muscular endurance, Flexibility and Body composition. Diet and Nutrition: Concept of balanced diet, Micro and Macronutrients, Carbohydrates and Glycemic Index, Animal- and Plant-based proteins and their effects on human health, Dietary fats and their effects on human health, Essential vitamins and minerals. Healthy lifestyle practices.	

Module: 3	**Contact Hours: 8**
Mental health and factors affecting mental health. Stress management techniques. Meaning, aims and objectives of Yoga. Classification and importance of Yogic Asanas (Standing, Sitting and Lying), Pranayama and its types. Active lifestyle and stress management through Yoga. Understanding substance abuse and addiction. Psychoactive substances and their ill effects: Alcohol, Opioids, Cannabis, Sedatives, Cocaine, Other stimulants including caffeine, Hallucinogens, Tobacco and Volatile solvents. Lifestyle management strategies to prevent and manage common hypokinetic diseases and disorders: Obesity, Cardiovascular diseases (Coronary artery disease and Hypertension), Diabetes, Osteoporosis and Musculoskeletal disorders (Osteoarthritis, Low back pain, Kyphosis, Lordosis, Flat foot and Knock knee).	

Module: 4	**Contact Hours: 7**
First aid and principles of First Aid: Primary survey: ABC (Airway, Breathing and Circulation). Qualities of a Good First Aider. First aid measures for: Cuts and scrapes, Bruises, Sprains, Strains, Fractures, Burns and Nosebleeds. First Aid Procedures: Cardiopulmonary Resuscitation (CPR), Heimlich Maneuver and Applying a sling. Basic response to common health emergencies. Sports injuries: Classification (Soft Tissue Injuries – Abrasion, Contusion, Laceration, Incision, Sprain and Strain). Designing safe, effective and personalized exercise and fitness programmes based on individual needs, goals, fitness levels and health conditions.	

Continuous Internal Assessment (CIA)

Theory course with 50:00 marks

Attendance	Activity evaluation	Case Study/Micro project	Presentation	Total
10	20	10	10	50

Suggested Assignments for Case Study, Micro project, Activity evaluation:

- Prepare a report explaining the functions of the respiratory, cardiovascular, and musculoskeletal systems during physical activity. Record daily physical activities for one week and classify them according to the exercise continuum. Prepare a balanced diet chart highlighting the role of macro- and micronutrients in maintaining health. Design a personalized exercise programme based on the FITT principle for an individual with specific fitness goals. Write a report on the benefits of yoga in stress management and overall wellness. Prepare an awareness note on the harmful effects of substance abuse and suggest preventive measures. Demonstrate and document basic first aid procedures for common injuries and emergencies. Prepare a case study on the prevention and management of a lifestyle disease through physical activity, nutrition, and healthy lifestyle practices. Identify common sports injuries and explain their causes, prevention, and basic first aid management. Develop a personal health and fitness improvement plan incorporating exercise, nutrition, stress management, and wellness strategies.
- Use AI tools to explore recent advancements in physical activity, health, and wellness and prepare a summary report. Generate a personalized exercise and fitness programme using AI and critically evaluate its suitability based on the FITT principle. Use AI to analyze the nutritional content of a one-day meal plan and suggest improvements for a balanced diet. Explore AI-based applications for stress management, yoga, and mental well-being, and prepare a comparative review. Use AI tools to identify lifestyle disease risk factors and recommend preventive strategies through physical activity and healthy lifestyle practices. Prepare an AI-assisted presentation on the harmful effects of substance abuse and methods of prevention. Use AI to develop a first aid awareness guide for common health emergencies and sports injuries, and verify the information using standard first aid guidelines before submission.
- Activity evaluation

Tests to evaluated as per Criterion - 2 and Benchmark Scores

1. V Sit Reach Test

How to Perform:

1. The subject removes their shoes and sits on the floor with the measuring line between their legs and the soles of their feet placed immediately behind the baseline, heels 8-12" apart.

2. The thumbs are clasped so that hands are together, palms facing down and placed on the measuring line.

3. With the legs held flat by a partner, the subject slowly reaches forward as far as possible, keeping the fingers on baseline and feet flexed.

4. After three tries, the student holds the fourth reach for three seconds while that distance is recorded.
5. Make sure there are no jerky movements, and that the fingertips remain level and the legs flat.

Infrastructure/Equipment Required:

1. A tape for marking the ground, marker pen, and ruler.

2. With the tape mark a straight line two feet long on the floor as the baseline, and a measurement line perpendicular to the midpoint of the baseline extending two feet on each side.

3. Use the marker pen to indicate every centimeter and millimeter along the measurement line. The point where the baseline and the measuring line intersect is the zero point.

Scoring: The score is recorded in centimeters and millimeters as the distance reached by the hand, which is the difference between the zero point (where the baseline and measuring line intersect) and the final position.

Scoring for V Sit Reach Test for Males

Level	Benchmark Score	Measurement (cm)
1	2	<11
2	4	12-13
3	6	14-17
4	7	18-19
5	8	20-21
6	9	22
7	10	>22

Scoring for V Sit Reach Test for Females

Level	Benchmark Score	Measurement (cm)
1	2	<14
2	4	15-16
3	6	17-19

4	7	20-21
5	8	22
6	9	23
7	10	>23

2.Partial Curl Up – 30 seconds How to Perform**:**

1.The subject lies on a cushioned, flat, clean surface with knees flexed, usually at 90 degrees, with hands straight on the sides (palms facing downwards) closer to the ground, parallel to the body.

2. The subject raises the trunk in a smooth motion, keeping the arms in position, curling up the desired amount (at least 6 inches above/along the ground towards the parallel strip).

3.The trunk is lowered back to the floor so that the shoulder blades or upper back touch the floor.

Infrastructure/Equipment Required:

Flat clean cushioned surface with two parallel strips (6 inches apart), Stopwatch Scoring: Record the maximum number of Curl ups in a certain time period 30 seconds.

Scoring for Partial Curl Up - 30 seconds Test for Males

Level	Benchmark Score	Numbers
1	2	<25
2	4	25-30
3	6	31-34
4	7	35-38
5	8	39-43
6	9	44-49

7	10	>49

Scoring for Partial Curl Up - 30 seconds Test for Females

Level	Benchmark Score	Numbers
1	2	**<18**
2	4	18-24
3	6	25-28
4	7	29-32
5	8	33-36
6	9	37-43
7	10	>43

3.Push Ups for Male/Modified Push Ups for Female

How to Perform:

1. A standard push up begins with the hands and toes touching the floor, the body and legs in a straight line, feet slightly apart, the arms at shoulder width apart, extended and at a right angle to the body.
2. Keeping the back and knees straight, the subject lowers the body to a predetermined point, to touch some other object, or until there is a 90-degree angle at the elbows, then returns back to the starting position with the arms extended.
3. This action is repeated, and the test continues until exhaustion, or until they can do no more in rhythm or have reached the target number of push-ups.
4. For female: push-up technique is with the knees resting on the ground.

Infrastructure/Equipment Required:

Flat clean cushioned surface/Gym mat

Scoring: Record number of correctly completed pushups.

Scoring for Push Ups for Male

Level	Benchmark Score	Numbers
1	2	<4
2	4	04- 10
3	6	11 -18
4	7	19-34
5	8	35-46
6	9	47-56
7	10	>56

Scoring for Modified Push Ups for Female

Level	Benchmark Score	Numbers
1	2	0-1
2	4	2 - 5
3	6	6 -10
4	7	11 - 20
5	8	21-27
6	9	27-35
7	10	>35

4. 2 Km Run/Walk

How to Perform:

1. Participants are instructed to run or walk 2 kms in the fastest possible pace.

2. The participants begin on signal (Starting point)- "ready, start". As they cross the finish line, elapsed time should be announced to the participants.

3. Walking is permitted but the objective is to cover the distance in the shortest possible time.

Infrastructure/Equipment Required:

Stopwatch, whistle, marker cone, lime powder, measuring tape, 200 or 400 m with 1.22 m (minimum 1 m) width preferably on a flat and even playground with a marking of starting and finish line. You can also use any application on your mobile phone that tells you the distance.

Scoring: Time taken for completion (Run or Walk) in min, sec.

Scoring for 2Km Run/walk for Male

Level	Benchmark Score	Minutes: Seconds
1	2	> 11:50
2	4	10:42
3	6	09:44
4	7	08:59
5	8	08:33
6	9	07:37
7	10	<07:37

Scoring for 2Km Run/walk for Female

Level	Benchmark Score	Minutes: Seconds
1	2	>13:47
2	4	12:51

3	6	12:00
4	7	11:34
5	8	10:42
6	9	09:45
7	10	<09:45

Text Books

1. Foundations of Nutrition**,** Bhavana Sabarwal, Commonwealth Publishers, 1999.

2. Anatomy and Physiology in Health and Illness**,** Ross and Wilson, Waugh, A., & Grant, A., 2022.

Reference Books and Extended Learning

1. Fit to be Well: Essential Concepts, Thygerson, A. L., Thygerson, S. M., & Thygerson, J. S., Jones & Bartlett Learning, 2018.

2. Introduction to Physical Education, Fitness, and Sport**,** Siedentop, D., & Van der Mars, H., Human Kinetics, 2022.

3.ACSM's Resource Manual for Guidelines for Exercise Testing and Prescription, American College of Sports Medicine, Lippincott Williams & Wilkins, 2012.

4. Exercise Physiology: Energy, Nutrition and Human Performance, Katch, F. I., Katch, V. L., & McArdle, W. D., Lippincott Williams & Wilkins, 2010.

Course Code	26UCHUT128		
Course Name	LIFE SKILLS AND PROFESSIONAL COMMUNICATION		
Teaching Hours	L:0 T:0 P:30 SL:0	**Course Credits**	1
Continuous Internal assessment Marks	100	**Semester End Exam Marks**	0
Exam Hours	Nil	**Total Marks**	100
Course Type	HMC: Activity-based learning	**Course Category**	UC: Common Course (For all branches)
Prerequisites	None		

Preamble

This course focuses on developing students' personal, interpersonal, communication, and professional skills. It enhances self-awareness, teamwork, critical thinking, emotional intelligence, and effective communication, while preparing students to confidently meet academic, workplace, and career challenges.

Course Objectives

- To introduce the concepts of self-awareness, personal growth, and essential life skills.
- To enable students to develop effective communication and interpersonal skills.
- To develop students' ability to work effectively in groups and teams.
- To enhance critical thinking, problem-solving, and decision-making skills.
- To provide knowledge and strategies for developing emotional intelligence to handle academic, personal, and professional challenges.
- To establish professional skills and workplace competencies aligned with industry expectations.

Course Outcomes (COs)

CO#	CO Statement	Knowledge Level
CO1	Demonstrate self-awareness, emotional intelligence, and essential life skills to foster personal growth, build positive relationships, and adapt effectively to academic, personal, and professional environments.	K2
CO2	Collaborate effectively in diverse groups and teams by demonstrating interpersonal skills, leadership, responsibility and respect for diversity.	K3
CO3	Apply critical thinking, problem-solving, and decision-making skills to analyze situations and identify appropriate solutions.	K4

CO4	Demonstrate basic workshop skills by performing simple mechanical operations such as measuring, marking, cutting, drilling, and welding while following safe working practices.	K3
CO5	Integrate life skills, communication skills, and professional competencies by applying effective listening, speaking, reading, and writing skills to communicate clearly and confidently and address personal, academic, and workplace challenges effectively.	K4

Course Articulation Matrix

CO-PO-PSO Mapping

	PROGRAM OUTCOMES											PSOs		
CO #	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
CO1	-	-	-	-	-	-	2	2	2		3	-	-	-
CO2	-	-	-	-	-	-	2	3	2	2	2	-	-	-
CO3	-	2	-	-	-	-	-	-	-	1	2	-	-	-
CO4	2	-	-	-	1	-	2	2	-	-	1	-	-	-
CO5	-	-	-	-	-	-	1	2	3	2	2	-	-	-
Avg	**2**	**2**	**-**	**-**	**1**	**-**	**1.75**	**2.25**	**2.33**	**1.67**	**2**	-	-	-

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Course Syllabus

Module: 1	**Contact Hours:6**
Overview of Life Skills, Life Skills for professionals, Self-Awareness, Communication Skills, Empathy, Self-Reflection report, Identify their own goal, Role Storming, Online personality test, Creativity, Mind Map, Personality Development.	

Module: 2	**Contact Hours: 6**
Effective Communication, Interpersonal relationship, Group Formation, Getting Acquainted in a Group, Group Discussion, Six Thinking Hats, Debate, Team Work, Leadership, Time Management, Cooperation and Commitment, Stress Management, Gratitude Training	

Module: 3	**Contact Hours: 6**
Critical and Creative Thinking, Problem Solving, Decision Making, Prepare a Presentation, Activities to improve English vocabulary, Basic English Grammar, Activities to identify errors in English language usage, TED Talks, Composing Emails and letters, Drafting Reports	

Module: 4	**Contact Hours: 12**
LinkedIn profile creation, Resume Preparation, Know Yourself, Mock Interview Lab Activities: Hands on session on day to day engineering skills and a self-reflection report on the experienced gained- Drilling, Cutting, Filing, finishing and smoothening using electrically operated hand grinders, MS Rod cutting, Handling different types of measuring instruments, Welding MS,SS work pieces, Pipe Bending, Water Tap fitting, Foot Valve fitting practices	

Continuous Internal Assessment (CIA)

Classroom Activities to learn Communication Skills [CA]	**Group Discussion/ Debate [GD]**	**Presentation Skills [PPT]**	**Portfolio/Lab Report [PTF/LR]**	**Total** **CA+GD+PPT+LR/PTF**
20	30	20	30	100

Suggested Classroom Activities:

- Group formation, self-introduction, and personality assessment with self-reflection.
- Role storming, goal setting, and mind mapping for personal and professional development.
- Group discussions, debates, and presentations on life skills.
- Activities to develop teamwork, leadership, time management, cooperation, and commitment.
- Stress management and gratitude training to enhance emotional well-being.
- Critical thinking, creative thinking, problem-solving, and decision-making activities.
- English language enhancement through vocabulary, grammar, TED Talk reviews, email/letter writing, and technical report preparation.
- Career readiness activities including LinkedIn profile creation, resume preparation, self-assessment, and mock interviews.
- Hands-on engineering skill sessions covering basic workshop practices such as measuring, drilling, cutting, filing, welding, pipe bending, and fitting.
- Independent learning through online certification courses, self-improvement reading, reflective journaling, educational videos, presentation practice, and current affairs to promote continuous personal, professional, and technical growth.

Text Books

- Life Skills for Engineers, Compiled, ICT Academy of Kerala, McGraw Hill Education(India)Private Ltd.,2016.
- Personality Development and Soft Skills, Barun K Mitra, , Oxford Publishers,2011.
- Life Skills, R Gopalakrishnan, McGraw Hill Education, 2015.

Reference Books and Extended Learning

- NPTEL video repository: https://nptel.ac.in/courses/109107121
- NPTEL video repository: https://nptel.ac.in/courses/109104107