CHRIST COLLEGE OF ENGINEERING
IRINJALAKUDA (AUTONOMOUS)

DEPARTMENT OF
ELECTRICAL & ELECTRONICS ENGINEERING

B. Tech – 2026

SEMESTER – S1

FIRST SEMESTER: Electrical and Electronics Engineering														
10 Days Compulsory Induction Program and Universal Human Values														
Sl. No:	Slot	Course Code	Course Type	Course Category	Course Title (Course Name)	Credit L	Credit T	Credit P	Credit R	SS	Total CIA	Total ESE	Credits	Hrs./Week
THEORY														
1	A	G26MAE101	BS	GC	Linear Algebra & Calculus with Simulation Lab	2	1	2	0	4.5	40	60	4	5
2	B	G26PHE202	BS	GC	Engineering Physics	2	1	2	0	4.5	40	60	4	5
3	C	G26MHT104	ES	GC	Engineering Mechanics	3	1	0	0	5	40	60	4	4
4	D	G26ELT108	ES	GC	Basics of Electrical and Electronics Engineering	4	0	0	0	6	40	60	4	4
5	E	G26ATE110	ES	CC	Algorithmic thinking with Python	2	0	2	0	4	40	60	3	4
PRACTICALS														
6	G	G26EWP112	ES	GC	Electrical and Electronics Workshop Practice	0	0	2	0	1	50	50	1	2
7	H	A26AEE115	HM	CC	Applied English for Communication	2	0	0	0	3	50	-	2	2
8	I	A26EDR113	SE	CC	Engineering Design and Innovation Studio (EDIS-I)	0	0	0	2	2	50	-	1	2
MANDATORY NON-CREDIT COURSES														
9	J	A26HWP114	MC	CC	Health and Wellness	1	0	1	0	2	50	-	Pass /Fail	2
ACTIVITY POINT PROGRAMME														
10	-	A26APP116	MC	CC	Activity Point Programme[$]								0	-
Total										**32**			**23**	**30**

- L-T-P-R = Lecture – Tutorial – Practical - Project
- SS (Self Study) Hours = 1.5*L+0.5*T+0.5*P+R
- CIA = Continuous Internal Assessment, and ESE = End Semester Examination

[$] **Activity Points:** Students are required to acquire a minimum of 120 activity points, with at least 40 points per group, to fulfil the curriculum requirement of 3 activity credits. At the end of 6th semester, the students are required to earn the minimum number of activity points from the AICTE mandated activity point programme to qualify for the award of B. Tech degree.

SEMESTER 1

LINEAR ALGEBRA AND CALCULUS WITH SIMULATION LAB

Programme: Common for All	**Scheme**: 2026
Course Name: Linear Algebra and Calculus with Simulation Labs	**Course code**: G26MAE101
Teaching Hours Per Week: (2:1:2:0)	**Credits**: 4
Prerequisites: None	**Course Type:** Lab Embedded Theory

Course Objective:

- To equip students with a strong foundation in Linear Algebra and Calculus, enabling them to apply mathematical concepts in the context of engineering disciplines.
- To develop students' ability to use computational tools such as MATLAB for solving and visualising mathematical problems relevant to engineering.

SYLLABUS

Module	SYLLABUS DESCRIPTION	CONTACT HOURS
I	**Linear Algebra** Rank of a matrix, Solution of linear system of equations, Gauss Elimination, Eigen value and Eigen vectors, Diagonalization, Cayley Hamilton Theorem (without proof), LU Decomposition. **Experiments:** 1. Computation of the Rank of a Matrix and Solution of a System of Linear Equations Using Matrix Operations 2. Solution of Linear Systems Using the Gauss Elimination Method 3. Computation of Eigenvalues and Eigenvectors of a Matrix and Verification of the Eigenvalue Equation $Ax=\lambda x$ 4. Diagonalization of a Matrix Using Eigenvalue Decomposition and Verification of Matrix Reconstruction $A=PDP^{-1}$ 5. Verification of the Cayley–Hamilton Theorem and LU Decomposition of a Matrix for Solving Linear Systems	12
II	**Multivariable Calculus** Partial derivatives, Partial derivatives of functions of two variables, Partial derivatives viewed as rates of change and slopes, Local linear approximation, The Chain rule, The Chain Rule of Partial derivatives, Maxima and Minima of functions of two variables (Finding relative extrema). **Experiments:** 1. Computation and Evaluation of Partial Derivatives of Functions of	12

	Two Variables 2. Visualization of Functions of Two Variables Using Surface and Contour Plots 3. Interpretation of Partial Derivatives as Slopes and Rates of Change and Determination of the Tangent Plane (Local Linear Approximation) 4. Verification of the Chain Rule for Composite Functions 5. Finding Critical Points and Classifying Relative Maxima and Minima Using the Second Derivative Test	
III	**Multiple Integral** Double integrals, Reversing the order of integration in double integrals,Evaluating areas using Double integrals, Finding volumes using double integration, Triple integrals, Volume calculated as triple integral. **Experiments:** 1. Evaluation and Verification of Double Integrals Using MATLAB 2. Calculation and Visualization of Area of Plane Regions Using Double Integrals 3. Calculation of Volume Under a Surface Using Double Integrals 4. Evaluation of Triple Integrals and Volume Computation of Solids with Visualization of Three-Dimensional Integration Regions 5. Comparison of Analytical and Numerical Integration Results and Applications of Multiple Integrals to Area and Volume Computation Problems	12
IV	**Series representation of Functions** Taylor Series (without proof), Maclaurin Series, Fourier series, Euler formulas,Fourier series of 2π periodic functions,Fourier series of $2l$ periodic functions,Half range sine series expansion, Half range cosine series expansion. **Experiments:** 1. Computation and Visualization of Taylor and Maclaurin Series Expansions of Functions 2. Visualization of Taylor/Maclaurin Series Approximations Using Different Numbers of Terms 3. Verification of Euler's Formula Using MATLAB 4. Computation and Visualization of Fourier Series of 2π-Periodic Functions 5. Half-Range Sine and Cosine Series Expansions and Analysis of Fourier Series Convergence	12

Course Assessment Method (CIE: 40 Marks, ESE: 60 Marks)

Continuous Internal Evaluation Marks (CIE):

Continuous Assessment	**Internal Examination-I(Written)**	**Internal Examination-II(Written)**	**Internal Examination-III(Written)**	**Internal Lab Examination**	**Total**
10	30	30	30	**10**	**40**
	Total 90 marks scaled to 20				

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions.

Part A	Part B	Total
• 2 questions from each module. • Total of 8 questions, each carrying 3 marks **(8 x 3 = 24 Marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4 x 9 = 36 Marks)**	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

CO No.	Description	Blooms KL
CO1	Apply the concepts of matrices, rank, eigenvalues, and eigenvectors to solve systems of linear equations and related engineering problems.	3
CO2	Compute partial derivatives, apply the chain rule, and determine maxima and minima of multivariable functions.	3
CO3	Analyze multivariable functions using partial derivatives, chain rule, and critical point analysis to determine extrema and behavior of functions.	4
CO4	Represent periodic functions using Fourier series, including half-range sine and cosine expansions, and apply Taylor and Maclaurin series.	3
CO5	Apply MATLAB tools to solve calculus problems and visualize mathematical functions.	

Note: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyse, K5 – Evaluate, and K6 – Create

CO-PO MAPPING MATRIX

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	3	3	2	1	1								
CO 2	3	3	2	1	1								
CO 3	3	3	2	1	1								
CO 4	3	3	2	1	1								

CO 5	3	3	2	2	3				1	1			

Text Books

Sl. No.	Title of the Book	Name of the Author(s)	Publisher & Edition
1	Calculus	H. Anton, I. Biven, S. Davis	Wiley, 10th Edition, 2015
2	Advanced Engineering Mathematics	Erwin Kreyszig	John Wiley & Sons, 10th Edition, 2016

Reference Books

Sl. No.	Title of the Book	Name of the Author(s)	Publisher & Edition
1	Essential Calculus	J. Stewart	Cengage, 2nd Edition, 2017
2	Calculus and Analytic Geometry	G.B. Thomas and R.L. Finney	Pearson, 9th Edition, Reprint 2002
3	Advanced Engineering Mathematics	Peter V. O'Neil	Cengage, 7th Edition, 2012
4	Engineering Mathematics for first year	Veerarajan T.	Tata McGraw-Hill, New Delhi, 2008
5	Higher Engineering Mathematics	B.S. Grewal	Khanna Publishers, 36th Edition, 2010

Video Links (NPTEL, SWAYAM, etc.)

Module No.	Link
All	https://nptel.ac.in/courses/111104125 (Calculus of Several Real Variables – IIT Kanpur)
1	https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/ (Linear Algebra – MIT OpenCourseWare)

Module 1

1. Computation of the Rank of a Matrix and Solution of a System of Linear Equations

- Compute the rank of a matrix.
- Determine the consistency of a system of equations.
- Solve linear systems using MATLAB matrix operations.

2. Solution of Linear Systems Using the Gauss Elimination Method

- Implement the Gauss Elimination algorithm.
- Solve systems of linear equations.

- Compare results with MATLAB built-in functions.

3. Computation of Eigenvalues and Eigenvectors and Verification of $Ax=\lambda x$

- Compute eigenvalues and eigenvectors.
- Verify the eigenvalue equation for each eigenpair.

4. Diagonalization of a Matrix Using Eigenvalue Decomposition

- Diagonalize a matrix.
- Verify matrix reconstruction using $A=PDP^{-1}$

5. Verification of the Cayley–Hamilton Theorem and LU Decomposition

- Verify the Cayley–Hamilton theorem for a given matrix.
- Perform LU decomposition and use it to solve linear systems.

Module 2

1. Computation and Evaluation of Partial Derivatives of Functions of Two Variables

- Compute first- and higher-order partial derivatives.
- Evaluate partial derivatives at specified points.

2. Visualization of Functions of Two Variables Using Surface and Contour Plots

- Generate 3D surface plots.
- Generate contour plots and interpret level curves.

3. Interpretation of Partial Derivatives and Determination of the Tangent Plane

- Interpret partial derivatives as slopes and rates of change.
- Determine and visualize the tangent plane (local linear approximation) to a surface.

4. Verification of the Chain Rule for Composite Functions

- Compute derivatives directly and using the chain rule.
- Verify the equivalence of the two results.

5. Finding and Classifying Critical Points of Functions of Two Variables

- Determine critical points.
- Find relative maxima and minima.
- Classify critical points using the second derivative test.

Module 3

1. **Evaluation and Verification of Double Integrals**

- Evaluate double integrals using MATLAB.
- Verify results by reversing the order of integration.

2. **Calculation and Visualization of Area of Plane Regions Using Double Integrals**

- Compute the area of a plane region.
- Visualize the integration region.

3. **Calculation of Volume Under a Surface Using Double Integrals**

- Evaluate volumes bounded by surfaces using double integrals.

4. **Evaluation and Visualization of Triple Integrals for Volume Computation**

- Evaluate triple integrals using MATLAB.
- Compute the volume of solids.
- Visualize three-dimensional integration regions.

5. Comparison of Analytical and Numerical Integration Results and Applications of Multiple Integrals

- Compare symbolic and numerical integration results.
- Apply double and triple integrals to practical area and volume computation problems.

Module 4

1. **Computation and Visualization of Taylor and Maclaurin Series Expansions of Functions**

- Compute Taylor and Maclaurin series of standard functions.
- Compare the original function with its series approximation.

2. Visualization of Taylor/Maclaurin Series Approximation Using Different Numbers of Terms

- Study the effect of increasing the number of terms on approximation accuracy.

3. Verification of Euler's Formula Using MATLAB

- Verify Euler's formula and explore its applications to complex exponentials.

4. Computation and Visualization of Fourier Series of Periodic Functions

- Compute Fourier series coefficients for 2π2\pi2π-periodic and 2l2l2l-periodic functions.
- Construct and visualize Fourier series approximations.

5. Half-Range Fourier Series Expansions and Convergence Analysis

- Compute half-range sine and cosine series expansions.
- Compare original functions with their Fourier series approximations.
- Visualize Fourier series convergence using increasing numbers of terms.

SEMESTER S1

ENGINEERING PHYSICS

Course Code	G26PHE202	**CIE Marks**	40
Teaching Hours/Week (L:T:P:R)	2: 1 : 2 : 0	**ESE Marks**	60
Credits	4	**Exam Hours**	2 Hrs. and 30 Mins.
Prerequisites (if any)	None	**Course Type**	Theory + Lab

Course Objective:

1. To equip students with a strong foundation in the fundamentals of Physics, impart this knowledge within the context of Information Science disciplines, cultivate scientific attitudes and critical thinking skills, and enable students to integrate Physics concepts with their core Information Science programs.
2. To make students gain practical knowledge to correlate the theoretical studies and to develop practical applications of engineering.

SYLLABUS

Module	Content	Hours
I	**Electrical conductivity** 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.	9
II	**Quantum Mechanics** Introduction, Concept of uncertainty and conjugate observables (qualitative), Uncertainty principle (statement only), Application of uncertainty principle- Absence of electron inside 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 eigen values and normalized wave function, Quantum Mechanical Tunnelling (qualitative), Quantum Computing (qualitative).	9

III	**Semiconductor Physics** Intrinsic semiconductor, Derivation of density of electrons in conduction band and density of holes in valence band, Intrinsic carrier concentration, Variation of Intrinsic carrier concentration with temperature, Extrinsic semiconductor (qualitative). Formation of p-n junction, Fermi level in semiconductors-intrinsic and extrinsic, 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, I-V Characteristics of p-n junction	9
IV	**Optics and Photonics** Optic fibre-Principle of propagation of light, Types of fibres-Step index and Graded index fibres, Acceptance angle, Numerical aperture - Derivation, Optic fibre communication (block Diagram), Applications of optical fibres – Optic fibre sensors Photonic devices (Qualitative treatment only) - Photo detectors (Junction and PIN photodiodes), Solar cells-IV Characteristics, Efficiency, Light Emitting Diode, Applications	9

Course Assessment Method (CIE: 40 Marks, ESE: 60 Marks)

Continuous Internal Evaluation Marks (CIE):

<table>
<tr><th>Continuous Assessment</th><th>Internal Examination-I (Written)</th><th>Internal Examination-II (Written)</th><th>Internal Examination-III (Written)</th><th>Internal Lab Examination</th><th>Total</th></tr>
<tr><td rowspan="2">10</td><td>30</td><td>30</td><td>30</td><td rowspan="2">10</td><td></td></tr>
<tr><td colspan="3">Total 90 marks scaled to 20</td><td>40</td></tr>
</table>

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions.

Part A	Part B	Total
• 2 questions from each module. • Total of 8 questions, each carrying 3 marks **(8 x 3 = 24 Marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4 x 9 = 36 Marks)**	**60**

Course Outcomes (Cos)

At the end of the course students should be able to:

CO No.	Description	Blooms Knowledge Level (KL)
CO1	Analyse the behaviour of matter in atomic and subatomic level through the principles of quantum mechanics to perceive the microscopic processes in electronic devices.	3
CO2	Apply the basic theory of electrical conductivity and superconductivity to evaluate conductive materials in engineering for sustainable applications.	4
CO3	Apply the fundamentals of semiconductor physics to analyse material properties for producing clean energy.	3
CO4	Analyze the principles of optical fibers and photonic devices, and evaluate their applications in communication, medical, industrial, and clean energy systems.	4
CO5	Apply scientific principles in an engineering context, training students through hands-on learning to promote quality education.	4
CO6	Apply fundamental principles of physics to analyze and interpret experimental results using software tools and simple electronic assemblies.	4

Note: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyse, K5 – Evaluate, and K6 – Create

CO-PO MAPPING MATRIX

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PSO 1	PSO 2
CO1	3	2											
CO2	3	2											
CO3	3	2											
CO4	2	2											
CO5	2	2			3	3		3	3		2		
CO6	2	2		3	3	3		3	3		2		

Text Books

Sl. No.	Title of the Book	Name of the Author(s)	Name of the Publisher	Edition and Year
1	Engineering Physics	H K Malik and A K Singh	McGraw Hill	2nd Edition, 2017
2	Concepts of Modern Physics	Arthur Beiser	Tata McGraw Hill	6th Edition, 2003
3	A Textbook of Engineering Physics	MN Avadhanulu, P G Kshirsagar, TVS Arun Murthy	S. Chand	11th Edition, 2018

SEMESTER S1
ENGINEERING MECHANICS

Course Code	G26MHT104	**CIE Marks**	40
Teaching Hours/Week (L:T:P:R)	3:1:0:0	**ESE Marks**	60
Credits	4	**Exam Hours**	2 Hrs. and 30 Mins.
Prerequisites (if any)	None	**Course Type**	Theory

Course Objective:

1. To develop a fundamental understanding of engineering mechanics principles. (*Bloom's Levels: Remember, Understand, Apply*)
2. To analyze the motion of particles and rigid bodies using the principles of kinematics and kinetics. (*Bloom's Levels: Remember, Understand, Apply, Analyse*.)
3. To relate engineering mechanics concepts to real-world engineering (*Bloom's Levels: Remember, Understand*.)

SYLLABUS

Module No.	Description	Contact Hours
1	**Fundamentals of Statics:** Introduction to Engineering Mechanics – branches of mechanics, rigid body concept, scalars & vectors. Principle of superposition – Forces in space - Force systems: composition and resolution of forces in 2D and 3D. Moment of a force, couple, Varignon's theorem. Equilibrium of particles and rigid bodies – free body diagrams, equations of equilibrium. Support reactions of beams (point load and UDL).	14
2	**Friction and Properties of Surfaces:** Laws of friction – application to blocks, ladders, and wedges. Centroid of simple and composite areas. Moment of inertia – parallel and perpendicular axis theorems. Polar moment of inertia, radius of gyration, mass moment of inertia of ring, disc. Theorems of Pappus Guldinus (demonstration only)	14
3	**Dynamics of Particles and Rigid Bodies:** Kinematics of rectilinear translation - Kinetics – equations of motion - Newton's second law, D'Alembert's principle. Motion on horizontal and inclined planes, motion of connected bodies. Work-energy principle, impulse-momentum principle. Kinematics of curvilinear translation – equations of kinematics - Projectile motion using differential equations.	10
4	**Rotation:** kinematics of rotation- equation of motion for a rigid body rotating about a fixed axis –rotation under a constant moment **Vibrations:** Simple harmonic motion - free vibrations of single degree of freedom systems	10

	Advanced applications: Robotics, Vehicle dynamics, Biomechanics, Aerospace and Advanced materials. (Self-study topics for internal assessment only)	

Course Assessment Method
(CIE: 40 Marks, ESE: 60 Marks)

Continuous Internal Evaluation Marks (CIE):

Assignment (Activity based)	Internal Examination-I (Written)	Internal Examination-II (Written)	Internal Examination-III (Written)	Total
15	30	30	30	**40**
	Total 90 marks scaled to 25			

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions.

Part A	Part B	Total
• Total of 8 questions, 2 from each carrying 3 marks **(3 x 8 = 24 Marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(9 x 4 = 36 Marks)**	**60**

Course Outcomes (Cos)

At the end of the course students should be able to:

CO No.	Description	Blooms Knowledge Level (KL)
CO1	Apply the principles of rigid body mechanics and concepts of equilibrium to determine forces, moments, and reactions acting on bodies.	2,3
CO2	Analyze frictional force acting on bodies and determine the properties of plane areas.	3, 4
CO3	Analyze the motion of particles and rigid bodies using kinematic and kinetic principles.	3,4
CO4	Apply the principles of rotational dynamics and vibrations to determine the motion characteristics of rotating bodies and simple mechanical systems.	3
CO5	Relate engineering mechanics principles to advanced applications such as robotics, vehicle dynamics, biomechanics, and aerospace systems.	2,3

Note: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyse, K5 – Evaluate, and K6 - Create

CO – PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	–	–	–	–	–	–	–	–	–	3	–	–
CO2	3	3	–	–	–	–	–	–	–	–	–	3	–	–
CO3	3	3	–	–	–	–	–	–	–	–	–	3	–	–
CO4	3	3	–	–	–	–	–	–	–	–	–	3	–	–
CO5	3	_	–	–	–	–	–	3	3	–	–	3	–	–

Text Books

Sl. No.	Title of the Book	Name of the Author(s)	Name of the Publisher	Edition and Year
1	*Engineering Mechanics*	Timoshenko, S. & Young, D.H.	McGraw-Hill	3rd Edition, 2020
2	*Engineering Mechanics: Statics and Dynamics*	Hibbeler, R.C.	Pearson Education	14th Edition, 2010
3	*Engineering Mechanics: Statics and Dynamics*	Shames, I.H.	Prentice Hall of India	4th Edition 2002

Reference Books

Sl. No.	Title of the Book	Name of the Author(s)	Name of the Publisher	Edition and Year
1	*Engineering Mechanics: Statics and Dynamics*	J.L. Meriam & L.G. Kraige	Wiley.	6th Edition 2008
2	*Vector Mechanics for Engineers*	Beer, F.P. & Johnston, E.R.	Tata McGraw Hill	8th Edition 2019
3	*Introduction to Statics and Dynamics*	Ruina, A. & Pratap, R.	Oxford University Press.	2009
4	*A Textbook of Engineering Mechanics*	R.S. Khurmi	S. Chand	22nd Edition 2018

SEMESTER S1

BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Course Code	**G26ELT108**	**CIE Marks**	40
Teaching Hours/Week (L: T:P: R)	4:0:0:0	**ESE Marks**	60
Credits	4	**Exam Hours**	2 Hrs. 30 Min.
Prerequisites (if any)	None	**Course Type**	Theory

Course Objectives:

1. Develop an awareness on the fundamentals of electric power generation, transmission and distribution
2. Apply fundamental concepts and circuit laws to solve simple DC/AC electric circuits and compare the performance of AC and DC motors
3. To provide students with a fundamental understanding of passive, active electronic components and develop an understanding of communication systems, electronic instrumentation, and modern electronic technologies.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Generation of alternating voltages: - Faradays laws of Electromagnetic induction, Elementary Generator, Representation of ac voltage and currents, sinusoidal waveforms: frequency, period average, RMS values and form factor of waveform (Simple numerical problems based on sinusoidal waveforms) DC Circuits: Resistance in Series and Parallel, Ohms Law and Kirchhoff's laws, Voltage and current divider rule. Mesh analysis, Nodal analysis (Simple numerical problems) AC circuits: Purely resistive, inductive and capacitive circuits; Inductive and capacitive reactance, concept of impedance. (Simple numerical problems) Power in AC circuits – Power factor; active, reactive and apparent power in single phase system. (Simple numerical problems) Measuring the Current, voltage and power of simple DC circuits using MATLAB software	12

2	Generation of electrical energy: Conventional Sources: Hydro, thermal, nuclear plants (Block diagram description) Introduction to non-conventional energy sources: solar and wind Three phase AC systems: Three phase 3 wire and 4 wire systems, Transmission System, Distribution system: Feeder, distributor, service mains. Representation of three phase voltages; star and delta connections (balanced only), relation between line and phase voltages, line and phase currents, Power factor; active, reactive and apparent power in Three phase system. (Simple numerical problems) Transformers. Principle of operation, step-up and step-down transformers Types of Motors – Principle of Operation of DC motor: Block diagram showing power stages, losses and efficiency. Electric Vehicle - Block diagram representation. Types of motors used in Electric vehicles.	12
3	**Introduction to Electronic devices:** Passive and active components in electronics- Passive and active components in electronics- Resistors, Capacitors and Inductors(constructional features not required): types, specifications. Standard values, colour coding. 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, full wave and bridge rectifiers, ripple factor (with and without capacitor filters) Construction, working and V-I Characteristics of BJT, Input output characteristics of CE configuration, Comparison of CE, CB and CC configurations. Concept of biasing and load line Transistor as a switch, RC coupled amplifier - Circuit diagram and frequency response .	11
4	**Modern Electronics and its applications:**General block diagram of a Communication system, Concept of AM and FM (No derivation required), Block diagram of AM and FM super-heterodyne receiver, Basic concepts of Wired and Wireless communication, Block diagram of Fiber optic Communication system, Concept of Cell & cluster, Block diagram of GSM	10

	Comparison of 3G, 4G, 5G and 6G communication technologies Block diagrams of electronic instrumentation system, Digital Multimeter, Function generator Introduction to CRO and Lissajous patterns Applications of modern electronics – IoT based smart homes, healthcare and agriculture (Case study only).	

Course Assessment Method (CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Assignment	Internal Examination -1 (Written)	Internal Examination - 2 (Written)	Internal Examination - 3 (Written)	Total
15	30	30	30	40
	A total of 90 marks will be scaled to 25			

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks (8x3 =24marks)	• 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 (4x9 = 36 marks)	60

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)	WKs Addressed	SDGs
CO1	Apply fundamental concepts and circuit laws to solve simple DC and AC electric circuits and acquire a knowledge on circuit solving using MATLAB	**Analyze, Apply, Understand**	**1,2,3,4**	**7 and 9**
CO2	Develop an awareness on the fundamentals of electric power generation, transmission, distribution and electric vehicles	**Understand, Remember**	**1,3,4**	
CO3	Design basic electronic circuits with the knowledge of passive and active electronic components	**Apply, Understand**	**1,3,4**	
CO4	Distinguish the principles of various Communication systems, electronic instruments and apply knowledge of modern electronics to study case studies related to IoT applications in smart homes, healthcare and agriculture	**Understand, Remember**	**1,3,4**	
CO5	Design and Develop applications of modern electrical & electronics systems in contemporary world	**Create, Analyse, Apply**	**1,2,3,4**	

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO 1	PO2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2		2		2	2	2		3
CO2	3	2					2	2			3
CO3		2		2		2					2
CO4	2	2	2	2		2					2
CO5	3	3	3	3	3	3	3	3	3	3	3

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

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Basic Electrical Engineering	D P Kothari and I J Nagrath	Tata McGraw Hill	4th Edition 2019
2	Schaum's Outline of Basic Electrical Engineering	J.J.Cathey and Syed A Nasar	Tata McGraw Hill	3rd Edition 2010
3	Basic Electronics: Principles and Applications	Chinmoy Saha, Arindham Halder and Debarati Ganguly	Cambridge University Press	1st Edition, 2018

4	Basic Electrical and Electronics Engineering	D. P. Kothari and I. J. Nagrath	McGraw Hill	2nd Edition, 2020
5	The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World	Michael Miller	QUE	1st Edition, 2015
6	Basic Electronics and Linear Circuits	N N Bhargava D C Kulshreshtha and S. C. Gupta	McGraw Hill	2nd Edition, 2017
7	Electronic Communication Systems	Kennedy and Davis	McGraw Hill	6th Edition, 2017

Reference Books

Sl. No.	Title of the Book	Name of the Author(s)	Name of the Publisher	Edition and Year
1	Basic Electrical Engineering	D C Kulshreshtha	Tata McGraw Hill	2nd Edition, 2019
2	Electrical Engineering Fundamentals	Del Toro V	Pearson Education	2nd Edition, 2019
3	Basic Electrical Engineering	T. K. Nagsarkar, M. S. Sukhija	Oxford Higher Education	3rd Edition, 2017
4	Electronics: A Systems Approach	Neil Storey	Pearson	6th Edition, 2017
5	Electronic Devices and Circuit Theory	Robert L. Boylestad and Louis Nashelsky	Pearson	11th Edition 2015

Video Links (NPTEL, SWAYAM…)	
No.	**Link ID**
1	Electricity and Electrical Wiring - Course
2	EST130 Basic Electrical & Electronics Engineering syllabus overview

SEMESTER S1

ALGORITHMIC THINKING WITH PYTHON

Course Code	G26ATE110	CIE Marks	40
Teaching Hours/Week (L:T:P:R)	2:0:2:0	ESE Marks	60
Credits	3	Exam Hours	2 Hrs. and 30 Mins.
Prerequisites (if any)	None	Course Type	Theory + Lab

Course Objective:

1. To provide students with a thorough understanding of algorithmic thinking and its practical applications in solving real-world problems. To develop the ability to accurately interpret and understand engineering drawings.
2. To explore various algorithmic paradigms, including brute force, divide-and-conquer, dynamic programming, and heuristics, in addressing and solving complex problems.

SYLLABUS

Module No.	Description	Contact Hours
1	**Problem-Solving Strategies**: - Problem-solving strategies defined, Importance of understanding multiple problem-solving strategies, Trial and Error, Heuristics, Means-Ends Analysis, and Backtracking (Working backward). **The Problem-Solving Process:** - Understanding the problem, formulating a model, developing an algorithm, Writing the program, Testing the program, and evaluating the solution. Contemporary computational problem-solving applications. **Essentials of Python Programming:** - Creating and using variables in Python, Numeric and String data types in Python, Using the math module, Using the Python Standard Library for handling basic I/O - print, input, Python operators and their precedence.	7
2	**Algorithm and Pseudocode Representation:** - Meaning and Definition of Pseudocode, Reasons for using pseudocode, The main constructs of pseudocode - Sequencing, selection (if-else structure, case structure) and repetition (for, while, repeat-until loops). Sample problems. **Flowcharts:** - Symbols used in creating a Flowchart - start and end, arithmetic calculations, input/output operation, decision (selection), module name (call), for loop (Hexagon), flow-lines, on-page connector, off-page connector.	9

3	**Selection and Iteration Using Python:** - if-else, elif, for loop, range, while loop. Sequence data types in Python - list, tuple, set, strings, dictionary, Creating and using Arrays in Python (using Numpy library). **Decomposition and Modularization*:** - Problem decomposition as a strategy for solving complex problems, Modularization, Motivation for modularization, Defining and using functions in Python, Functions with multiple return values **Recursion:** - Recursion Defined, Reasons for using Recursion, The Call Stack, Recursion and the Stack, Avoiding Circularity in Recursion, Sample problems.	10
4	**Computational Approaches to Problem-Solving:** Brute-force Approach, Divide-and-conquer Approach, Dynamic Programming Approach, Greedy Algorithm Approach, Randomized Approach.	10

Course Assessment Method
(CIE: 40 Marks, ESE: 60 Marks)

Continuous Internal Evaluation Marks (CIE):

Continuous Assessment	Internal Examination-I (Written)	Internal Examination-II (Written)	Internal Examination-III (Written)	Internal Lab Examination	Total
10	30	30	30	10	**40**
	A total of 90 marks will be scaled to 20				

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions.

Part A	Part B	Total
● 2 questions from each module. ● Total of 8 questions, each carrying 3 marks **(8 x 3 = 24 Marks)**	● Each question carries 9 marks. ● Two questions will be given from each module, out of which 1 question should be answered. ● Each question can have a maximum of 3 sub divisions. **(4 x 9 = 36 Marks)**	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

CO No.	Description	Blooms Knowledge Level (KL)
CO1	Utilize computing as a model for solving real-world problems.	2
CO2	Articulate a problem before attempting to solve it and prepare a clear and accurate model to represent the problem.	2, 3
CO3	Utilize effective algorithms to solve formulated models and translate algorithms into executable programs.	2, 3
CO4	Interpret problem-solving strategies, a systematic approach to solving computational problems, and essential Python programming skills.	2, 3
CO5	Design and implement a mini-project using algorithmic and problem-solving strategies to address real-world sustainability challenges.	2, 3

Note: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyse, K5 – Evaluate, and K6 – Create

CO-PO Mapping Table

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2									2	2	
CO2	2	3	2		1						2	2	1
CO3	2	3		2	2						2	2	2
CO4	2	2	3		2						2	2	2
CO5	2	3	2	2	2						2	2	2

Text Books

Sl. No.	Title of the Book	Name of the Author(s)	Name of the Publisher	Edition and Year
1	Problem solving & programming concepts	Maureen Sprankle, Jim Hubbard	Pearson	9th Edition, 2011
2	Python for Everyone	Cay S. Horstmann, Rance D. Necaise	Wiley	3rd Edition, 2024

Reference Books

Sl. No.	Title of the Book	Name of the Author(s)	Name of the Publisher	Edition and Year
1	How to Solve It: A New Aspect of Mathematical Method	George Pólya	Princeton University Press	2nd Edition, 2015
2	Creative Problem Solving: An Introduction	Donald Treffinger., Scott Isaksen, Brian Stead-Doval	Prufrock Press	4th Edition, 2005
3	Psychology (Sec. Problem Solving.)	Spielman, R. M., Dumper, K., Jenkins, W., Lacombe, A., Lovett, M., & Perlmutter, M	H5P Edition	1st Edition, 2021
4	Computational Thinking: A Primer for Programmers and Data Scientists	G Venkatesh Madhavan Mukund	Mylspot Education Services Pvt Ltd	1st Edition, 2020
5	Computer Arithmetic Algorithms	Koren, Israel	AK Peters/CRC Press	2nd Edition, 2001
6	Introduction to Computation and Programming using Python	Guttag John V	PHI	2nd Edition, 2016

Video Links (NPTEL, SWAYAM, etc.)

Module No.	Link
1	https://opentextbc.ca/h5ppsychology/chapter/problem-solving/
2	https://onlinecourses.nptel.ac.in/noc21_cs32/preview

Continuous Assessment (10 Marks)

Accurate Execution of Programming Tasks

- Correctness and completeness of the program
- Efficient use of programming constructs
- Handling of errors.
- Proper testing and debugging

Evaluation Pattern for Lab Examination (10 Marks)

1. Algorithm (2 Marks)

Algorithm Development: Correctness and efficiency of the algorithm related to the question.

2. Programming (3 Marks)

Execution: Accurate execution of the programming task.

3. Result (3 Marks)

Accuracy of Results: Precision and correctness of the obtained results.

4. Viva Voce (2 Marks)

Proficiency in answering questions related to theoretical and practical aspects of the subject.

Laboratory Experiments

1. Simple desktop calculator using Python supporting the five basic arithmetic operators.
2. Program to create, concatenate, print a string, and access a substring from a given string.
3. Program to display time and date in various formats.
4. Program to create, append, and remove elements from lists in Python using NumPy.
5. Program to find the largest of three numbers.
6. Program to convert temperature values between Celsius (℃) and Fahrenheit (F). Formula: ℃/5 = (F-32)/9
7. Program to construct star (*) patterns using nested for loops.
8. Program to print all prime numbers less than N.
9. Program to find the factorial of a number using recursion.
10. Recursive function to add two positive numbers.
11. Recursive function to multiply two positive numbers.
12. Recursive function to find the Greatest Common Divisor (GCD) of two positive numbers.
13. Program to determine whether a triangle is a right triangle using functions, based on the lengths of its three sides.
14. Program to define a module for generating Fibonacci numbers and import the module into another program.
15. Program to validate a mobile number using functions.
    Validation Rules:
    - The number must contain exactly 10 digits.
    - The first digit must be 7, 8, or 9.
16. Program to merge two user-input lists into a third list such that:
    - All even numbers appear first in sorted order.
    - All odd numbers appear next in sorted order.
17. Program to implement the Sticks Game:
    - Initially, 16 sticks are available.
    - Two players take turns.
    - A player may pick 1, 2, or 3 sticks in a turn.
    - The player who picks the last stick loses.
18. Program to simulate the Monty Hall Problem and analyze whether switching doors increases the probability of winning.

SEMESTER S1

Electrical and Electronics Workshop Practice

Course Code	G26EWP112	**CIE Marks**	50
Teaching Hours/Week (L: T:P: R)	0:0:2:0	**ESE Marks**	50
Credits	1	**Exam Hours**	NA
Prerequisites (if any)	None	**Course Type**	Lab

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

SYLLABUS

Expt. No.	Experiments
	Electrical Engineering Experiments
1	a) Demonstrate the precautionary steps adopted in case of Electrical shocks. b) Identify different types of cables, wires, switches, fuses, fuse carriers, MCB, ELCB and MCCB, familiarize the ratings.
2	Wiring of a simple light circuit for light/ fan point (PVC conduit wiring) and a 6A plug socket with individual control.
3	Wiring of light/fan circuit using two-way switches. (Staircase wiring)
4	Wiring of fluorescent lamp and a power plug (16 A) socket with a control switch.
5	Wiring of power distribution arrangement using single phase MCB distribution board with ELCB, main switch and Energy meter.
6	Familiarization 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
7	Familiarization of rheostats, measurement of potential across resistance elements and introducing the concept of relative potential using a DC circuit.
8	a) Identify battery specifications using different types of batteries. (Lead acid, Li Ion, NiCd

	etc.) b) Familiarize different types of earthing (Pipe, Plate Earthing, Mat Schemes) and ground enhancing materials (GEM).
9	Resistance measurement using Voltmeter and Ammeter Method, using Multimeter.
10	Verification of Kirchhoff's Voltage and Kirchhoff's Current laws in simple DC circuits.
Electronics Engineering Experiments	
11	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.)
12	Drawing of electronic circuit diagrams using BIS/IEEE symbols and Interpret data sheets of discrete components and IC's
13	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.
14	Testing of electronic components using multimeter - Resistor, Capacitor, Diode, Transistor and JFET.
15	Printed circuit boards (PCB) - Types, Single sided, Double sided, PTH, Processing methods. Design and fabrication of a single sided PCB for a simple circuit.
16	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.
17	Assembling of electronic circuit/system on Bread Board , 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.
18	Assembling of electronic circuits using SMT (Surface Mount Technology) stations.
19	Introduction to EDA tools (such as KiCad or XCircuit)
20	Measurement of variables voltage, current, time period, frequency using CRO and DSO

Course Assessment Method

(CIA: 50 Marks, ESE: 50 Marks)

Continuous Internal Assessment (CIA):

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

End Semester Examination (ESE):

Procedure/Preparatory work/Design/Algorithm	Conduct of Experiment/ Execution of work/troubleshooting/ Programming	Result with valid inference/ Quality of Output	Viva Voce	Record	Total Marks
10	20	5	10	5	50

Course Outcomes (COs)

At the end of the course students should be able to:

	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Identify and familiarize various electrical components.	**K2**
CO2	Identify and familiarize various electronic components.	**K2**
CO3	Illustrate the connection diagram and identify the suitable accessories necessary for wiring simple electric circuits.	**K3**
CO4	Apply the design procedure of simple electronic circuits on breadboard, PCB and Operate various measuring instruments to take measurements of circuit parameters.	**K3**
CO5	Design and interpret basic circuit diagrams and translate them into physical layouts for prototyping and testing	**K3**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2									
CO2	2	2									
CO3	3	2									
CO4	3	2			2						
CO5	3	2			2	2		3	3	2	2

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

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Electrical Design Estimating and Costing	K B Raina and S K Bhattacharya	New Age International Publishers	2/e 2024
2	Electrical Systems Design	M K Giridharan	I K International Publishing House Pvt. Ltd	3/e 2022
3	Basic Electrical Engineering	D P Kothari and I J Nagrath	Tata McGraw Hill	4/e 2019
4	Basic Electronics and Linear Circuits	NN Bhargava, D C Kulshreshtha and S C Gupta	Mc Graw Hill	2/e 2017

SEMESTER S1
HEALTH AND WELLNESS

Course Code	A26HWP114	**CIE Marks**	50
Teaching Hours/Week (L:T:P:R)	1:0:1:0	**ESE Marks**	0
Credits	Nil	**Exam Hours**	Nil
Prerequisites (if any)	None	**Course Type**	Theory and Practical

Course Objective:

1. To provide essential knowledge on physical activity, health, and wellness.
2. To ensure students understand body systems, exercise principles, nutrition, mental health, and disease management.
3. To educate students on the benefits of yoga, the risks of substance abuse and basic first aid skills.
4. To equip students with the ability to lead healthier lifestyles.
5. To enable students to design effective and personalized exercise programs.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Human Body Systems related to Physical activity and its 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, Vigorous -intensity physical activity. Defining Physical Activity, Aerobic Physical Activity, Anaerobic Physical Activity, Exercise and Health-Related Physical Fitness. FITT principle to design an Exercise programme Components of Health-related Physical Fitness: - Cardiorespiratory Fitness- Muscular strength- Muscular endurance- Flexibility- Body composition.	4
2	Concept of Health and Wellness: Health and wellness differentiation, Factors affecting health and wellness. Mental health and Factors affecting mental health. Sports and Socialization: Sports and character building - Leadership through Physical Activity and Sports Diet and nutrition: Exploring Micro and Macronutrients: Concept of Balanced diet, Carbohydrate & the Glycemic Index Animal & Plant - based Proteins and their Effects on Human Health Dietary Fats & their Effects on Human Health Essential Vitamins and Minerals	2

3	Lifestyle management strategies to prevent / manage common hypokinetic diseases and disorders - Obesity - cardiovascular diseases (e.g., coronary artery disease, hypertension) - Diabetes - Osteoporosis - Musculoskeletal disorders (e.g., osteoarthritis, Low back pain, Kyphosis, lordosis, flat foot, Knock knee) Meaning, Aims and objectives of yoga - Classification and importance of of Yogic Asanas (Sitting, Standing, lying) Pranayama and Its Types - Active Lifestyle and Stress Management Through Yoga Understanding on substance abuse and addiction - Psychoactive substances & its ill effects- Alcohol- Opioids- Cannabis -Sedative - Cocaine -Other stimulants, including caffeine -Hallucinogens - Tobacco -Volatile solvents.	4
4	First aid and principles of First Aid: Primary survey: ABC (Airway, Breathing, Circulation). Qualities of a Good First Aider First aid measures for: - Cuts and scrapes - Bruises - Sprains - Strains - Fractures - Burns - Nosebleeds. First Aid Procedures: Cardiopulmonary Resuscitation (CPR) - Heimlich Maneuver - Applying a sling Sports injuries: Classification (Soft Tissue Injuries - Abrasion, Contusion, Laceration, Incision, Sprain & Strain**)**	2

Additional Topics

- Need and Importance of Physical Education and its relevance in interdisciplinary context. Understanding of the Endocrine System
- Developing a fitness profile
- Healthy foods habits for prevention and progression of Lifestyle Diseases. Processed foods and unhealthy eating habits.
- Depression - Anxiety - Stress
- Different ways of carrying an injured person. Usage of Automated external defibrillator

Course Assessment Method
(CIE: 40 Marks)

Continuous Internal Evaluation Marks (CIE):

Activity Evaluation	Case Study/Micro project/Presentation	Total
25	25	50

Course Outcomes (Cos)

At the end of the course students should be able to:

CO No.	Description	Blooms Knowledge Level (KL)
CO1	Explain the different human body systems and describe various types of physical activities along with methods to measure and quantify these activities	2
CO2	Explain how to maintain or improve health and wellness through psychological practices, dietary habits, and sports activities.	2
CO3	Discuss about common hypokinetic disorders and musculoskeletal disorders, and describe the importance of leading a healthy lifestyle through the practice of yoga and abstaining from addictive substances.	2
CO4	Explain the basics of first aid and describe common sports injuries	2
CO5	Demonstrate endurance through physical activity	3

Note: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyse, K5 – Evaluate, and K6 – Create

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1				2		3	3	3	2		2
CO2				2		3	2	2			2
CO3				0		3	3				2
CO4				2		3					2
CO5				2		3	3	3			2

Text Books

Sl. No.	Title of the Book	Name of the Author(s)	Name of the Publisher	Edition and Year
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

Sl. No.	Title of the Book	Name of the Author(s)	Name of the Publisher	Edition and Year
1	Fit to be Well Essential Concept	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	Substance Use Disorders. Manual for Physicians.	Lal, R., & Ambekar, A. (2005).	National Drug Dependence Treatment Centre, New Delhi	2005
4	The exercise health connection-how to reduce your	Nieman, D. C., & White, J. A	Public Health	1998

	risk of disease and other illnesses by making exercise your medicine.			
5	ACSM's resource manual for guidelines for exercise testing and prescription.	Lippincott Williams & Wilkins.	American College of Sports Medicine.	2012
6	Exercise Physiology: energy, nutrition and human performance.	Katch, F. I., Katch, V. L., & McArdle, W. D.	Lippincott Williams & Wilkins	2010

Continuous Internal Evaluation Marks (CIE): for the Health and Wellness Course

Students will be evaluated as follows,

Title	Method of Evaluation
Activity Evaluation	It will be evaluated based on the Fitness Protocols and Guidelines for ages 18+ to 65 years, as set forth by FIT India. Measurements will be taken for all the tests of the FIT India Fitness Protocol and the evaluation will be based on the benchmark score received for the following tests: 1. V Sit Reach Test 2. Partial Curl Up - 30 seconds 3. Push Ups (Male) and Modified Push Up (Female) 4. Two (2) Km Run/Walk Students who achieve a total benchmark score of 8 across the aforementioned 4 tests will be awarded pass marks for activity evaluation. Students who score better will be awarded a maximum mark of 20.
Case Study/Micro project/Presentation	Case studies will be given to students to assess their understanding of the subjects taught. Students will be required to make presentations on the subjects taught in class, and their understanding of the subjects will be assessed. Based on the case studies, micro projects, and Presentations the students will be awarded marks out of 30.
Activity Evaluation – Special Circumstances	Physically challenged and medically unfit students can opt for an objective test to demonstrate their knowledge of the subjects taught. Based on their performance in the objective test, they will be awarded marks out of 20.
Activity Evaluation - Special Considerations - NCC	Students who enrolled themselves in the NCC during the course period (between the start and end dates of the program) and attended 5 college level parades will be awarded pass marks for activity evaluation. Students who attend more parades will be eligible for a maximum mark of 20 based on their parade attendance.

SEMESTER S1
APPLIED ENGLISH FOR COMMUNICATION

Course Code	A26AEE115	**CIE Marks**	50
Teaching Hours/Week (L:T:P:R)	2:0:0:0	**ESE Marks**	0
Credits	2	**Exam Hours**	Nil
Prerequisites (if any)	None	**Course Type**	Theory and Practical

Course Objective:

1. Develop English language proficiency for academic, professional, and social contexts.
2. Adopt a task-based and application-oriented approach to learning.
3. Enhance listening, speaking, reading, and writing skills with emphasis on technical and professional communication.
4. Build communicative confidence and promote ethical academic practices.
5. Foster essential life skills required for higher education and employability.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	**Foundations of English, Technical Communication, and Academic Reading** **Core Topics** • Significance of English in academic and professional environments. • Formal and informal communication; professional self-introduction. • Vocabulary development - technical vocabulary, formal emails, letters, and reports. • Paraphrasing, synonyms, sequence words, and commonly misused/misspelled words. • Effective email communication and introductory slide presentation skills. • Modern research and study skills with emphasis on academic integrity and plagiarism awareness. **Academic Reading Skills** • Reading styles: skimming, scanning, intensive reading, and critical reading.	17

	• Comprehending technical and non-technical texts — identifying main ideas, supporting details, and transitions. • Study strategies: SQ3R and PQRST methods. • Note-taking techniques: bullet points, mind maps, and simplified Cornell method. • Accurate and concise summarising of written and audio-visual content. **Task-Based Activities** • Professional self-introduction • Email drafting • Vocabulary exercises • Introductory slide preparation • Plagiarism awareness tasks • Reading comprehension exercises • Note-making tasks • Summary writing • Short reading-based discussions	
2	**Grammar in Context, Language Accuracy, and Oral Communication** **Grammar Component** • Sentence structure and word order. • Tenses used in academic and everyday communication. • Modals for requests and suggestions. • Subject-verb agreement. • Introduction to active and passive voice. • Vocabulary development through contextual usage, error correction, and rewriting informal language into academic/professional English. **Oral Communication Component** • Structuring short presentations and organising ideas logically. • Voice modulation, pace, body language, and eye contact. • Basic awareness of visual aids in presentations. • Speaking practice on current affairs, social issues, and introductory technical concepts. • Professional delivery and audience interaction. **Task-Based Activities** • Grammar-in-context exercises • Error correction tasks • Rewriting activities • Guided language practice • Micro-presentations	15

	• Peer feedback sessions • Time-bound speaking tasks • Reflective practice	
3	**Listening Skills, Group Interaction, and Interview Preparation** **Listening Skills** • Active and passive listening. • Listening for general and specific information — interviews, documentaries, talks, and short lectures. **Interview Skills** • Types of interviews: one-to-one, panel, telephonic, and online. • Interview etiquette and effective response strategies. **Group Discussion Skills** • Case-based activities encouraging collaborative communication. • Presenting collective ideas clearly as a group. **Task-Based Activities** • Listening comprehension exercises • Case-based group discussions • Group spokesperson summaries • Interview role-plays • Mock interviews	6
4	**Professional Communication, Life Skills, and Digital Presence** **Key Topics** • Interpersonal communication and impression management. • Time and stress management, adaptability, motivation, and goal setting. • Digital self-presentation and professional communication practices. • Development of a video resume. • Collaborative content creation. • Representing oneself effectively in digital and professional environments. **Task-Based Activities** • Professional role-plays • Self-reflection exercises • Video résumé preparation • Group-based podcast creation focusing on clarity, collaboration, and content organisation	5

Course Assessment Method
(CIE: 50 Marks)

Continuous Internal Evaluation Marks (CIE):

Assignments/Quiz/Micro-Project/Presentation	Activity Evaluation	Total
25	25	50

Course Outcomes (Cos)

At the end of the course students should be able to:

CO No.	Description	Blooms Knowledge Level (KL)
CO1	Develop vocabulary and language skills relevant to academic, professional, and engineering contexts.	3
CO2	Analyse, interpret, and effectively summarize technical and non-technical textual content.	4
CO3	Apply appropriate grammatical structures and language accuracy in spoken and written communication.	3
CO4	Deliver structured oral presentations and participate effectively in group discussions and professional interactions.	3
CO5	Identify limitations in listening patterns and apply suitable listening strategies for academic and professional needs.	2
CO6	Create clear, well-structured professional and technical documents adhering to standard conventions and ethical practices.	6

Note: K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyse, K5 – Evaluate, and K6 – Create

CO-PO Mapping

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

Reference Books

Sl. No.	Title of the Book	Name of the Author(s)	Name of the Publisher	Edition and Year
1	English for Careers.,	-	Mahatma Gandhi University, Kottayam, Kerala.	-
2	Technical Communication: Principles and Practice.	Raman, Meenakshi & Sharma, Sangeeta.	Oxford University Press, New Delhi.	-
3	Practical English Usage.	Swan, Michael.	Oxford University Press, India Edition.	

B.Tech. 2026 – S1

ENGINEERING DESIGN AND INNOVATION STUDIO - I

Course Code	A26EDR113	CIE Marks	50
Teaching Hours/Week (L:P)	0: 0: 0: 2	ESE Marks	-
Credits	1	Exam Hours	2 Hrs (Lab Exam)
Prerequisites (if any)	NIL	Course Type	Project-Based / Skill Enhancement

Course Objectives:

- To develop structured problem-solving and idea communication skills through Design Thinking principles and pitch presentation.
- To introduce 3D digital modelling as a tool for visualising and prototyping design concepts using Autodesk Fusion 360.
- To provide hands-on experience in sensor/actuator interfacing using Arduino.
- To build individual and team competencies through project-based learning and live demonstrations.

SYLLABUS

Module No.	Description	Contact Hours
1	**MODULE I (9 P): Design Thinking, Pitch Deck & 3D Modelling with Fusion 360** **A. Design Thinking & Problem Framing (4 P)** • **Empathise –** User interviews, Observation, pain-gain chart, journey mapping. • **Define –** How-Might-We (HMW) questions, Problem Statement Canvas. • **Ideate –** SCAMPER, Mind Mapping, Crazy 8s; convergent selection using a criteria matrix. • **Pitch Deck –** Anatomy of a pitch (Problem → Solution → Value Proposition → Ask); slide design principles; 5-minute group presentation with peer Q&A (SBI feedback framework). **B. 3D Modelling with Autodesk Fusion 360 (5 P)** • **Lab 1 –** Interface familiarisation; sketch a 2D profile; apply constraints and dimensions. • **Lab 2 –** Basic solid modelling: Extrude and Revolve to create a simple mechanical part. • **Lab 3 –** Advanced features: Fillet, Chamfer, Shell, Circular Pattern, Mirror. • **Lab 4 –** Assembly modelling: 2-part assembly (cap and body); joints and interference check. • **Lab 5 –** Idea Model Sprint: each student models their idea concept from the pitch exercise; render and export to STL. **Assignment I:** Individual submission – 300-word idea abstract (problem, HMW analysis, proposed solution) (10 Marks) **Assignment II -** Individual submission - Fusion 360 model file (.f3d) and STL export with 1-page design brief. (10 Marks)	**9 P**

2	**MODULE II (9 P): Arduino – Sensors, Actuators.** **A. Sensors & Actuator Interfacing (4 P)** • **Lab 1 –** Arduino IDE setup; digital I/O: LED control with digitalWrite(); PWM with analogWrite(); reading a push button. • **Lab 2 –** Analog sensing: LDR and potentiometer with analogRead(); ADC resolution; controlling LED brightness from sensor input. • **Lab 3 –** Environmental sensors: DHT11 (temperature & humidity); HC-SR04 ultrasonic distance sensor; display readings on 16x2 LCD (I2C). • **Actuators –**Relay module for load switching; RGB LED and passive buzzer for alert indication; servo motor position control with Servo library. **B. Communication Protocols & IoT (3 P)** • **UART –** Serial communication between Arduino and PC; Software Serial for multi-device messaging. • **I2C –** Two-wire protocol; addressing; interfacing OLED display and I2C temperature probe (LM75). • **SPI –** Four-wire protocol; interfacing SD card module; logging sensor data to file. **Micro-Project (2 P)** • **Micro-Project –** Teams of 3 design and build a functional Arduino-based embedded system integrating at least one sensor, one actuator, one communication protocol to address a real-world problem. • **Example themes –** Smart room monitor (DHT11 + LCD + relay); automated irrigation (soil sensor + relay); visitor counter (IR sensor + OLED + I2C). • **Deliverables –** Working prototype + circuit schematic + commented code + 1-page report + 5-minute demo. **Assignment III:** Group lab task – implement a sensor-actuator circuit with one communication protocol (I2C or SPI); display output on Serial Monitor or OLED. Submit code and observations. (10 Marks) **MicroProject:** Micro-project group demonstration and report (group of 3). Evaluated on functionality, circuit design, code quality, and presentation. (10 Marks)	**9 P**

Course Assessment Method

Continuous Internal Evaluation (CIE: 50 Marks)

Assignment I	Assignment II	Assignment III	Micro-Project	Lab Examination
Idea Abstract + 3D Model	Sensor-Actuator / Protocol Lab Task	Micro-Project Demo & Report	Demo & Report	On-spot Arduino / Fusion 360 Task
10 Marks	**10 Marks**	**10 Marks**	**15 Marks**	**15 Marks**
Continuous Assessment (Avg. of A-I, A-II, A-III) convert it out of **20 Marks**				
Total:	**50 Marks** (Continuous Assessment 20 + Micro-Project 15 + Lab Exam 15)			

Course Outcomes (COs)

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

CO No.	Description	Bloom's KL
CO1	Apply Design Thinking principles and Fusion 360 modelling to frame a real-world problem, generate a solution concept, and produce a 3D digital prototype communicated through a structured pitch.	K3 (Apply)
CO2	Interface sensors and actuators with Arduino and implement serial communication protocols (UART, I2C, SPI) to build responsive, data-driven embedded systems.	K4 (Analyse)
CO3	Design, build, and demonstrate a functional Arduino based micro-project that integrates sensing, actuation, communication, and real-time data visualisation to address a real-world problem.	K5 (Evaluate)

CO-PO Mapping

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	3	2	3	2	--	--	3	2	3
CO2	3	3	3	3	3	1	--	--	2	2	3
CO3	2	3	3	2	3	3	2	1	3	2	3

Text Books

Sl. No.	Title of the Book	Name of the Author(s)/Editor(s)	Publisher	Edition & Year
1	Exploring Arduino: Tools and Techniques for Engineering Wizardry	Jeremy Blum	Wiley	2/e, 2020
2	Arduino Cookbook	Michael Margolis et al.	O'Reilly	3/e, 2020
3	Autodesk Fusion 360: A Tutorial Approach	Sham Tickoo	CADCIM Technologies	2023
4	Product Design and Development	Karl T. Ulrich & Steven D. Eppinger	McGraw-Hill	7/e, 2020

Reference Books

Sl. No.	Title of the Book	Name of the Author(s)/Editor(s)	Publisher	Edition & Year
1	Arduino: A Technical Reference	J. M. Hughes	O'Reilly	1/e, 2016
2	Change by Design: How Design Thinking Transforms Organizations	Tim Brown	HarperCollins	2/e, 2019
3	The Field Guide to Human-Centered Design	IDEO.org	IDEO	1/e, 2015
4	Internet of Things: A Hands-On Approach	Bahga & Madisetti	Universities Press	1/e, 2015

Video Links (NPTEL, SWAYAM, etc.)

Module	Resource	Link
I	Design Thinking: A Primer – NPTEL (IIT Bombay)	nptel.ac.in/courses/110106124
I	Autodesk Fusion 360 Official Tutorial Library	help.autodesk.com/view/fusion360
I	Stanford d.school Design Thinking Bootleg Deck	dschool.stanford.edu/resources
II	Arduino Official Language Reference (Serial, I2C, SPI, Interrupts)	docs.arduino.cc/language-reference
II	Arduino by Prof Kannan Moudgalya - Principal Investigator of Spoken Tutorial Project (IIT Bombay)	https://onlinecourses.swayam2.ac.in/e-learning/preview/aic20_sp04
II	Arduino Project Hub – Community Reference Projects	https://projecthub.arduino.cc