MAR ATHANASIUS COLLEGE OF ENGINEERING

Government Aided, Autonomous Institution
Kothamangalam, Kerala, India

B.TECH ELECTRICAL AND ELECTRONICS ENGINEERING

SCHEME

SEMESTER 1

SLOT	COURSE NO.	COURSES	L-T-P-S	HOURS	CREDIT
A	B24MA1T01	LINEAR ALGEBRA AND MULTIVARIABLE CALCULUS	3-1-0-3	4	4
B	B24ES1T01A	PROBLEM SOLVING AND PROGRAMMING TECHNIQUES (A)	2-1-0-2	3	3
C	B24EE1T01	INTRODUCTION TO ELECTRICAL ENGINEERING	2-2-0-2	4	4
D	B24EE1T02	ELECTRONIC CIRCUITS I	2-1-0-2	3	3
E	B24ES1T03B	COMPUTER AIDED ENGINEERING GRAPHICS (B)	2-1-1-3	4	4
G	B24ES1L01A	PROGRAMMING LAB (A)	0-0-3-3	3	2
H	B24EE1L01	BASIC ELECTRICAL ENGINEERING LAB	0-0-3-3	3	2
I	B24MC1T01	LIFE SKILLS	1-0-1-2	2	P/F
J	B24MC1T02	DESIGN THINKING	1-1-0-1	2	P/F
K	B24MC1L01	YOGA AND SPORTS	0-1-1-1	2	P/F
			TOTAL	30	22

SEMESTER 2

SLOT	COURSE NO.	COURSES	L-T-P-S	HOURS	CREDIT
A	B24MA1T02	ORDINARY DIFFERENTIAL EQUATIONS AND TRANSFORMS	3-1-0-3	4	4
B	B24PH1T01A	ENGINEERING PHYSICS (A)	2-1-0-2	3	3
C	B24CY1T01A	ENGINEERING CHEMISTRY (A)	2-1-0-2	3	3
D	B24ES1T05A	BASIC CIVIL AND MECHANICAL ENGINEERING (A)	2-2-0-2	4	4
E	B24EE1T03	ELECTRICAL MEASUREMENTS	2-1-0-2	3	3
F	B24ES1L04A	BASIC CIVIL AND MECHANICAL ENGINEERING WORKSHOP (A)	0-0-2-2	2	1
G	B24EE1L02	ELECTRONIC CIRCUITS LAB I	0-0-3-3	3	2
H	B24PH1L01A	ENGINEERING PHYSICS LAB (A)	0-0-1-1	2	1
	B24CY1L01A	ENGINEERING CHEMISTRY LAB (A)	0-0-1-1		
I	B24MC1T03	PROFESSIONAL COMMUNICATION AND ETHICS	2-0-1-3	3	P/F
J	B24MC1L02	IDEA LAB	0-0-3-3	3	P/F
			TOTAL	30	21

SEMESTER 3

SLOT	COURSE NO.	COURSES	L-T-P-S	HOURS	CREDIT
A	B24MA2T03A	COMPLEX VARIABLES AND APPLICATIONS OF PDE	3-1-0-3	4	4
B	B24EE2T01	CIRCUITS AND NETWORKS	2-2-0-2	4	4
C	B24EE2T02	ELECTRICAL MACHINES I	2-2-0-2	4	4
D	B24EE2T03	DIGITAL ELECTRONICS	2-1-0-2	3	3
E	B24EE2T04	ELECTRONIC CIRCUITS II	2-1-0-2	3	3
G	B24EE2L03	ELECTRICAL MEASUREMENTS LAB	0-0-3-3	3	2
H	B24EE2L04	DIGITAL ELECTRONICS LAB	0-0-3-3	3	2
I	B24MC2T04	UNIVERSAL HUMAN VALUE AND CONSTITUTIONAL RIGHTS	2-0-0-2	2	P/F
J	B24MC2T05	ENERGY CONSERVATION AND ENVIRONMENTAL SUSTAINABILITY	2-0-0-2	2	P/F
M		MINOR	3-1-0-3	4	4
			TOTAL*	32	22

SEMESTER 4

SLOT	COURSE NO.	COURSES	L-T-P-S	HOURS	CREDIT
A	B24MA2T04A	STOCHASTIC PROCESSES AND NUMERICAL METHODS	3-1-0-3	4	4
B	B24EE2T05	SIGNALS AND SYSTEMS	2-2-0-2	4	3
C	B24EE2T06	POWER ELECTRONICS	3-1-0-3	4	4
D	B24EE2T07	ELECTROMAGNETIC THEORY	2-1-0-2	3	3
E	B24HU2T01	BUSINESS ECONOMICS AND FINANCIAL MANAGEMENT	3-0-0-3	3	3
F	B24EE2T08	MICROPROCESSORS AND MICROCONTROLLERS	2-2-0-2	4	4
G	B24EE2L05	ELECTRICAL MACHINES LAB I	0-0-3-3	3	2
H	B24EE2L06	ELECTRONIC CIRCUITS LAB II	0-0-3-3	3	2
M		MINOR	3-1-0-3	4	4
N		HONORS	2-2-0-2	4	4
			TOTAL*	36	25

*Total does not include the credits of honors and minor courses

SEMESTER 5

SLOT	COURSE NO.	COURSES	L-T-P-S	HOURS	CREDIT
A	B24EE3T01	LINEAR CONTROL SYSTEM	2-2-0-2	4	4
B	B24EE3T02	POWER SYSTEM I	2-2-0-2	4	4
C	B24EE3T03	ELECTRICAL MACHINES II	2-2-0-2	4	4
D	B24EE3T04	INSTRUMENTATION SYSTEMS	3-1-0-3	4	4
E	B24HU3T05	ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT STRATEGIES	2-1-0-2	3	3
F	B24EE3P1X	PROGRAMME ELECTIVE I	2-1-0-2	3	3
G	B24EE3L07	MICROPROCESSOR AND MICROCONTROLLER LAB	0-0-3-3	3	2
H	B24EE3L08	POWER ELECTRONICS LAB	0-0-3-3	3	2
M		MINOR	3-1-0-3	4	4
N		HONORS	3-1-0-3	4	4
			TOTAL*	36	26

Note: Six programme electives are offered starting from Semester 5 as per the curriculum. This curriculum is designed to provide learners with the opportunity to gain proficiency in six different streams of Electrical and Electronics Engineering, including Control and Instrumentation, Power Electronics and Applications, Power System and High Voltage Engineering, Embedded Systems and VLSI, Electronics and Communication Systems, and Intelligent Computing Techniques, through program electives. Learners can choose any one of the streams in semester 5 and it is not compulsory to follow the same stream in the subsequent semesters. The department may offer Elective Courses to enable students to utilize this opportunity, depending on faculty availability.

PROGRAMME ELECTIVE I

COURSE NO.	COURSES
B24EE3P11	INDUSTRIAL INSTRUMENTATION AND AUTOMATION
B24EE3P12	RENEWABLE ENERGY SYSTEMS AND APPLICATIONS
B24EE3P13	HIGH VOLTAGE ENGINEERING
B24EE3P14	MICROCONTROLLERS FOR EMBEDDED SYSTEM DESIGN
B24EE3P15	ELECTRONIC MATERIALS
B24EE3P16	COMPUTER ORGANIZATION AND ARCHITECTURE

SEMESTER 6

SLOT	COURSE NO.	COURSES	L-T-P-S	HOURS	CREDIT
A	B24EE3T05	ADVANCED CONTROL SYSTEM	2-2-0-2	4	4
B	B24EE3T06	ELECTRIC DRIVES AND CONTROL	3-1-0-3	4	4
C	B24EE3T07	POWER SYSTEM II	2-2-0-2	4	4
D	B24EE3T08	OBJECT-ORIENTED PROGRAMMING	2-2-0-2	4	4
E	B24EE3P2X	PROGRAMME ELECTIVE II	2-1-0-2	3	3
F	B24EE3G1X	OPEN ELECTIVE I	2-1-0-2	3	3
G	B24EE3L09	ELECTRICAL MACHINES LAB II	0-0-3-3	3	2
H	B24EE3L10	CONTROL SYSTEM LAB	0-0-3-3	3	2
M		MINOR	3-1-0-3	4	4
N		HONORS	3-1-0-3	4	4
			TOTAL*	36	26

PROGRAMME ELECTIVE II

COURSE NO.	COURSES
B24EE3P21	BIOMEDICAL INSTRUMENTATION
B24EE3P22	SWITCHED-MODE POWER CONVERTERS
B24EE3P23	ENERGY MANAGEMENT AND AUDITING
B24EE3P24	SYSTEM DESIGN USING HDL
B24EE3P25	COMMUNICATION SYSTEMS
B24EE3P26	DATA STRUCTURES AND ALGORITHMS

OPEN ELECTIVE I

COURSE NO.	COURSES
B24EE3G11	ELECTRICAL SAFETY
B24EE3G12	RENEWABLE POWER GENERATION SYSTEMS
B24EE3G13	ELECTRICAL POWER UTILIZATION
B24EE3G14	ENERGY MANAGEMENT AND AUDITING
B24EE3G15	INDUSTRIAL AUTOMATION
B24EE3G16	ELECTRIC VEHICLE TECHNOLOGY

SEMESTER 7

SLOT	COURSE NO.	COURSES	L-T-P-S	HOURS	CREDIT
A	B24EE4T01	ELECTRICAL SYSTEM DESIGN AND ESTIMATION	2-1-0-2	3	3
B	B24EE4P3X	PROGRAMME ELECTIVE III	2-1-0-2	3	3
C	B24EE4P4X	PROGRAMME ELECTIVE IV	2-1-0-2	3	3
D	B24EE4G2X	OPEN ELECTIVE II	2-1-0-2	3	3
E	B24HU4T04	DISASTER MANAGEMENT AND INDUSTRIAL SAFETY	2-1-0-2	3	3
G	B24EE4L11	POWER SYSTEM LAB	0-0-3-3	3	2
H	B24EE4L12	PROJECT PHASE I	0-0-6-6	6	3
J	B24EE4L13	SEMINAR	0-0-4-4	4	2
K	B24EE4T02	VIVA VOCE	0-0-0-0	-	1
M		MINOR	3-1-0-3	4	4
N		HONORS	3-1-0-3	4	4
			TOTAL*	36	23

PROGRAMME ELECTIVE III

COURSE NO.	COURSES
B24EE4P31	ROBOTICS AND AUTOMATION
B24EE4P32	ELECTRIC VEHICLE TECHNOLOGY
B24EE4P33	POWER QUALITY
B24EE4P34	INTERNET OF THINGS
B24EE4P35	SOLID STATE DEVICES
B24EE4P36	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

PROGRAMME ELECTIVE IV

COURSE NO.	COURSES
B24EE4P41	DIGITAL CONTROL SYSTEM
B24EE4P42	ENERGY STORAGE SYSTEMS FOR EV
B24EE4P43	COMPUTER AIDED POWER SYSTEM ANALYSIS
B24EE4P44	DIGITAL IC DESIGN
B24EE4P45	DIGITAL SIGNAL PROCESSING
B24EE4P46	COMPUTER NETWORKS

OPEN ELECTIVE II

COURSE NO.	COURSES
B24EE4G21	BIOMEDICAL INSTRUMENTATION
B24EE4G22	INTRODUCTION TO ENERGY STORAGE SYSTEMS
B24EE4G23	ILLUMINATION ENGINEERING
B24EE4G24	ARTIFICIAL NEURAL NETWORKS AND FUZZY LOGIC SYSTEMS
B24EE4G25	ELECTRICAL SYSTEM DESIGN FOR BUILDING
B24EE4G26	SPECIAL MACHINES

SEMESTER 8

SLOT	COURSE NO.	COURSES	L-T-P-S	HOURS	CREDIT
A, B, C		INTERNSHIP & MOOC COURSES** (3 NUMBERS)			9
OR					
A	B24EE4P5X	PROGRAMME ELECTIVE V	2-1-0-2	3	3
B	B24EE4P6X	PROGRAMME ELECTIVE VI	2-1-0-2	3	3
C	B24EE4G3X	OPEN ELECTIVE III	2-1-0-2	3	3
AND					
H	B24EE4L14	PROJECT PHASE II	0-0-12-12	12	6
M		MINOR PROJECT***	0-0-3-3	3	6
N		HONORS PROJECT***	0-0-6-6	6	6
			TOTAL*	30	15

** Students can take MOOC courses either in Semester 7 or Semester 8 from the list of approved courses by the Board of Studies

***Minor/Honors Project can be done either in Semester 7 or Semester 8

PROGRAMME ELECTIVE V

COURSE NO.	COURSES
B24EE4P51	NON-LINEAR CONTROL THEORY
B24EE4P52	ADVANCED ELECTRIC DRIVES
B24EE4P53	POWER SYSTEMS OPERATION AND CONTROL
B24EE4P54	CMOS ANALOG CIRCUIT DESIGN
B24EE4P55	NANOELECTRONICS
B24EE4P56	DEEP LEARNING

PROGRAMME ELECTIVE VI

COURSE NO.	COURSES
B24EE4P61	PROCESS CONTROL AND INSTRUMENTATION
B24EE4P62	SMART GRID TECHNOLOGIES
B24EE4P63	FLEXIBLE AC TRANSMISSION SYSTEMS
B24EE4P64	REAL-TIME OPERATING SYSTEMS
B24EE4P65	MICROELECTROMECHANICAL SYSTEMS
B24EE4P66	SOFT COMPUTING TECHNIQUES

OPEN ELECTIVE III

COURSE NO.	COURSES
B24EE4G31	INDUSTRIAL INSTRUMENTATION
B24EE4G32	SUSTAINABLE ENERGY SYSTEMS
B24EE4G33	HUMAN FACTORS ENGINEERING
B24EE4G34	ELECTRICITY MARKETS
B24EE4G35	INTERNET OF THINGS
B24EE4G36	SMART GRID ENGINEERING

PROGRAMME ELECTVE STREAMWISE LIST

STREAM 1 CONTROL AND INSTRUMENTATION	
ELECTIVE	**COURSES**
I	INDUSTRIAL INSTRUMENTATION AND AUTOMATION
II	BIOMEDICAL INSTRUMENTATION
III	ROBOTICS AND AUTOMATION
IV	DIGITAL CONTROL SYSTEM
V	NON-LINEAR CONTROL THEORY
VI	PROCESS CONTROL AND INSTRUMENTATION

STREAM 2 POWER ELECTRONICS AND APPLICATIONS	
ELECTIVE	**COURSES**
I	RENEWABLE ENERGY SYSTEMS AND APPLICATIONS
II	SWITCHED-MODE POWER CONVERTERS
III	ELECTRIC VEHICLE TECHNOLOGY
IV	ENERGY STORAGE SYSTEMS FOR EV
V	ADVANCED ELECTRIC DRIVES
VI	SMART GRID TECHNOLOGIES
STREAM 3 POWER SYSTEM AND HIGH VOLTAGE ENGINEERING	
ELECTIVE	**COURSES**
I	HIGH VOLTAGE ENGINEERING
II	ENERGY MANAGEMENT AND AUDITING
III	POWER QUALITY
IV	COMPUTER AIDED POWER SYSTEM ANALYSIS
V	POWER SYSTEMS OPERATION AND CONTROL
VI	FLEXIBLE AC TRANSMISSION SYSTEMS
STREAM 4 EMBEDDED SYSTEMS AND VLSI	
ELECTIVE	**COURSES**
I	MICROCONTROLLERS FOR EMBEDDED SYSTEM DESIGN
II	SYSTEM DESIGN USING HDL
III	INTERNET OF THINGS
IV	DIGITAL IC DESIGN
V	CMOS ANALOG CIRCUIT DESIGN
VI	REAL-TIME OPERATING SYSTEMS
STREAM 5 ELECTRONICS AND COMMUNICATION SYSTEMS	
ELECTIVE	**COURSES**
I	ELECTRONIC MATERIALS
II	COMMUNICATION SYSTEMS
III	SOLID-STATE DEVICES
IV	DIGITAL SIGNAL PROCESSING
V	NANOELECTRONICS
VI	MICROELECTROMECHANICAL SYSTEMS

STREAM 6 INTELLIGENT COMPUTING TECHNIQUES	
ELECTIVE	**COURSES**
I	COMPUTER ORGANIZATION AND ARCHITECTURE
II	DATA STRUCTURES AND ALGORITHMS
III	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
IV	COMPUTER NETWORKS
V	DEEP LEARNING
VI	SOFT COMPUTING TECHNIQUES

MINOR

BASKET 1	
SEMESTER	**COURSES**
3	CIRCUIT THEORY
4	LINEAR CONTROL SYSTEMS
5	MODELING OF SYSTEMS
6	INDUSTRIAL INSTRUMENTATION AND AUTOMATION
7	DIGITAL CONTROL
8	PROJECT
BASKET 2	
SEMESTER	**COURSES**
3	ELECTRIC CIRCUITS
4	FUNDAMENTALS OF ELECTRICAL MACHINES
5	SOLID STATE POWER CONVERSION
6	POWER ELECTRONIC DRIVES
7	HVDC TRANSMISSION
8	PROJECT
BASKET 3	
SEMESTER	**COURSES**
3	INTRODUCTION TO POWER ENGINEERING
4	ENERGY STORAGE SYSTEMS
5	POWER SYSTEM OPERATION AND CONTROL
6	AUTOMATION OF POWER PLANTS
7	DISTRIBUTED GENERATION AND SMART GRID
8	PROJECT

Note:- Learners can choose any one of the baskets in semester 3 and they have to follow the same basket in the subsequent semesters.

HONORS

BASKET 1	
SEMESTER	**COURSES**
4	NETWORK ANALYSIS AND SYNTHESIS
5	SIMULATION OF ELECTRIC SYSTEMS
6	ANALYSIS OF POWER ELECTRONIC CIRCUITS
7	DYNAMICS OF POWER CONVERTERS
8	PROJECT
BASKET 2	
SEMESTER	**COURSES**
4	NETWORK ANALYSIS AND SYNTHESIS
5	SIMULATION OF ELECTRIC SYSTEMS
6	POWER SYSTEM DYNAMICS
7	CONTROL AND DYNAMICS OF MICROGRID
8	PROJECT
BASKET 3	
SEMESTER	**COURSES**
4	NETWORK ANALYSIS AND SYNTHESIS
5	SIMULATION OF ELECTRIC SYSTEMS
6	GENERALIZED MACHINE THEORY
7	FINITE ELEMENT APPLICATIONS IN ELECTRICAL ENGINEERING
8	PROJECT

Note:- Learners can choose any one of the baskets in semester 4 and they have to follow the same basket in the subsequent semesters.

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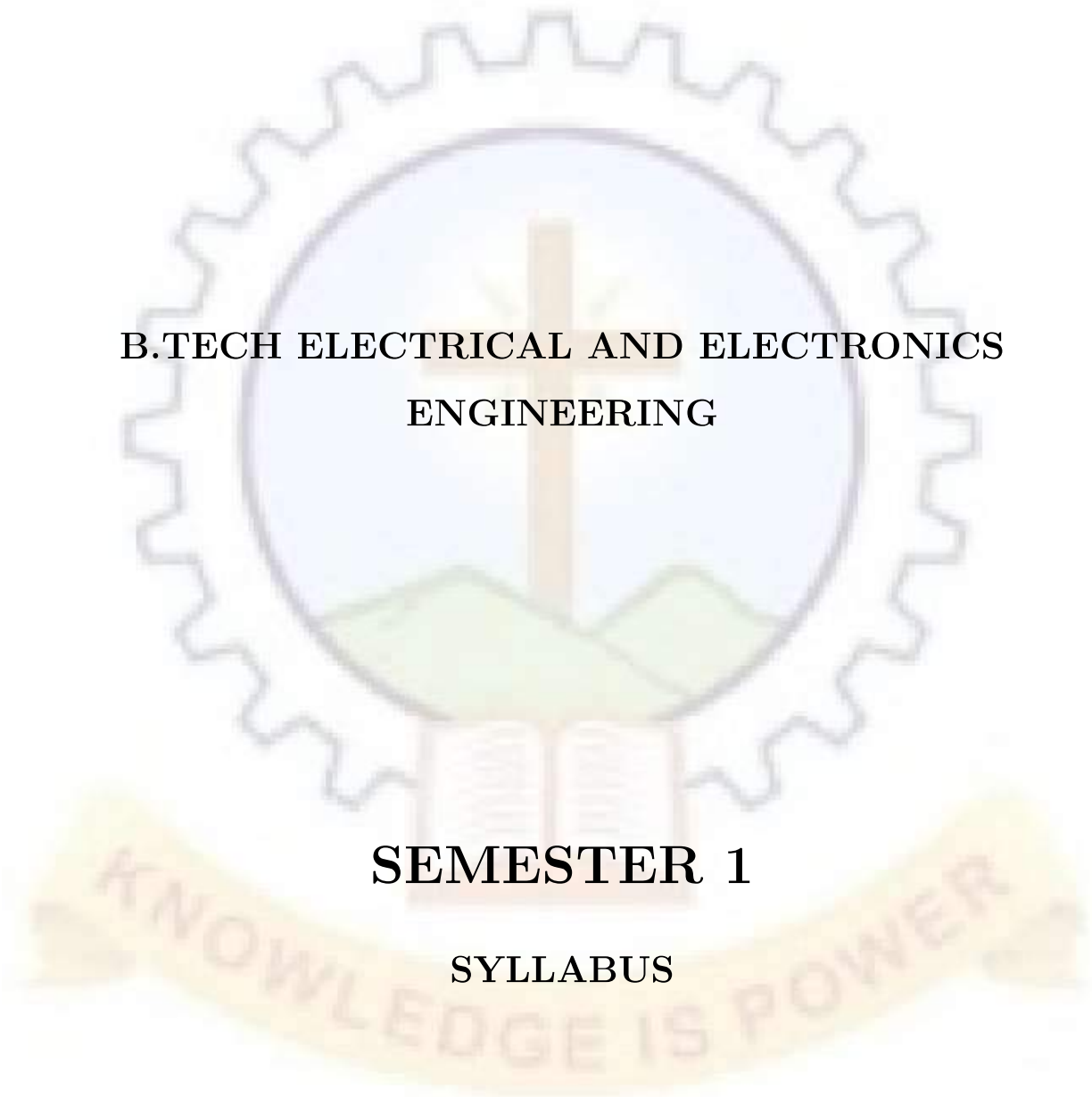


B.TECH ELECTRICAL AND ELECTRONICS ENGINEERING

SEMESTER 1

SYLLABUS

B24MA1T01	LINEAR ALGEBRA AND MULTIVARIABLE CALCULUS	L	T	P	S	CREDIT	YEAR OF INTRODUCTION
		3	1	0	3	4	2024

Preamble

This course introduces students to some basic mathematical ideas and tools which are at the core of any engineering course. A brief course in Linear Algebra familiarises students with some basic techniques in matrix theory which are essential for analyzing linear systems. The calculus of functions of one or more variables taught in this course are useful in modelling and analyzing physical phenomena involving continuous change of variables or parameters and have applications across all branches of engineering.

Prerequisite

Nil

Course Outcomes

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

CO 1	Solve systems of linear equations, diagonalize matrices and characterise quadratic forms. (Cognitive Knowledge Level: Apply)
CO 2	Compute the partial and total derivatives and maxima and minima of multivariable functions. (Cognitive Knowledge Level: Apply)
CO 3	Compute multiple integrals and apply them to find areas and volumes of geometrical shapes, mass and centre of gravity of plane laminas. (Cognitive Knowledge Level: Apply)
CO 4	Compute the derivatives and line integrals of vector functions and learn their applications. (Cognitive Knowledge Level: Apply)
CO 5	Evaluate surface and volume integrals and learn their inter-relations and applications. (Cognitive Knowledge Level: Apply)

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	1	1	1					1		1
CO 2	3	2	1	1	1					1		1
CO 3	3	2	1	1	1					1		1
CO 4	3	2	1		1							1
CO 5	3	2	1	1	1					1		1

Assessment Pattern

Bloom's Category	Continuous Assessment		End Semester Examination (% Marks)
	Test 1 (% Marks)	Test 2 (% Marks)	
Remember	20	20	20
Understand	40	40	40
Apply	40	40	40
Analyse			
Evaluate			
Create			

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern

Attendance	10 marks
Continuous Assessment Test (2 numbers)	25 marks
Assignment/Quiz/Course Project	15 marks

End Semester Examination Pattern

There will be two parts; Part A and Part B. Part A contain 10 questions carrying 3 marks each. Part B contains 2 questions from each module out of which 1 to be answered. Each question carries 14 marks and can have maximum 2 sub divisions.

SYLLABUS

MODULE 1 (9 hours)

Linear Algebra

Systems of linear equations, Solution by Gauss elimination, row echelon form and rank of a matrix, fundamental theorem for linear systems (homogeneous and non-homogeneous, without proof), Eigenvalues and eigenvectors. Diagonalization of matrices, orthogonal transformation, quadratic forms and their canonical forms.

(Textbook 2: Relevant topics from 7.3, 7.4, 7.5, 8.1, 8.3, 8.4)

MODULE 2 (9 hours)

Multivariable Calculus-Differentiation

Partial derivatives, partial derivatives of functions of more than two variables, higher order partial derivatives, differentials and local linearity, The chain rule, Maxima and Minima of functions of two variables, extreme value theorem (without proof), relative extrema.

(Textbook 1: Relevant topics from sections 13.3, 13.4, 13.5, 13.8)

MODULE 3 (9 hours)

Multivariable Calculus-Integration

Double integrals (Cartesian), reversing the order of integration, Change of coordinates (Cartesian to polar), finding areas using double integrals, mass and centre of gravity of inhomogeneous laminas using double integral. Triple integrals, volume calculated as triple integral, triple integral in cylindrical and spherical coordinates (computations involving spheres, cylinders).

(Textbook 1: Relevant topics from sections 14.1, 14.2, 14.3, 14.5, 14.6, 14.8)

MODULE 4 (9 hours)

Calculus of Vector Functions

Vector valued function of single variable, derivative of vector function and geometrical interpretation, motion along a curve-velocity, speed and acceleration. Concept of scalar and vector fields, Gradient and its properties, directional derivative, divergence and curl, Line integrals of vector fields, work as line integral, Conservative vector fields, independence of path and potential function(results without proof).

(Textbook 1: Relevant topics from sections 12.1, 12.2, 12.6, 13.6, 15.1, 15.2, 15.3)

MODULE 5 (9 hours)

Vector Integral Theorems

Green's theorem (for simply connected domains, without proof) and applications to evaluating line integrals and finding areas. Surface integrals over surfaces of the form z = g(x, y), y = g(x, z) or x = g(y, z) , Flux integrals over surfaces of the form z = g(x, y), y = g(x, z) or x = g(y, z), divergence theorem (without proof) and its applications to finding flux integrals, Stokes' theorem (without proof) and its applications to finding line integrals of vector fields and work done.

(Textbook 1: Relevant topics from sections 15.4, 15.5, 15.6, 15.7, 15.8)

Text Books

1. H. Anton, I. Biven, S. Davis, *Calculus*, Wiley, 10th ed., 2015.
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley & Sons, 10th ed., 2015.

Reference Books

1. G.B. Thomas and R.L. Finney, *Calculus and Analytic Geometry*, Pearson, 9th ed., Reprint,2002.
2. J. Stewart, *Essential Calculus*, Cengage, 2nd ed., 2017.
3. B.S. Grewal, *Higher Engineering Mathematics*, Khanna Publishers, 43rd., 2015.
4. Peter O Neil, *Advanced Engineering Mathematics*, Thomson, 7th ed., 2007.
5. Veerarajan T., *Engineering Mathematics for first year*, Tata McGraw - Hill, 2008.

COURSE CONTENTS AND LECTURE SCHEDULE

No.	Topic	No of Lecture/Tutorial Hours
	Total	45 Hours
1	**Module 1: Linear Algebra**	**9**
1.1	Systems of linear equations, Solution by Gauss elimination	1
1.2	Row echelon form, finding rank from row echelon form, fundamental theorem for linear systems	2
1.3	Eigenvalues and eigenvectors	2
1.4	Diagonalization of matrices	2
1.5	Orthogonal transformation, quadratic forms and their canonical forms	2
2	**Module 2: Multivariable Calculus-Differentiation**	**9**
2.1	Partial derivatives	2
2.2	Differentials, Local Linear approximations	2
2.3	Chain rule, total derivative	2
2.4	Maxima and minima	3
3	**Module 3: Multivariable Calculus-Integration**	**9**
3.1	Double integrals (Cartesian)-evaluation	2
3.2	Change of order of integration in double integrals, change of coordinates (Cartesian to polar)	2
3.3	Finding areas, mass and centre of gravity of plane laminas	2
3.4	Triple integrals, volume calculated as triple integral, triple integral in cylindrical and spherical coordinates	3
4	**Module 4: Calculus of Vector Functions**	**9**

4.1	Vector valued function of a scalar variable - derivative of vector valued function of scalar variable t-geometrical meaning	2
4.2	Motion along a curve-speed, velocity, acceleration	1
4.3	Gradient and its properties, directional derivative, divergence and curl	3
4.4	Line integrals with respect to arc length, line integrals of vector fields. Work done as line integral	2
4.5	Conservative vector field, independence of path, potential function	1
5	**Module 5: Vector Integral Theorems**	**9**
5.1	Green's theorem and it's applications	2
5.2	Surface integrals, flux integral and their evaluation	3
5.3	Divergence theorem and applications	2
5.4	Stokes theorem and applications	2

CO ASSESSMENT QUESTIONS

Course Outcome 1 (CO 1): Solve systems of linear equations, diagonalise matrices and characterise quadratic forms.

1. A is a real matrix of order 3×3 and $X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$. What can you say about the solution of $AX = 0$ if rank of A is 2 ? 3 ?
2. Given A $= \begin{bmatrix} 3 & 0 & 2 \\ 0 & 2 & 0 \\ -2 & 0 & 0 \end{bmatrix}$, find an orthogonal matrix P that diagonalizes A.
3. The matrix $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$ has an eigenvalue 5 with corresponding eigenvector $X = \begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix}$. Find A^5X.

Course Outcome 2 (CO 2): Compute the partial and total derivatives and maxima and minima of multivariable functions.

1. Find the slope of the surface $z = x^2y + 5y^3$ in the x-direction at the point $(1, -2)$.
2. Given the function $w = xy + z$, use the chain rule to find the instantaneous rate of change of w at each point along the curve $x = \cos t$, $y = \sin t$, $z = t$.

3. Determine the dimension of rectangular box open at the top, having a volume 32 cubic ft and requiring the least amount of material for it's construction.

Course Outcome 3 (CO 3): Compute multiple integrals and apply them to find areas and volumes of geometrical shapes, mass and centre of gravity of plane laminas.

1. Evaluate $\iint_D (x + 2y)\, dA$ where D is the region bounded by the parabolas

   $y = 2x^2$ and $y = 1 + x^2$.

2. Explain how you would find the volume under the surface $z = f(x, y)$ and over a specific region D in the xy plane using triple integral?

3. Find the mass and centre of gravity of a triangular lamina with vertices (0,0), (2,1), (0,3) if the density function is $f(x, y) = x + y$.

Course Outcome 4 (CO 4): Compute the derivatives and line integrals of vector functions and learn their applications

1. How would you calculate the speed, velocity and acceleration at any instant of a particle moving in space whose position vector at time t is $\mathbf{r}(t)$?

2. Find the work done by the force field $\mathbf{F} = (e^x - y^3)\ \mathbf{i} + (\cos y + x^3)\ \mathbf{j}$ on a particle that travels once around the unit circle centered at origin having radius 1.

3. When do you say that a vector field is conservative? What are the implications if a vector field is conservative?

Course Outcome 5 (CO 5): Evaluate surface and volume integrals and learn their inter-relations and applications

1. Write any one application each of line integral, double integral and surface integral.

2. Use the divergence theorem to find the outward flux of the vector field $\mathbf{F}(x, y, z) = z\mathbf{k}$ across $x^2 + y^2 + z^2 = a^2$.

3. State Greens theorem. Use Green's theorem to express the area of a plane region bounded by a curve as a line integral.

MODEL QUESTION PAPER

QP CODE: **Pages: 3**

Reg.No.: .....

Name: .....

MAR ATHANASIUS COLLEGE OF ENGINEERING (AUTONOMOUS), KOTHAMANGALAM

FIRST SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2024

Course Code: B24MA1T01

Course Name: LINEAR ALGEBRA AND MULTIVARIABLE CALCULUS

Common to all branches

Max. Marks: 100 Duration: 3 hours

PART A

Answer all questions. Each question carries 3 marks.

1. Determine the rank of the matrix $\begin{bmatrix} 1 & 2 & -1 \\ -2 & -4 & 2 \\ 3 & 6 & -3 \end{bmatrix}$
2. Write down the eigen values of A = $\begin{bmatrix} 2 & 0 \\ 0 & -1 \end{bmatrix}$
3. Find $f_x(1,3)$ and $f_y(1,3)$ for the function $f(x,y) = 2x^3y^2 + 2y + 4x$.
4. Show that the function $u(x,t) = sin(x-ct)$ is a solution of the equation $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$.
5. Use double integral to find the area of the region enclosed between the parabola $y = \frac{x^2}{2}$ and the line $y = 2x$.
6. Use polar coordinates to evaluate the area of the region bounded by $x^2 + y^2 = 4$, the line y = x and the y axis in the first quadrant.
7. Is the vector $\mathbf{r}$ where $\mathbf{r} = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$ conservative? Justify your answer.
8. Find a unit vector normal to the surface $x^3 + y^3 + 3xyz = 3$ at the point (1,2,-1).
9. What is the outward flux of $\mathbf{F}(x,y,z) = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$ across any unit cube?
10. What is the relationship between Green's theorem and Stokes theorem?

PART B

Answer any one question from each module. Each question carries 14 marks.

11. (a) Solve the following system of equations
y + z - 2w = 0
2x - 3y - 3z + 6w = 2
4x + y + z - 2w = 4 (7 marks)

(b) Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} 2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & 2 & 0 \end{bmatrix}$ (7 marks)

OR

12. (a) Diagonalize the matrix $\begin{bmatrix} -1 & 2 & -2 \\ 2 & 4 & 1 \\ 2 & 4 & 1 \end{bmatrix}$ (7 marks)

(b) What kind of conic section the quadratic form $3x^2 + 22xy + 3y^2 = 0$ represents? Transform it to principal axes. (7 marks)

13. (a) Find the local linear approximation to $f(x, y) = \sqrt{x^2 + y^2}$ at the point (3,4). Use it to approximate $f(3.04, 3.98)$. (7 marks)

(b) Let $w = \sqrt{x^2 + y^2 + z^2}$, x = cos$\theta$, y = sin$\theta$, z = tan$\theta$. Use chain rule to find $\frac{dw}{d\theta}$ when $\theta = \frac{\pi}{4}$. (7 marks)

OR

14. (a) Let $z = f(x, y)$ where $x = rcos\theta$, $y = rsin\theta$, prove that

$$\left(\frac{\partial z}{\partial x}\right)^2 + \left(\frac{\partial z}{\partial y}\right)^2 = \left(\frac{\partial z}{\partial r}\right)^2 + \frac{1}{r^2}\left(\frac{\partial r}{\partial \theta}\right)^2$$

(7 marks)

(b) Locate all relative maxima, relative minima and saddle points of $f(x, y) = xy + \frac{a^3}{x} + \frac{b^3}{y}$,$(a \neq 0, b \neq 0)$. (7 marks)

15. (a) Evaluate $\iint_D (2x^2y + 9y^3)\, dx\, dy$ where D is the region bounded by $y = \frac{2}{3}x$ and $y = 2\sqrt{x}$. (7 marks)

(b) Evaluate $\int_0^4 \int_{\sqrt{y}}^2 e^{x^3}\, dx\, dy$ by changing the order of integration. (7 marks)

OR

16. (a) Find the volume of the solid bounded by the cylinder $x^2 + y^2 = 4$ and the planes $y + z = 4$ and $z = 0$. (7 marks)

(b) Evaluate $\iiint \sqrt{1 - x^2 - y^2 - z^2}\, dx\, dy\, dz$, taken throughout the volume of the sphere $x^2 + y^2 + z^2 = 1$. (7 marks)

17. (a) Prove that the force field $\mathbf{F} = e^y\mathbf{i} + xe^y\mathbf{j}$ is conservative in the entire xy-plane. (7 marks)

(b) Find the work done in moving a particle along a straight line from (0,0,0) to (2,1,3) by the force $\mathbf{F} = 3x^2\mathbf{i} + (2xz - y)\mathbf{j} + z\mathbf{k}$. (7 marks)

OR

18. (a) Find the divergence of the vector field $\mathbf{F} = x^3y^2z\mathbf{i} + xyz^3\mathbf{j} + xyz^2\mathbf{k}$ at (1,1,1). (7 marks)

(b) Find the work done by the force field $\mathbf{F}(x, y, z) = xy\mathbf{i} + yz\mathbf{j} + xz\mathbf{k}$ along C where C is the curve $\mathbf{r}(t) = t\mathbf{i} + t^2\mathbf{j} + t^3\mathbf{k}$. (7 marks)

19. (a) Use divergence theorem to find the outward flux of the vector field $\mathbf{F} = 2x\mathbf{i} + 3y\mathbf{j} + z^3\mathbf{k}$ across the unit cube bounded by x = 0, y = 0, z = 0, x =1, y = 1, z = 1. (7 marks)

(b) Find the circulation of $\mathbf{F} = (x - z)\mathbf{i} + (y - x)\mathbf{j} + (z - xy)\mathbf{k}$ using Stokes theorem around the triangle with vertices A(1,0,0), B(0,2,0) and C(0,0,1). (7 marks)

OR

20. (a) Use divergence theorem to find the volume of the cylindrical solid bounded by $x^2 + 4x + y^2 = 7$, $z = -1$, $z = 4$ given the vector field $\mathbf{F} = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$ across surface of the cylinder. (7 marks)

(b) Use Stokes theorem to evaluate $\int_c F.dr$ where $\mathbf{F} = x^2\mathbf{i} + 3x\mathbf{j} - y^3\mathbf{k}$ where C is the circle $x^2 + y^2 = 1$ in the xy-plane with counterclockwise orientation looking down the positive z-axis. (7 marks)

B24ES1T01A	PROBLEM SOLVING AND PROGRAMMING TECHNIQUES (A)	L	T	P	S	CREDIT	YEAR OF INTRODUCTION
		2	1	0	2	3	2024

Preamble

This course shall prepare Engineering Graduates to write versatile C programs for solving computational problems that they come across in their professional life. The subject covers the basics of C programming, array handling, string manipulations, function creation, structure and pointer operations and file processing. On completing this course a learner will be able to write efficient C programs to solve real world computational problems.

Prerequisites

Nil

Course Outcomes

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

CO 1	Analyze a computational problem and try to solve it using algorithms, flowcharts and also develop C programs from them using Arithmetic, Logical, Relational and Bitwise operators. (Cognitive Knowledge Level: Understand)
CO 2	Develop C programs with branching and looping statements for processing arrays and matrices. (Cognitive Knowledge Level: Apply)
CO 3	Divide a given computational problem into a number of modules and develop functions to find the solution to the computational problem and also create programs for string processing. (Cognitive Knowledge Level: Apply)
CO 4	Develop C programs which use structures and pointers for data processing and parameter passing. (Cognitive Knowledge Level: Apply)
CO 5	Develop C programs for file processing. (Cognitive Knowledge Level: Apply)

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	3	3		1		1				1
CO 2	3	3	3	3		1		1				1
CO 3	3	3	3	3		1		1				1
CO 4	3	3	3	3		1		1				1
CO 5	3	3	3	3		1		1				1

Assessment Pattern

Bloom's Category	Continuous Assessment		End Semester Examination (% Marks)
	Test 1 (% Marks)	Test 2 (% Marks)	
Remember			
Understand	40	40	40
Apply	60	60	60
Analyse			
Evaluate			
Create			

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern

Attendance	10 marks
Continuous Assessment Test (2 numbers)	25 marks
Assignment/Quiz/Course Project	15 marks

End Semester Examination Pattern

There will be two parts; Part A and Part B. Part A contain 10 questions carrying 3 marks each. Part B contains 2 questions from each module out of which 1 to be answered. Each question carries 14 marks and can have maximum 2 sub divisions.

SYLLABUS

MODULE 1 (6 hours)

Problem Solving

Problem solving using Algorithms, Pseudocode and Flowcharts.

C Fundamentals

Character set, Constants, Identifiers, Keywords, Basic data types, Variables, Operators and its precedence, Bitwise operators, Expressions, Statements, Input and Output statements– Structure of a C program– simple programs.

MODULE 2 (9 hours)

Control Statements

If, if-else, nested if, switch , while, do-while, for, break & continue, nested loops. Single dimensional arrays – defining an array, array initialization, accessing array elements, Enumerated data type, Two-dimensional arrays – defining a two-dimensional array – Programs for matrix processing - Programs for Sequential search, Bubble sort.

MODULE 3 (8 hours)

Strings

Declaring a string variable, reading and displaying strings, string related library functions – Programs for string matching.

Functions

Function definition, function call, function prototype, parameter passing – Recursion – Passing array to function. Macros: Defining and calling macros.

MODULE 4 (8 hours)

Structures

Defining a structure variable, accessing members, array of structures, passing structure to function. Union, Pointers: declaration, operations on pointers, passing 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, Dynamic memory allocation.

MODULE 5 (5 hours)

Files

Different types of files in C – Opening & Closing a file – Writing to and Reading from a file – Processing files – Library functions related to file – fseek(), ftell(), fread(), fwrite(). Storage Class associated with variables: automatic, static, external and register.

Text Books

1. *Programming with C*, Byron S. Gottfried, Tata McGraw Hill.
2. *Computer Programming in C*. Kerninghan & Ritchie, PHI.

Reference Books

1. Stephen C. Kochan, *Programming in C*, CBS Publishers.
2. E. Balaguruswamy, *Programming in C*, Mc Graw Hill.
3. Yashwant Kanetkar, *Let us C*, BPB Publications.
4. Al Kelley and Ira Pohl, *A Book on C*, Addison-Wesley.
5. Stan Kelly Bootle, *Mastering Turbo C*, BPB Publications.
6. Yashwant Kanetkar, *Pointers in C*, BPB Publications.
7. Munish Cooper, *The Spirit of C*, Jaico Books.

COURSE CONTENTS AND LECTURE SCHEDULE

No.	Topic	No of Lecture/Tutorial Hours
	Total Hours	36 Hours
	Module 1: C Fundamentals	**6**
1.1	Problem solving using Algorithms, Pseudocode and Flowcharts	1
1.2	C fundamentals: Character set, Constants, Identifiers	1
1.3	Keywords, Basic data types, Variables	1
1.4	Operators and its precedence, bitwise operators	1
1.5	Expressions, Statements, Input and Output statements	1
1.6	Structure of a C program– simple programs	1
	Module 2: Control Statements	**9**
2.1	Control statements: if, if-else, nested if	

2.2	Switch, while loop, do-while loop	1
2.3	For loop, break & continue statements, nested loops	1
2.4	Single dimensional arrays – defining an array, array initialization, accessing array elements	1
2.5	Two-dimensional arrays – defining a two-dimensional array	1
2.6	Programs for matrix processing	1
2.7	Programs for sequential search	1
2.8	Bubble sort	1
2.9	Enumerated data type	1
	Module 3: Strings and Functions	**8**
3.1	Strings: declaring a string variable, reading and displaying strings	1
3.2	String related library functions	1
3.3	Programs for string matching	1
3.4	Functions: Function definition, Function call	1
3.5	Function prototype, Parameter passing	1
3.6	Recursion	1
3.7	Passing array to function	1
3.8	Macros: Defining and calling macros	1
	Module 4: Structures	**8**
4.1	Structures: defining a structure variable, accessing members	1
4.2	Array of structures, passing structure to function	1
4.3	Union	1
4.4	Pointers: declaration, operations on pointers, pointer to a function	1
4.5	Accessing array elements using pointers, Processing strings using pointers	1
4.6	Pointer to pointer, Array of pointers	1
4.7	Pointer to function, Pointer to structure	1
4.8	Dynamic memory allocation	1
	Module 5: Files	**5**
5.1	Different types of files in C, Opening & Closing a file	1
5.2	Writing to and Reading from a file, Processing file	1
5.3	Library functions related to file – fseek(), ftell()	1
5.4	Library functions related to file – fread(), fwrite()	1
5.5	Storage Class associated with variables: automatic, static, external and register	1

CO ASSESSMENT QUESTIONS

Course Outcome 1 (CO 1)

1. Write an algorithm and pseudocode to check if a given number is an Armstrong number or not
2. Draw a flow chart to check if a given number is an Armstrong number or not.

Course Outcome 2 (CO 2)

1. Write a C program to find the smallest number, largest number and the number of occurrences from a set of numbers.
2. Write a C program to add two matrices.

Course Outcome 3 (CO 3)

1. Write a C program to find whether a string is present in another string.
2. Write functions to accept an N X N matrix and find the row sum and column sum of the matrix.

Course Outcome 4 (CO 4)

1. Write a C program to find the difference between two time intervals using structure.
2. Write a C program to check if a given string is palindrome using pointers.

Course Outcome 5 (CO 5)

1. Write a C program to count the number of lines in a file.
2. The name of some students and their marks in 5 subjects are given in a file. Write a C program to read the student details and calculate the total marks and write the name and total marks to another file.

MODEL QUESTION PAPER

QP CODE: **Pages: 2**

Reg.No.: .....

Name: .....

MAR ATHANASIUS COLLEGE OF ENGINEERING (AUTONOMOUS), KOTHAMANGALAM

First SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2024

Course Code: B24ES1T01A

Course Name: PROBLEM SOLVING AND PROGRAMMING TECHNIQUES

Max. Marks: 100 Duration: 3 hours

PART A

Answer all questions. Each question carries 3 marks.

1. Draw a flow chart to find the largest of three numbers.
2. Write a C program to convert Fahrenheit temperature to Celsius.
3. Differentiate between while loop and do-while loop.
4. Write a C program to find all the factors of a number.
5. Explain any 3 string handling functions using examples.
6. Differentiate between macros and functions.
7. What are the advantages of using structure in C language?
8. Explain pointer to a pointer with an example.
9. Write any three file handling functions in C.
10. What is a static variable? When should it be used?

PART B

Answer any one question from each module. Each question carries 14 marks.

11. Explain linear search with an example. Draw a flowchart and write pseudo code to perform linear search on an array of numbers. (14 marks)

OR

12. (a) Write a C program to find the area of a triangle given the length of three sides of the triangle. (7 marks)

    (b) Write a C program to find the Area and Circumference of a Circle given the radius of the circle. (7 marks)

13. (a) Write a C program to find the transpose of a matrix. (7 marks)

    (b) Write a C program to sort an array of numbers using bubble sort. (7 marks)

OR

14. (a) Write a C program to find the sum of first and last digit of a number. (7 marks)

    (b) Write a C program to print all the prime numbers between 100 to 200. (7 marks)

15. (a) Explain any 4 string handling functions in C programming. (7 marks)

    (b) Write a C program to reverse a string without using string handling functions. (7 marks)

OR

16. (a) What is the purpose of function declaration and function definition and function call? With examples illustrate their syntax. (7 marks)

    (b) What is recursion? Write a C program to display Fibonacci series using recursive function. (7 marks)

17. (a) Write a C program to: (7 marks)

        i. Create a structure with fields: Name, Address, Date of Birth.

        ii. Read the above details for five students from user and display the details.

    (b) Differentiate between array of pointers and pointer to an array. (7 marks)

OR

18. (a) What are the different dynamic memory allocation functions available in C language. (7 marks)

    (b) Write a C program to reverse a string using pointers. (7 marks)

19. (a) What are different storage classes in C? Give examples for each. (7 marks)

    (b) Explain any 5 file handling functions in C. (7 marks)

OR

20. (a) Write a C program to count number of lines in a text file. (7 marks)

    (b) Write a C program to read a text file and replace all vowels in the text file with character 'x' and write it to another file. (7 marks)

B24EE1T01	INTRODUCTION TO ELECTRICAL ENGINEERING	L	T	P	S	CREDIT	YEAR OF INTRODUCTION
		2	2	0	2	4	2024

Preamble

The course aims to equip the students with an understanding of the fundamental principles of electrical engineering. This will set a strong conceptual understanding of basic electrical laws and theorems with the art of technical problem solving. Upon successful completion of the course, the students will be empowered to analyze and comprehend the diverse electrical systems that surround us.

Prerequisites

Nil

Course Outcomes

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

CO 1	Apply fundamental concepts and circuit laws to solve electric circuits. (Cognitive Knowledge Level: Apply)
CO 2	Apply the circuit theorems of electrical engineering to solve DC circuits in steady-state. (Cognitive Knowledge Level: Apply)
CO 3	Understand the basic concepts of magnetism to develop and solve models of magnetic circuits and fundamental concepts of AC systems. (Cognitive Knowledge Level: Understand)
CO 4	Solve single-phase AC circuits by applying the fundamental laws of electrical engineering and analyze the same using circuit theorems. (Cognitive Knowledge Level: Apply)
CO 5	Analyze balanced and unbalanced 3-phase star-connected and delta-connected systems. (Cognitive Knowledge Level: Apply)

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	2	1		1	1		1		1	1
CO 2	3	3	2	1		1	1		1		1	1
CO 3	3	3	2	1		1	1		1		1	1
CO 4	3	3	2	1		1	1		1		1	1
CO 5	3	3	2	1		2	1		2		2	2

Assessment Pattern

Bloom's Category	Continuous Assessment		End Semester Examination (% Marks)
	Test 1 (% Marks)	Test 2 (% Marks)	
Remember	20	20	20
Understand	30	30	30
Apply	50	50	50
Analyse			
Evaluate			
Create			

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern

Attendance	10 marks
Continuous Assessment Test (2 numbers)	25 marks
Assignment/Quiz/Course Project	15 marks

End Semester Examination Pattern

There will be two parts; Part A and Part B. Part A contain 10 questions carrying 3 marks each. Part B contains 2 questions from each module out of which 1 to be answered. Each question carries 14 marks and can have maximum 2 sub divisions.

SYLLABUS

MODULE 1 (10 hours)

DC Circuits

Independent voltage and current sources, passive components (circuit and dimension), Ohm's Law, Kirchhoff's Laws, series and parallel combinations, voltage and current division rule, Star-Delta/Delta-Star Conversions to reduce resistive networks, source transformation.

Analysis of DC Circuits

Mesh current analysis and nodal voltage analysis of circuits containing resistors and independent sources- solution of network equations by matrix representation.

MODULE 2 (8 hours)

Circuit Theorems

Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, and Reciprocity theorem. Thevenin's and Norton's equivalent circuits (with independent sources only).

MODULE 3 (12 hours)

Electromagnetism

Magnetism - Terminologies, analogy of electrical and magnetic circuit, series and parallel magnetic circuits, force on current carrying conductors placed in a magnetic field - Fleming's left-hand rule, Faraday's Laws of electromagnetic induction, Lenz's Law, statically and dynamically induced EMF - self-inductance, mutual-inductance and coefficient of coupling.

AC Fundamentals

Generation of sinusoidal voltage and currents, average value, rms value, form and peak factors of trapezoidal and sinusoidal waveforms, Phasor representation of sinusoidal quantities - phase difference, addition and subtraction of sinusoids, Symbolic Representation: cartesian, polar and exponential forms.

MODULE 4 (8 hours)

Single Phase AC Circuits

AC circuits with pure resistance, pure inductance, pure capacitance, RL, RC, and RLC circuits - voltage-current phasor diagrams, active, reactive, apparent, complex power, and power factor.

Circuit Theorems in AC

Thevenin's Theorem, Norton's Theorem, and Maximum Power Transfer Theorem.

MODULE 5 (7 hours)

Analysis of Three-phase AC Circuits

Generation of 3-phase AC voltage, phase sequence, 3-phase star connected and delta connected systems - balanced and unbalanced 3-wire and 4-wire systems, power in three-phase balanced circuits - active power, reactive power, complex power, apparent power and power factor.

Text Books

1. K. S. Suresh Kumar, *Electric Circuits and Networks*, Pearson Education, 2nd ed., 2022.
2. B. L. Theraja, *Electrical Technology*, S. Chand Publication, Vol.1, 30th ed., 2020.
3. V. K. Mehta, *Basic Electrical Engineering*, S. Chand and Company Ltd, 8th ed., 2020.
4. Edward Hughes, *Electrical Technology*, Pearson Education, 11th ed., 2020.
5. J. A. Edminister, *Electric Circuit Theory*, McGraw-Hill , 2nd ed., 2022.

Reference Books

1. Del Toro V, *Electrical Engineering Fundamentals*, Pearson Education, 3rd ed., 2023.
2. T. K. Nagsarkar, M. S. Sukhija, *Basic Electrical Engineering*, Oxford Higher Education, 6th ed., 2022.
3. Hayt W. H., Kemmerly J. E., and Durbin S. M., *Engineering Circuit Analysis*, Tata McGraw-Hill, 10th ed., 2023.
4. Hughes, *Electrical and Electronic Technology*, Pearson Education, 12th ed., 2022.
5. V. N. Mittle and Arvind Mittal, *Basic Electrical Engineering*, McGraw Hill, 6th ed., 2022.

COURSE CONTENTS AND LECTURE SCHEDULE

No.	Topic	No of Lecture/Tutorial Hours
	Total Hours	45 Hours
	Module 1: DC Circuits and Analysis of DC Circuits	**10**
1.1	Independent voltage and current sources, passive components (circuit and dimension), Ohm's Law, Kirchhoff's Laws	1
1.2	Series and parallel combinations, voltage, and current division rule -Numerical problems	2
1.3	Star-Delta / Delta-Star Conversions to reduce resistive networks (derivation not required), source transformation-Numerical problems	2
1.4	Mesh current analysis and nodal voltage analysis of circuits containing resistors and independent sources	2
1.5	Numerical problems	1
1.6	Solution of network equations by matrix representation	2
	Module 2: Circuit Theorems	**8**
2.1	Superposition theorem, Numerical problems	2
2.2	Maximum Power Transfer theorem, and Reciprocity Theorem. Numerical problems	2
2.3	Thevenin's theorem and Norton's theorem	1
2.4	Determination of Thevenin's and Norton's equivalent circuits containing independent sources	3
	Module 3: Electromagnetism and AC Fundamentals	**12**
3.1	Magnetism- Terminologies, analogy of electrical and magnetic circuit, series and parallel magnetic circuits - Numerical problems	2
3.2	Force on current carrying conductors placed in a magnetic field - Fleming's left-hand rule	1
3.3	Faraday's Laws of electromagnetic induction, Lenz's Law, statically and dynamically induced EMF	2
3.4	Self-inductance, mutual-inductance, and coefficient of coupling- Numerical problems	2
3.5	Generation of sinusoidal voltage and currents	1
3.6	Average value, rms value, form and peak factors of trapezoidal and sinusoidal waveforms - Numerical problems	2
3.7	Phasor representation of sinusoidal quantities - phase difference, addition and subtraction of sinusoids	1
3.8	Symbolic Representation: cartesian, polar and exponential forms	1
	Module 4: Single phase AC Circuits and Circuit Theorems in AC	**8**

4.1	AC circuits with pure resistance, pure inductance, pure capacitance, RL, RC, and RLC circuits -corresponding voltage-current phasor diagrams	2
4.2	Active, reactive, apparent, complex power, and power factor	1
4.3	Numerical problems	3
4.4	Thevenin's theorem, Norton's theorem, and Maximum Power Transfer Theorem for AC circuits - Numerical problems	2
	Module 5: Analysis of Three-phase AC Circuits	**7**
5.1	Generation of 3-phase AC voltage, phase sequence	1
5.2	3-phase star connected and delta connected systems-balanced and unbalanced - 3-wire and 4-wire systems - Numerical problems	3
5.3	Power in three-phase balanced circuits- active power, reactive power, complex power, apparent power and power factor Numerical problem	3

CO ASSESSMENT QUESTIONS

Course Outcome 1 (CO 1)

1. Solve problems based on the current division rule.
2. Solve problems with Mesh/Nodal analysis.
3. Solve problems on Star-Delta Transformation.

Course Outcome 2 (CO 2)

1. Solve DC circuits using the Superposition theorem.
2. Solve DC circuits using the Maximum Power Transfer/Reciprocity Theorem.
3. Determination of Thevenin's and Norton's equivalent circuits.

Course Outcome 3 (CO 3)

1. Problems on series/parallel magnetic circuits.
2. Problems on self-inductance, mutual-inductance, and coefficient of coupling.
3. Problems on rms and average values of periodic waveforms.

Course Outcome 4 (CO 4)

1. Problems on series RL and RC circuit.
2. Problems on series RLC circuit.
3. Solve AC circuits using Thevenin/Norton's Theorem.

Course Outcome 5 (CO 5)

1. Solve problems of balanced 3-phase star and delta connected system.
2. Solve problems of unbalanced 3-phase star and delta-connected system.
3. Determination of power in three-phase balanced circuits.

MODEL QUESTION PAPER

QP CODE: **Pages: 4**

Reg.No.: .....

Name: .....

MAR ATHANASIUS COLLEGE OF ENGINEERING (AUTONOMOUS), KOTHAMANGALAM

FIRST SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2024

Course Code: : B24EE1T01

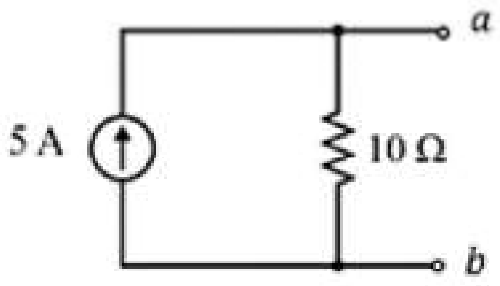
Course Name: : INTRODUCTION TO ELECTRICAL ENGINEERING

Max. Marks: 100 Duration: 3 hours

PART A

Answer all questions. Each question carries 3 marks.

1. State Kirchhoff's laws. Draw a circuit with one loop consisting of two resistances and two voltage sources, and write the voltage equation of the loop.
2. Three resistors, 20 Ω, 90 Ω, and 10 Ω, are star connected. Obtain the equivalent delta circuit.
3. State and explain the Reciprocity theorem using an example.
4. Find the value of the load resistance to be connected at a - b so that maximum power is transferred by the source. What is the maximum power delivered to the load?



5. Distinguish between self and mutual inductances. Derive an expression for the self-inductance of a coil.
6. Derive the form factor of a pure sinusoidal waveform.

7. A resistance of 10 Ω and an inductive reactance of 10Ω are connected in series. Calculate the value of impedance and draw the impedance triangle.
8. Explain active power, reactive power, and apparent power.
9. Draw a three-phase, four-wire system and mark the voltage between each wire. Assume that the voltage across a phase is 230 V.
10. Derive the relation between line and phase values of voltage and current for delta connected system.

PART B

Answer any one question from each module. Each question carries 14 marks.

11. (a) Determine the node voltages in the Figure 1. (10 marks)

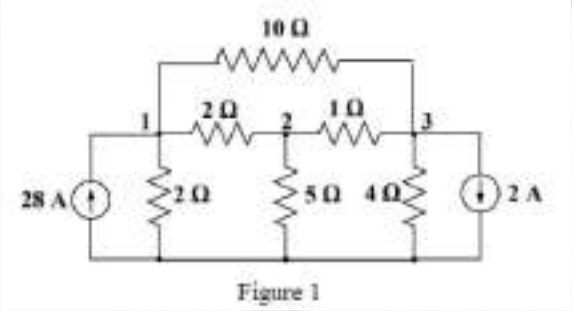


Figure 1

(b) Three lamps are connected in series across a 180 V supply and take a current of 2.5 A. If the resistance of two of the lamps is 30 Ω each, what is the resistance of the third lamp? (4 marks)

OR

12. (a) Using mesh analysis, find the voltage V_x of Figure 2. (10 marks)

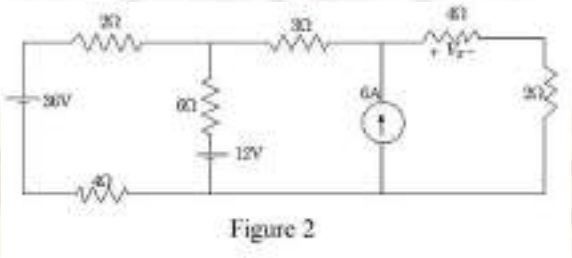


Figure 2

(b) Using star delta transformation, find the equivalent resistance between A and B in Figure 3. (4 marks)

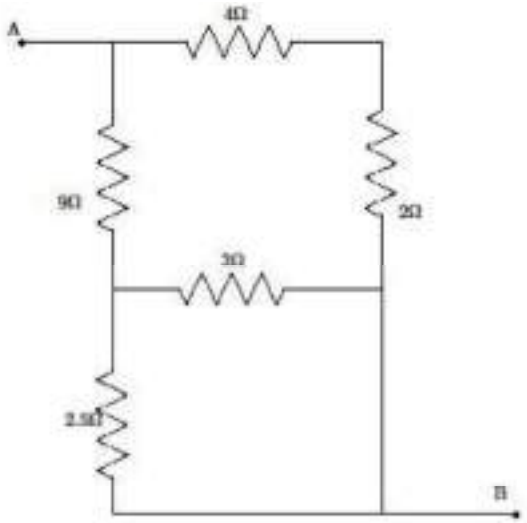


Figure 3

13. For the circuit given in Figure 4,

    (a) Determine the Thevenin's equivalent circuit across the terminals X and Y. (10 marks)

    (b) Determine the value of resistance to be connected across X and Y so that maximum power is transferred to it. Also, calculate the maximum power transferred. (4 marks)

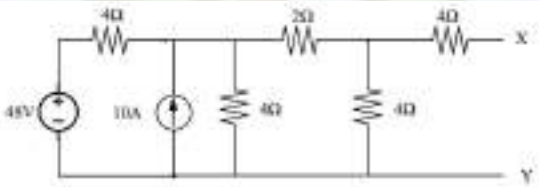


Figure 4

OR

14. For the circuit given in Figure 5, apply the superposition theorem to find the power dissipated in the 5 Ω. (14 marks)

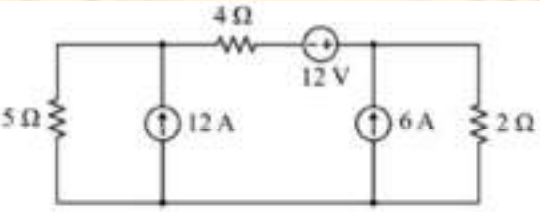


Figure 5

15. (a) A magnetic core is made up of a ring with a mean diameter of 7.96 cm and a cross-sectional area of 1 cm^2. The relative permeability of iron is 2000. A coil of

1500 turns is uniformly wound around the ring. Obtain the current required to produce a flux of 25 mWb? What current will be required to maintain the same flux, if an air gap of 2 mm is cut through the core. (10 marks)

(b) Write a short note on (4 marks)

i. Magneto motive force
ii. Reluctance
iii. Magnetic flux
iv. Permeability

OR

16. (a) Define the following terms with an example: a) Phase b) Phase difference. (4 marks)

(b) Explain in detail the dynamically and statically induced emfs. An air solenoid has 300 turns, its length is 25 cm, and cross-sectional area of 3 cm^2. Calculate the self-inductance. If the coil current of 10 A is completely interrupted in 0.04 s, calculate the induced emf in the coil. (10 marks)

OR

17. (a) A current of 5 A flows through a non-inductive resistance in series with a choke coil when supplied at 250 V, 50 Hz. If the voltage across the resistance is 125 V and that across the coil is 200 V, calculate (i) Impedance, reactance, and resistance of the coil, (ii) Power absorbed by the coil, and (iii) Total power absorbed by the circuit. (10 marks)

(b) Explain the phasor diagram and impedance triangle of a series resistive inductive circuit excited by an AC source. (4 marks)

18. In the circuit given in Figure 6,

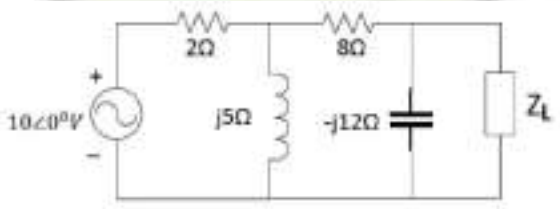


Figure 6

(a) Determine the value of the load impedance for maximum power transferred by the source to the load. (12 marks)

(b) Find the maximum power transferred. (2 marks)

OR

19. A 3-phase, 3-wire, 240V system supplies a delta-connected load in which $Z_{AB} = 25 < 90^o\ \Omega$, $Z_{BC} = 15 < 30^o\ \Omega$ and $Z_{CA} = 20 < 0^o\ \Omega$. Determine the phase currents, line currents, and total power consumed by the load. (14 marks)

20. A 3-phase, 400V, 4-wire system has a star connected load with $Z_A = 20\ \Omega$, Z_B= 15 + j10 Ω and Z_C = j5 Ω. Find the line currents, current through the neutral conductor, and the total power consumed by the load. (14 marks)

B24EE1T02	ELECTRONIC CIRCUITS I	L	T	P	S	CREDIT	YEAR OF INTRODUCTION
		2	1	0	2	3	2024

Preamble

Electronic Circuits I course aims to impart sound knowledge and basic concepts of electronic circuits. It gives information about the principle of operation of electronic devices and their practical applications. This course will enable the students to understand and analyse practical electronic circuits.

Prerequisites

Nil

Course Outcomes

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

CO 1	Understand the fundamental concepts of diodes, applications, and analysis. (Cognitive Knowledge Level: Understand)
CO 2	Describe the various transistor configurations and characteristics. (Cognitive Knowledge Level: Apply)
CO 3	Apply the basic biasing and stabilization techniques of transistors to develop practical circuits. (Cognitive Knowledge Level: Apply)
CO 4	Apply the h parameter model to find amplifier parameters and understand the frequency response of multi-stage amplifiers. (Cognitive Knowledge Level: Apply)
CO 5	Understand the principles of power amplifiers and various oscillators. (Cognitive Knowledge Level: Understand)

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	1		1	1	1	1	1	1		2
CO 2	3	2	2				1	1	1	1		2
CO 3	3	3	3	2				1	1	1		2
CO 4	3	3	3	2		1		1	1	1		2
CO 5	3	3	1		1	1	1	1	1	1		2

Assessment Pattern

Bloom's Category	Continuous Assessment		End Semester Examination (% Marks)
	Test 1 (% Marks)	Test 2 (% Marks)	
Remember	20	20	20
Understand	40	40	40
Apply	40	40	40
Analyse			
Evaluate			
Create			

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern

Attendance	10 marks
Continuous Assessment Test (2 numbers)	25 marks
Assignment/Quiz/Course Project	15 marks

End Semester Examination Pattern

There will be two parts; Part A and Part B. Part A contain 10 questions carrying 3 marks each. Part B contains 2 questions from each module out of which 1 to be answered. Each question carries 14 marks and can have maximum 2 sub divisions.

SYLLABUS

MODULE 1 (7 hours)

Introduction to Semiconductor Devices

PN Junction diode - principle of operation, VI characteristics, principle of avalanche breakdown, zener diode, zener shunt regulator, Schottky diode.

Rectifiers

Half-wave rectifier, full-wave rectifier, full-wave bridge rectifier-design of half-wave and full-wave rectifiers with capacitor filters.

MODULE 2 (8 hours)

Wave Shaping Circuits

Clipping circuits and clamping circuits - applications - RC Integrator and Differentiator.

Transistor Circuits

Bipolar Junction Transistors (BJT), PNP and NPN structures, principle of operation, the relation between current gains in CE, CB, and CC, input and output characteristics of common base and common emitter configuration. Uni Junction Transistor (UJT), Junction Field Effect Transistor (JFET) - construction and working principle.

MODULE 3 (7 hours)

Transistor Stability

Operating point of BJT - factors affecting stability of Q point, DC biasing - biasing circuits - fixed bias, collector to base bias, voltage divider bias, role of emitter resistance in bias stabilization - stability factor derivation for voltage divider biasing, Numerical problems.

MODULE 4 (8 hours)

h-parameters

Modeling of BJT - h-parameter model of BJT in CE configuration, small signal low frequency, AC equivalent circuit of CE amplifier, calculation of amplifier gains and impedances using h-parameter equivalent circuit - Numerical problems.

Feedback in Amplifiers: Effect of positive and negative feedback.

Multistage Amplifiers

Direct coupled amplifiers, RC coupled amplifiers, frequency response of RC coupled - role of coupling capacitors and emitter bypass capacitor.

MODULE 5 (6 hours)

Power Amplifiers using BJT

Class A, Class B, Class AB, Class C, and Class D amplifiers (basic principles).

Oscillators

Oscillators: Bark Hausen's criterion - RC phase shift oscillator, LC oscillators (Hartley), Crystal oscillator (derivation not needed), BJT sweep generator, Astable multivibrator (working principle and applications only).

Text Books

1. Bell D. A., *Electronic Devices and Circuits*, Oxford University Press, 5th ed., 2007.
2. Boylestad R. L. and L. Nashelsky, *Electronic Devices, and Circuit Theory*, Pearson Education, 10th ed., 2009.
3. Floyd T.L., *Fundamentals of Analog Circuits*, Pearson Education, 2nd ed., 2012.

Reference Books

1. J. B. Gupta, *Electronic Devices and Circuits*, S.K. Kataria, 6th ed., 2016.
2. Millman J. and C. C. Halkias, *Integrated Electronics: Analog and Digital Circuits and Systems*, Tata McGraw-Hill, 2nd ed., 2010.
3. Malvino A. and D. J. Bates, *Electronic Principles*, Tata McGraw Hill, 7th ed., 2010.
4. Allen Mottershead, *Electronic Devices and Circuits: An Introduction*, Prentice Hall of India.
5. G.K. Mithal, *Electronic Devices and Circuits*, Khanna Publishers, 2014.

COURSE CONTENTS AND LECTURE SCHEDULE

No.	Topic	No of Lecture/Tutorial Hours
	Total Hours	45 Hours
	Module 1: Introduction to Semiconductor Devices	**7**
1.1	PN Junction diode, principle of operation, VI characteristics	1
1.2	Principle of avalanche breakdown - Zener diode	1
1.3	Zener shunt regulator, Schottky diode	1
1.4	Rectifiers - Half-wave rectifier, Full-wave rectifier	2
1.5	Full-wave bridge rectifier	1
1.6	Design of Half-wave and full-wave rectifiers with capacitor filters	1
	Module 2: Wave Shaping Circuits and Transistor Circuits	**8**
2.1	Clipping circuits	1
2.2	Clamping circuits - Applications- RC Integrator and Differentiator	2
2.3	Transistor circuits - Bipolar Junction Transistors	1
2.4	PNP and NPN structures, principle of operation	1
2.5	Relation between current gains in CE, CB, and CC	1
2.6	Input and output characteristics of common base and common emitter configuration	1
2.7	UJT and JFET - construction and working principle	1
	Module 3: Transistor Stability	**7**
3.1	Operating point of BJT - Factors affecting the stability of Q point	2
3.2	DC Biasing circuits - fixed bias, collector to base bias	1
3.3	Voltage divider bias, role of emitter resistance in bias stabilization	1
3.4	Stability factor derivation for Voltage Divider Biasing	1
3.5	Numerical problems – Biasing	2
	Module 4: h-parameters and Multistage Amplifiers	**8**
4.1	Introduction to h-parameters	1
4.2	Modeling of BJT- h-parameter model of BJT in CE configuration	1
4.3	Small signal low-frequency AC equivalent circuit of CE amplifier	1
4.4	Calculation of amplifier gains and impedances using the h-parameter equivalent circuit, Numerical problems	2
4.5	Feedback in Amplifiers - Effect of positive and negative feedback	1

4.6	Multistage amplifiers: Direct coupled amplifiers, RC coupled amplifiers, the frequency response of RC coupled amplifier, Role of coupling capacitors, and emitter bypass capacitor	2
	Module 5: Power Amplifiers using BJT and Oscillators	**6**
5.1	Power amplifiers using BJT: Class A, Class B, Class AB, Class C, and Class D amplifiers	2
5.2	Oscillators: Barkhausen's criterion - RC Phase Shift oscillator (principle and frequency of operation)	1
5.3	LC oscillators (Hartley), Crystal oscillator (derivation not needed)	1
5.4	BJT Sweep generator (working principle and applications only)	1
5.5	Astable multivibrator (working principle and applications only)	1

CO ASSESSMENT QUESTIONS

Course Outcome 1 (CO 1)

1. Explain the principle of operation of the diode.
2. Draw the VI characteristics of diodes.
3. Explain the working of rectifiers.

Course Outcome 2 (CO 2)

1. Understand the working of clipping and clamping circuits.
2. Explain the different configurations of transistors.
3. Describe the operation of UJT and JFET.

Course Outcome 3 (CO 3)

1. Problems with the stability factor of voltage divider biasing.
2. Explain factors affecting stability of Q point.
3. Explain the various biasing circuits and compare them.

Course Outcome 4 (CO 4)

1. Problems on amplifier gains and impedances using h-parameter equivalent.
2. Compare positive and negative feedback in amplifiers
3. Explain the frequency response curve of the RC coupled amplifier.

Course Outcome 5 (CO 5)

1. What are the various classes of Power Amplifiers?
2. Explain the working principle of Oscillators.
3. Explain the working of the Sweep Generator and Astable Multivibrator.

MODEL QUESTION PAPER

QP CODE: **Pages: 2**

Reg.No.: .....

Name: .....

MAR ATHANASIUS COLLEGE OF ENGINEERING (AUTONOMOUS), KOTHAMANGALAM

FIRST SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2024

Course Code: B24EE1T02

Course Name: ELECTRONIC CIRCUITS I

Max. Marks: 100 Duration: 3 hours

PART A

Answer all questions. Each question carries 3 marks.

1. Differentiate between Avalanche and Zener breakdown.
2. Explain the principle of Schottky diode.
3. Design a suitable circuit to obtain the output level clipped at +3V and -4V for a 10V peak-to-peak sinusoidal input voltage.
4. With a neat diagram, explain the constructional features of n channel JFET.
5. What are the advantages of potential divider biasing?
6. State the functions of a transistor biasing circuit.
7. Draw and explain the frequency response characteristics of the RC coupled amplifier.
8. List out the advantages of negative feedback in amplifiers.
9. Explain the Barkhausen's criteria of oscillations.
10. Draw the circuit of crystal oscillator.

PART B

Answer any one question from each module. Each question carries 14 marks.

11. (a) Explain the working of a PN junction diode and draw the VI characteristics of the diode. (8 marks)

    (b) Explain the formation of potential barrier in a PN junction diode. (6 marks)

OR

12. (a) With a neat diagram, explain the working of a full wave bridge rectifier. (8 marks)

    (b) Narrate how the capacitor filter eliminates ripples from the output of a rectifier. (6 marks)

13. (a) Explain the working of an NPN transistor. Describe with suitable sketches the input and output characteristics of a common emitter NPN transistor. (10 marks)

    (b) Derive the relationship between common base current gain and common emitter current gain. (4 marks)

OR

14. (a) With a neat circuit diagram, explain the working of a negative voltage clamping circuit. (8 marks)

    (b) Explain the working of a Uni Junction Transistor. (6 marks)

15. (a) Define the stability factor and derive the equation for the stability factor for voltage divider biasing. (8 marks)

    (b) What factors are to be considered for selecting the operating point Q of an amplifier? (6 marks)

OR

16. Design a voltage divider bias circuit to operate from an 18 V supply in which bias conditions are to be V_{CE} =V_E = 6 V, I_C = 1.5 mA, and β = 90. Also, calculate the stability factor S. (14 marks)

17. (a) Derive the equation for voltage gain and current gain for a BJT using an approximate h-parameter model for common emitter configuration. (8 marks)

    (b) Given h-parameters of a transistor connected in CE configuration is hie =1000 Ω, $h - r_e$= 10 × 10^{-4}, h_{fe}= 50, h_{oe} = 100 × 10 − 6 . If the load resistance R_L is 1 KΩ, find i) Input impedance, ii) Current gain, and iii) Voltage gain. (6 marks)

OR

18. (a) Draw the h parameter model of a transistor in CE configuration. Also, derive the expression for input impedance, current gain, and voltage gain. (8 marks)

    (b) Describe the gain and bandwidth of an RC-coupled amplifier. (6 marks)

19. (a) With a neat diagram, explain the working of a Hartley Oscillator. (8 marks)

    (b) Explain the working of Class A amplifier. (6 marks)

OR

20. (a) With a neat diagram, explain the working of the Astable multivibrator. (8 marks)

    (b) Explain the working of the Class C amplifier. (6 marks)

B24ES1T03B	COMPUTER AIDED ENGINEERING GRAPHICS (B)	L	T	P	S	CREDIT	YEAR OF INTRODUCTION
		2	1	1	3	4	2024

Preamble

This course aims to equip students with the skills for precise technical communication using global standards. Through this course, students learn to proficiently use CAD software and interpret engineering drawings accurately. Emphasis is placed on conveying design intent and specifications effectively. By mastering these skills, students develop a critical eye for detail and enhance their ability to communicate complex engineering concepts visually. Ultimately, the course prepares students to excel in the global engineering landscape by fostering proficiency in graphical communication and CAD expertise.

Prerequisites

Nil

Course Outcomes

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

CO 1	Draw the projection of points and lines located in different quadrants. (Cognitive Knowledge Level: Analyse)
CO 2	Prepare multi view orthographic projections of objects by visualizing them in different positions. (Cognitive Knowledge Level: Apply)
CO 3	Draw sectional views and develop surfaces of a given object. (Cognitive Knowledge Level: Apply)
CO 4	Familiarize the tools and features of CAD software. (Cognitive Knowledge Level: Understand)
CO 5	Prepare pictorial drawings using the principle of isometric projections and convert 3D views to orthographic views using CAD Software. (Cognitive Knowledge Level: Analyse)

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	2	2				1		1		1
CO 2	3	2	2	2				1		1		1
CO 3	3	2	2	2				1		2		1
CO 4	3	1	1	1	2			1		2		1
CO 5	3	2	2	2	2			1		2		1

Assessment Pattern

Bloom's Category	Continuous Assessment		End Semester Examination (% Marks)
	Test 1 (% Marks)	Test 2 (% Marks)	
Remember			
Understand	40	40	30
Apply	30	30	40
Analyse	30	30	30
Evaluate			
Create			

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
150	100	50	2 hours

Continuous Internal Evaluation Pattern

Attendance	20 marks
Continuous Assessment Test (2 numbers)	40 marks
Assignment/Class work	40 marks

Continuous Assessment Test 1 will be from Part A having 20 marks and test 2 will be from Part B with 20 marks. Regarding Assignments/Class work, 15 marks will be awarded for Part A and remaining 25 marks should be based on class works/assignments from Part B (minimum 5 exercise).

End Semester Examination Pattern

ESE will be from Part A of 2-hour duration on A4 size answer booklet and will be for 50 marks.
The question paper shall contain two parts, in which Part I contains one question from each module, each carries 12 marks and Part II contains two questions from any of the three modules carrying 14 marks each. Student has to answer all the three questions from Part I and any one question from Part II.

SYLLABUS

PART A

MODULE 1 (11 hours)

Introduction

Relevance of technical drawing in engineering field. Types of lines, Dimensioning, BIS code of practice for technical drawing.

Orthographic Projection of Points and Lines

Orthographic projection of Points and Lines: Projection of points in different quadrants, Projection of straight lines inclined to one plane and inclined to both planes. Trace of line. Inclination of lines with reference planes True length of line inclined to both the reference planes.

MODULE 2 (10 hours)

Orthographic Projection of Solids

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

MODULE 3 (10 hours)

Sections of Solids

Sections of Prisms, Pyramids, Cone, Cylinder with axis in vertical position and cut by different section planes. True shape of the sections.

Development of Surfaces

Development of surfaces of the Prisms, Pyramids, Cone, Cylinder cut by different section planes.

PART B

MODULE 4 (5 hours)

Introduction to Computer Aided Drawing

Role of CAD in design and development of new products, Advantages of CAD.
Create a new drawing, Set model environment i.e., units, limits etc., Set interface settings e.g., snap, grid, ortho, Create and save an AutoCAD drawing template, Use zooming tools, Drawing commands as line, spline, circle, arc, rectangle, polygon, ellipse, Hatch a closed entity to represent sections, Erase & oops, Copy and Move objects, Rotate, Scale, Stretch Extend & Offset, Mirror and array, Apply Chamfers and Fillets, Edit polylines and spline, decurve, fit, thickness join & explode, Trim, break, explode, Create layers and assign properties as line weights, line types, colour, Modify status: On, Off, Freeze, Thaw, Lock, Unlock, Set layer current, Modify layer attributes, Text and Dimensions, Plotting, Extrusion.
Use of CAD tools to draw simple electrical components and circuits.Drawing of simple electrical line drawings, layouts etc..

MODULE 5 (9 hours)

Isometric Projection using CAD

Isometric View and Projections of Prisms, Pyramids, Cone, Cylinder, Frustum of Pyramid, Frustum of Cone.
Simple isometric and Orthographic views of electrical components.

Conversion of Pictorial Views using CAD

Creating two-dimensional drawing from pictorial views.

Text Books

1. Bhatt, N.D., *Engineering Drawing*, Charotar Publishing House Pvt. Ltd., 54th ed., 2023.
2. John, K.C. *Engineering Graphics*, Prentice Hall India, 2nd ed., 2009.
3. K.N. Anilkumar, *Engineering Graphics*, Adhyuth Narayan, 8th ed., 2013.
4. P. I. Varghese, *Engineering Graphics*, VIP, 34th ed., 2023.

Reference Books

1. Agrawal, B. and Agrawal, C.M., *Engineering Drawing*, Tata McGraw Hill Publishers, 3rd ed., 2019.
2. Duff, J.M. and Ross, W.A., *Engineering Design and Visualisation*, Cengage Learning, 1st ed., 2008.
3. Kulkarni, D.M., Rastogi, A.P. and Sarkar, A.K., *Engineering Graphics with AutoCAD*, Prentice Hall India, 1st ed., 2010.

4. Luzaddff, W.J. and Duff, J.M., *Fundamentals of Engineering Drawing*, Prentice Hall India, 1st ed.,1992.

COURSE CONTENTS AND LECTURE SCHEDULE

No.	Topic	No of Lecture/Tutorial Hours
	Total Hours	45 Hours
	Module 1: Introduction and Orthographic Projection of Points and Lines	**11**
1.1	Introduction: Relevance of technical drawing in Engineering field. Types of lines, Dimensioning, BIS code of practice for technical drawing	1
1.2	Concept of principle planes of projection, different quadrants, locating points on different quadrants	2
1.3	Projection of lines, inclined to one plane and Lines inclined to both planes	4
1.4	Problems on lines using trapezoid method	2
1.5	Line rotation method of solving, problems on line rotation method	2
	Module 2: Orthographic projection of Solids	**10**
2.1	Introduction of different solids, Simple position plan and elevation of solids	3
2.2	Problems on views of solids inclined to one plane	2
2.3	Problems on views of solids inclined to both planes	3
2.4	Practice problems on solids inclined to both planes	2
	Module 3: Sections of Solids and Development of Surfaces	**10**
3.1	Introduction to section planes. Principle of locating cutting points and finding true shape	2
3.2	Problems on sections of different solids and Problems when the true shape is given	3
3.3	Principle and development of simple solids	2
3.4	Development of solids and sectioned solids	3
	Module 4: Introduction to Computer Aided Drawing	**5**
4.1	Introduction to Computer Aided Drawing: Role of CAD in design and development of new products, Advantages of CAD	1
4.2	AutoCAD Fundamentals: Open, (and close) AutoCAD application, Create a new drawing, Set model environment ie units, limits etc, Set interface settings eg snap, grid, ortho, Create and save an AutoCAD drawing template	1

4.3	Use zooming tools, Drawing commands as line, spline, circle, arc, rectangle, polygon, ellipse, Hatch a closed entity to represent sections, Erase and oops, Copy and Move objects, Rotate, Scale, Stretch Extend and Offset, Mirror and array, Apply Chamfers and Fillets, Edit polylines and spline, decurve, fit, thickness join and explode	1
4.4	Trim, break, explode, Create layers and assign properties as line weights, line types, colour, Modify status: On, Off, Freeze, Thaw, Lock, Unlock, Set layer current, Modify layer attributes, Text and Dimensions, Plotting, Extrusion	1
4.5	Use of CAD tools to draw simple electrical components and circuits. Drawing of simple electrical line drawings, layouts etc.	1
	Module 5: Isometric Projection using CAD and Conversion of Pictorial Views using CAD	**9**
5.1	Isometric View and Projections of Prisms, Pyramids, Cone, Cylinder	3
5.2	Isometric View and Projections of Frustum of Pyramid, Frustum of Cone	2
5.3	Simple isometric and orthographic views of electrical machines	1
5.4	Creating two-dimensional drawing from pictorial views	3

CO ASSESSMENT QUESTIONS

Course Outcome 1 (CO 1)

1. Locate points in different quadrants as per given conditions.
2. Problems on lines inclined to both planes.
3. Find True length, Inclinations and Traces of lines.

Course Outcome 2 (CO 2)

1. Draw orthographic views of solids and combination solids.
2. Draw views of solids inclined to any one reference plane.
3. Draw views of solids inclined to both reference planes.

Course Outcome 3 (CO 3)

1. Draw views of solids sectioned by a cutting plane.
2. Find location and inclination of cutting plane given true shape of the section.
3. Draw development of lateral surface of solids and also its sectioned views.

Course Outcome 4 (CO 4)

1. Draw the given figure including dimensions using 2D software.
2. Draw simple electrical components and circuits using 2D software.

Course Outcome 5 (CO 5)

1. Draw Isometric views/projections of solids or combination of solids using modelling software.
2. Draw simple Isometric views/projections of electrical components using modelling software.
3. Create 2D model using modelling software from the given 3D figure or from real 3D objects.

MODEL QUESTION PAPER

QP CODE: **Pages: 1**

Reg.No.: .....

Name: .....

MAR ATHANASIUS COLLEGE OF ENGINEERING (AUTONOMOUS), KOTHAMANGALAM

FIRST SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2024

Course Code: B24ES1T03B

Course Name: COMPUTER AIDED ENGINEERING GRAPHICS

Max. Marks: 50 Duration: 2 hours

Instructions: Retain construction lines. Show necessary dimensions.

PART I

Answer all questions. Each question carries 12 marks.

1. The endpoint A of a line is 20 mm above HP and 10mm in front of VP. The other end of the line is 50 mm above HP and 15 mm behind VP. The distance between the end projectors is 70 mm. Draw the projections of the line. Find the true length and true inclinations of the line with the principal planes.
2. A pentagonal pyramid of base side 25 mm and height 40 mm, is resting on the ground on one of its triangular faces. The base edge of that face is inclined 30^0 to VP. Draw the projections of the solid.
3. Draw the development of a pentagonal pyramid of base side 30 mm and height 50 mm. A string is wound from a corner of the base round the pyramid and back to the same point through the shortest distance. Show the position of the string in the elevation and plan.

PART II

Answer any one full question. Each question carries 14 marks.

4. A triangular prism of base side 40 mm and height 70 mm is resting with its base on the ground and having an edge of the base perpendicular to VP. Section the solid such that the true shape of the section is a trapezium of parallel sides 30 mm and 10 mm. Draw the projections showing the true shape. Find the inclination of the cutting plane with the ground plane.
5. A hexagonal prism of base edge 25 mm and height 60 mm is resting on one of its base edges on HP. Draw its projection if the rectangular face carrying that base edge is inclined 35^0 to HP and the base edge at which it is resting is inclined 40^0 to VP.

B24ES1L01A	PROGRAMMING LAB (A)	L	T	P	S	CREDIT	YEAR OF INTRODUCTION
		0	0	3	3	2	2024

Preamble

The course aims to provide students with exposure to problem solving through C Programming. The students will have hands on experience in C programming, array handling, string manipulations, function creation, structure and pointer operations and file processing. After the lab sessions the student will be able to analyze complex problems and find solutions for real word problems.

Prerequisite

Nil

Course Outcomes

After the completion of the course the student will be able to

CO 1	C programs with branching and looping statements for processing arrays and matrices. (Cognitive Knowledge Level: Apply)
CO 2	Divide a given computational problem into a number of modules and develop functions to find the solutions to the computational problem and also create programs for string processing. (Cognitive Knowledge Level: Apply)
CO 3	Construct C programs for searching and sorting. (Cognitive Knowledge Level: Apply)
CO 4	Develop C programs which use structures and pointers for data processing and parameter passing. (Cognitive Knowledge Level: Apply)
CO 5	Develop C programs for file processing. (Cognitive Knowledge Level: Apply)

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	3	3		1		1				1
CO 2	3	3	3	3		1		1				1
CO 3	3	3	3	3		1		1				1
CO 4	3	3	3	3		1		1				1
CO 5	3	3	3	3		1		1				1

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern

Attendance	15 marks
Class Work/ Assessment Viva-Voce	15 marks
Viva-Voce/ Test	20 marks

End Semester Examination (ESE) Pattern

The following guidelines should be followed regarding the award of marks.

Algorithm	20 marks
Program	30 marks
Viva-Voce	30 marks
Output	20 marks

SYLLABUS

LIST OF EXPERIMENTS

1	Familiarization of Linux Commands.
2	Familiarization of IO console. a) Write a C program to display the personal details. b) Write a C program to add two numbers. c) Write a C program to evaluate the arithmetic expression using command line arguments.
3	Familiarization of Operators. a) Write a C program to evaluate bitwise operations on given numbers. b) Write a C program to swap two numbers using XOR operation. c) Write a C program to find the largest of three numbers using conditional operator.
4	Write a C program for the salary increment of an employee. (eg: if the given salary is > 50000, 20 % increment)

5	Write a menu-driven program to perform the calculator operations, namely addition, subtraction, multiplication, division and square of a number.
6	Write a C program to check the given number is Armstrong or not and find the reverse of the number.
7	Write a C program to find the sum of first N natural numbers using array.
8	Write a C program a) To read an array of size n and display in reverse order. b) Display the sum and average of the array elements.
9	Write a C program to read an array of size n and display the prime numbers in the array.
10	Write a C program to read n integers, store them in an array and search for an element in the array using Linear Search.
11	Write a C program to read n integers, store them in an array and sort the elements using Bubble Sort.
12	Write a C program to read a string (word), store it in an array and check whether it is a palindrome word or not.
13	Write a C program to read two strings (each one ending with a $ symbol), store them in arrays and concatenate them without using library functions.
14	Write a C program to read a string (ending with a $ symbol), store it in an array and count the number of vowels, consonants and spaces in it.
15	Write a C program to read a string (word), store it in an array and obtain its reverse by using a user defined function.
16	Write a menu driven program for performing matrix addition, multiplication and finding the transpose. Use functions to a) Read a matrix. b) Find the sum of two matrices. c) Find the product of two matrices. d) Find the transpose of a matrix. e) Display a matrix.
17	Find the factorial of a given natural number n using recursive and non-recursive functions.
18	Write a C Program to find the largest of three numbers using Macros.
19	Using structure, read and print data of n employees (Name, Employee Id and Salary).
20	Write a C program to declare a union containing 5 string variables (Name, House Name, City Name, State and Pin code) each with a length of C_SIZE (user defined constant).Then, read and display the address of a person using a variable of the union.
21	Write a C program to read the student details using structure and display the information through the user defined function.

22	Do the following using pointers a) Add two numbers. b) Swap two numbers using a user defined function.
23	Read and display the elements of an array using pointers, Compute the sum of the elements stored in the array using pointers and user defined function.
24	Define a structure for student with fields roll no, name and age. Create a pointer to this structure, assign values to the fields, and print the values using pointer.
25	Write a C program to concatenate two strings using pointers.
26	Create a file and perform the following a) Write data to the file. b) Read the data in a given file & display the file content on console. c) Append new data and display on console.
27	Open a text file and count the number of characters, words and lines in it; and store the result in another file.
28	Find the substring from the given text file and replace it with another string.

Reference Books

1. Stephen C. Kochan, *Programming in C*, CBS Publishers.
2. E. Balaguruswamy, *Programming in C*, Mc Graw Hill.
3. Yashwant Kanetkar, *Let us C*, BPB Publications.
4. Al Kelley and Ira Pohl, *A Book on C*, Addison-Wesley.
5. Stan Kelly Bootle, *Mastering Turbo C*, BPB Publications.
6. Yashwant Kanetkar, *Pointers in C*, BPB Publications.
7. Munish Cooper, *The Spirit of C*, Jaico Books.

B24EE1L01	BASIC ELECTRICAL ENGINEERING LAB	L	T	P	S	CREDIT	YEAR OF INTRODUCTION
		0	0	3	3	2	2024

Preamble

The basic electrical lab aims to equip students with practical experience and a comprehensive understanding of fundamental electrical engineering principles. This includes learning the safe use of electrical equipment, understanding circuit components, and applying theoretical knowledge to practical scenarios. Upon successful completion of the course, the students will be well-prepared to connect theoretical knowledge with practical application, fostering a deeper understanding of electrical engineering principles.

Prerequisite

Nil

Course Outcomes

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

CO 1	Identify electrical symbols, measuring instruments, accessories, and tools used for electrical wiring, and perform basic electrical wiring. (Cognitive Knowledge Level: Understand)
CO 2	Understand the substation, distribution system, and safety measures against electrical shocks and select the fuse unit for a given electrical circuit. (Cognitive Knowledge Level: Understand)
CO 3	Apply fundamental circuit theorems to various electrical circuits. (Cognitive Knowledge Level: Apply)
CO 4	Measure various circuit parameters and analyze the voltage-current relationship of RLC circuits, linear and non-linear loads. (Cognitive Knowledge Level: Apply)
CO 5	Develop team management skills and prepare laboratory reports that logically and scientifically communicate experimental information. (Cognitive Knowledge Level: Apply)

Mapping of Course Outcomes with Program Outcomes

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

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern

Attendance	10 marks
Class Work/ Assessment Viva-Voce	20 marks
Viva-Voce/ Test	20 marks

End Semester Examination (ESE) Pattern:

The following guidelines should be followed regarding the award of marks

1. Preliminary work : 25 Marks
   (a) Circuit Diagram: 15 Marks
   (b) Theory and Procedure: 10 Marks
2. Implementing the work/Conducting the experiment : 30 Marks (usage of equipment and troubleshooting)
3. Result and Inference : 15 Marks
4. Viva Voce : 25 Marks
5. Record : 5 Marks

SYLLABUS

LIST OF EXPERIMENTS

1	a) Familiarization with electrical symbols, measuring instruments, lighting and wiring accessories, tools, and various wiring systems. b) Study the electric shock phenomenon, precautions, safety procedures, and earthing in electrical installations.
2	Realization of domestic wiring a) Wiring of one lamp controlled by one switch and a 3-pin plug socket controlled independently. b) Wiring of one lamp controlled by two switches (Staircase wiring).
3	a) Realization of Industrial wiring - Wiring of three lamps controlled by three switches (Godown wiring). b) Study of fuse, MCB, ELCB, and selection and rating of fuse, MCB, ELCB for circuits with medium and high power.
4	Wiring of the distribution board, including the power plug, an isolator, MCB, and ELCB for 1000 W power.
5	Measurement of low-medium-high resistance using the Megger and voltmeter-ammeter method.
6	Visit the on-campus substation and familiarize with the supply system, transformer, HT Panel, and distribution system.
7	a) Determination of V-I characteristics of the linear resistor and linear inductor, incandescent, and LED lamps. b) Verification of KCL and KVL for the given circuit theoretically and experimentally.

8	Verification of the Superposition theorem and Thevenin's theorem for the given circuit theoretically and experimentally.
9	Verification of Reciprocity's theorem and Maximum Power Transfer theorem for the given circuit theoretically and experimentally.
10	a) Measurement of self-inductance, the mutual inductance, and the coupling coefficient of two coils. b) Verification of the relation between phase and line quantities in a 3-phase balanced star and delta connected systems.
11	Analyze the RLC series and parallel AC circuits and verify them experimentally.
12	a) Determine the current and voltage response under illumination depending on the magnitude of the variable resistance. b) Visit the on-campus 150 kW solar power plant.

Reference Books

1. H. Cotton, *Advanced Electrical Technology*, Reem Publications, 5th ed., 2011.
2. K. S. Suresh Kumar, *Electrical Circuit and Networks*, Pearson Education, 2009.
3. E. W. Golding,*Electrical Measurements and Measuring Instruments*, Pitman, 3rd ed., 2011.

B24MC1T01	LIFE SKILLS	L	T	P	S	CREDIT	YEAR OF INTRODUCTION
		1	0	1	2	P/F	2024

Preamble

This Course is aimed at equipping individuals with the essential competencies to navigate life's challenges with resilience and positivity. This course, embarks on a profound exploration of personal development, fostering self-awareness, meaningful connections, and the ability to navigate the complexities of both the abstract and the concrete aspects of life. It aims to enhance employability by providing practical insights and hands-on experiences that will empower one to apply these principles effectively in one's personal and professional endeavors.

Prerequisites

Nil

Course Outcomes

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

CO 1	Empower individuals with the knowledge and practical skills needed to navigate life challenges and to cope with emotions and stress. (Cognitive Knowledge Level: Apply)
CO 2	Develop a profound understanding of themselves and others, leading a fulfilling professional life by embracing a holistic approach to well being. (Cognitive Knowledge Level: Analyzes)
CO 3	Provide a solid foundation in leadership principles and team dynamics. (Cognitive Knowledge Level: Apply)
CO 4	Basic understanding of financial concepts for financial well being. (Cognitive Knowledge Level: Apply)

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1			1			2			2			3
CO 2						3	1	2	2	2		2
CO 3									3			2
CO 4		1	1								3	

Assessment Pattern

Bloom's Category	Continuous Assessment	End Semester Examination (% Marks)
	Test (% Marks)	
Remember	20	20
Understand	20	20
Apply	30	30
Analyse	30	30
Evaluate		
Create		

Mark Distribution

Total Marks	CIE Marks	ESE Marks
100	50	50

Continuous Internal Evaluation Pattern

Attendance	10 marks
Continuous Assessment Test (1 numbers)	25 marks
Regular Assessment	15 marks

Regular Assessment

Group Discussion (Marks: 9)

Create groups of about 6 students each and engage them on a GD on a suitable topic for about 20 minutes. Parameters to be used for evaluation are as follows:

1. Communication Skills: 3 marks
2. Subject Clarity: 2 marks
3. Group Dynamics: 2 marks
4. Behaviors & Mannerisms: 2 marks

Presentation Skills (Marks: 6)

Identify a suitable topic and ask the students to prepare presentation (preferably a powerpoint presentation) for about 10 minutes. Parameters to be used for evaluation are as follows

1. Communication Skills: 2 marks
2. Platform Skills: 2 marks
3. Subject Clarity/Knowledge: 2 marks

End Semester Examination Pattern

Part A: Short answer question (20 marks)

There will be one question from each MODULE (four questions in total, five marks each). Each question should be written in about maximum of 400 words. Parameters to be used for evaluation are as follows:

1. Content Clarity/Subject Knowledge
2. Presentation style
3. Organization of content

Part B: Case Study (30 marks)

The students will be given a case study with questions at the end. The students have to analyze the case and answer the question at the end. Parameters to be used for evaluation are as follows:

1. Analyze the case situation
2. Key players/characters of the case
3. Identification of the problem (both major & minor if exists)
4. Bring out alternatives
5. Analyze each alternative against the problem
6. Choose the best alternative
7. Implement as solution
8. Conclusion
9. Answer the question at the end of the case

SYLLABUS

MODULE 1 (6 hours)

Overview of Life Skills

Meaning and significance of life skills, Life skills identified by WHO: Self-awareness, Empathy, Critical thinking, Creative thinking, Decision making, problem solving, Effective communication, interpersonal relationship, coping with stress- Four A's of stress management, Gratitude Training, Coping with emotion- PATH method and relaxation techniques.

MODULE 2 (6 hours)

Life Skills for Professionals

Positive thinking, right attitude, Experience, attention to detail, having the big picture, learning skills, research skills, setting goals and achieving them, perseverance, motivation, self-motivation, and motivating others, IQ, EQ, and SQ , Collaboration, continuous learning, unlearning and relearning, cross cultural communication, social media etiquettes, Financial Literacy.
Time Management: Prioritizing tasks, setting realistic goals and managing time effectively, work life balance.
Holistic Thinking: Imagination, intuition, lateral thinking, Multiple intelligence, spirituality, family bonding, living peacefully.

MODULE 3 (6 hours)

Leadership

Leadership traits, Styles of Leadership, VUCA Leadership, Transactional vs Transformational Leaders, managing diverse stakeholders, crisis management, Effective Leaders.

Group and Team Dynamics

Group vs Team, Team Dynamics, Virtual teams, managing team performance and managing conflicts, Intrapreneurship.

MODULE 4 (6 hours)

Financial Literacy

Time value of money, power of compounding, Future value of a single cash flow, effective versus nominal rate, Future value of an annuity, present value of a single cash flow, Present value of an annuity.

Reference Books

1. Shiv Khera, *You Can Win*, Macmillan Books, New York, 2003.
2. Barun K. Mitra, *Personality Development & Soft Skills*, Oxford Publishers, Third Impression, 2017.
3. ICT Academy of Kerala, *Life Skills for Engineers*, McGraw Hill Education (India) Private Ltd., 2016.
4. Caruso, D. R. and Salovey P, *The Emotionally Intelligent Manager: How to Develop and Use the Four Key Emotional Skills of Leadership*, John Wiley & Sons, 2004.
5. Kalyana, *Soft Skill for Managers*, Wiley Publishing Ltd, 1st ed., 2015.
6. Larry James, *The First Book of Life Skills*, Embassy Books, 1st ed., 2016.
7. Shalini Verma, *Development of Life Skills and Professional Practice*, Sultan Chand (G/L) & Company, 1st ed., 2014.
8. Daniel Goleman, *Emotional Intelligence*, Bantam, 2006.
9. Remesh S., Vishnu R.G., *Life Skills for Engineers*, Ridhima Publications, 1st ed., 2016.
10. Butterfield Jeff, *Soft Skills for Everyone*, Cengage Learning India Pvt Ltd, 1st ed., 2011.
11. *Training in Interpersonal Skills: Tips for Managing People at Work*, Pearson Education, India; 6th ed., 2015.
12. *The Ace of Soft Skills: Attitude, Communication and Etiquette for Success*, Pearson Education, 1st ed., 2013
13. Prasanna Chandra, *Fundamentals of Financial Management*, McGraw Hill Education (India) Private Ltd, 2020
14. Edward de Bono, *Lateral Thinking.*
15. Howard Gardener, *Multiple Intelligences.*

COURSE CONTENTS AND LECTURE SCHEDULE

No.	Topic	No of Lecture/Tutorial Hours
	Total Hours	24 Hours
	Module 1	**6**
1.1	Overview of Life Skills: Meaning and significance of life skills, Life skills identified by WHO: Self-awareness, Empathy, Critical thinking, Creative thinking, Decision making	1

1.2	Problem solving, Effective communication, interpersonal relationship, coping with stress- Four A's of stress management	1
1.3	Gratitude Training, Coping with emotion- PATH method and relaxation techniques	1
1.4	Activity- Presentation, Group discussion	3
	Module 2	**6**
2.1	Life skills for professionals: positive thinking, right attitude, Experience, attention to detail, having the big picture, learning skills, research skills, setting goals and achieving them, perseverance, motivation, self-motivation, and motivating others	1
2.2	IQ, EQ, and SQ, Collaboration, continuous learning, unlearning and relearning, cross cultural communication, social media etiquettes, Financial Literacy	1
2.3	Time management: Prioritizing tasks, setting realistic goals and managing time effectively, work life balance	1
2.4	Holistic Thinking: imagination, intuition, lateral thinking, Multiple intelligence, spirituality, family bonding, living peacefully	1
2.5	Activity- Presentation, Group discussion	2
	Module 3	**6**
3.1	Leadership: Leadership traits, Styles of Leadership, VUCA Leadership, Transactional vs Transformational Leaders, managing diverse stakeholders, crisis management, Effective Leaders	1
3.2	Group and Team Dynamics: Group vs Team, Team Dynamics, Virtual teams, managing team performance and managing conflicts, Intrapreneurship	1
3.3	Activity- Presentation, Group discussion	4
	Module 4	**6**
4.1	Financial Literacy: Time value of money, power of compounding, Future value of a single cash flow	1
4.2	Effective versus nominal rate, Future value of an annuity	1
4.3	Present value of a single cash flow, Present value of an annuity	1
4.4	Activity- Presentation, Group discussion	3

CO ASSESSMENT QUESTIONS

Course Outcome 1 (CO 1)

1. What are the life skills identified by WHO?
2. List the 4 A's of stress management.
3. Differentiate between Critical thinking and Creative thinking.

Course Outcome 2 (CO 2)

1. What are the life skills that a professional should have?
2. Explain how time management can help in work life balance.
3. What is the difference between intuition and lateral thinking?

Course Outcome 3 (CO 3)

1. How a person can grow as a leader in an organization?
2. Discuss the term "Crisis management".
3. What are the differences between a team and a group?

Course Outcome 4 (CO 4)

1. A finance company advertises that it will pay a lumpsum of Rs. 10000 at the end of 6 years to investors who deposit annually Rs. 1000. What interest rate is implicit in this offer?
2. How much should be deposited at the beginning of each year for 10 years in order to provide a sum of Rs. 50000 at the end of 10 years?
3. Suppose you deposit Rs. 10000 with an investment company which pays 8 percent interest with quarterly compounding. How much will this deposit grow in 5 years?

MODEL QUESTION PAPER

QP CODE: **Pages: 2**

Reg.No.: .....

Name: .....

MAR ATHANASIUS COLLEGE OF ENGINEERING (AUTONOMOUS), KOTHAMANGALAM

FIRST SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2024

Course Code: B24MC1T01

Course Name: LIFE SKILLS

Max. Marks: 50 Duration: 2 hours

PART A

Answer all questions. Each question carries 5 marks.

1. Stress is the emotional or physical tension the body creates when presented with events or thoughts that cause worry, frustration, anger or nervousness. When stress exceeds the ability to cope, balance in the mind and body need to be restored. Discuss how stress management can act as an effective tool to accomplish this.
2. "The only limit to our realization of tomorrow is our doubts of today." – Franklin D. Roosevelt. Critically assess how cultivating positive thinking and maintaining a right attitude can transform professional challenges into opportunities for growth.
3. Discuss leadership styles that are effective for successful management of multicultural groups and teams.
4. Mr. Vinay plans to send his son for higher studies abroad after 10 years. He expects the cost of these studies to be Rs. 100000. How much should he save annually to have a sum of Rs. 100000 at the end of 10 years if the interest rate is 12 percent?

PART B

Read carefully the following case and answer the questions given below. Each question carries 6 marks.

1. Based on the case study given below, answer the following questions: It occurred on the night of 2–3 December 1984 at the Union Carbide India Limited (UCIL) pesticide plant in Bhopal, Madhya Pradesh. Over 500,000 people were exposed to Methyl Isocyanate (MIC) gas and other chemicals. A runaway reaction had occurred in a storage tank of Methyl Isocyanate (MIC), which was used to manufacture a pesticide. The valves of the tank had burst, and a cloud of poisonous gas had escaped. The winds carried it to nearby shanty towns and the populous city of Bhopal, where thousands of people either died in their sleep or woke and died while fleeing. Those who survived suffered from burning eyes and lungs. Local medical facilities were not equipped for the disaster, and over the next few weeks' thousands more died. The killer gas spread through the city, sending residents scurrying through the dark streets. No alarm ever sounded a warning, so that local people were not informed the situation, and no evacuation plan was prepared. When victims arrived at hospitals breathless and blind, doctors did not know how to treat them, as UCIL had not provided emergency information. Perhaps most importantly at the time of the tragedy, the staff did not realize the gravity of the situation and even took a break for tea after the leak had been noticed, thinking they would have plenty of time to fix it. The operator in the control room did not notify his supervisor when the temperature began to rise inside the tank and the entire situation remained unattended for at least an hour. The disaster raised some serious ethical issues. The pesticide factory was built in the midst of densely populated settlements. UCIL chose to store and produce MIC, one of the deadliest chemicals (permitted exposure levels in USA and Britain are 0.02 parts per million), in an area where nearly 120,000 people lived. The MIC plant was not designed to handle a runaway reaction. When the uncontrolled reaction started, MIC was flowing through the scrubber (meant to neutralize MIC emissions) at more than 200 times its designed capacity.

   (a) Critique the communication strategy (or lack thereof) employed by UCIL during the disaster. How did the absence of timely warnings and information affect the outcome?

   (b) Assess the ethical implications of UCIL's decision to build a pesticide plant in a densely populated area. How should corporate responsibility have been exercised in this context?

   (c) As an engineer, comment on the drawback of the design which may have the reason for the tragedy.

   (d) Evaluate the leadership displayed by UCIL's management during the Bhopal disaster. How did their response, or lack thereof, impact the outcome of the crisis?

   (e) Reflect on the lessons learned from the Bhopal disaster. What key takeaways should industries and governments derive from this incident to enhance safety and prevent future catastrophes?

B24MC1T02	DESIGN THINKING	L	T	P	S	CREDIT	YEAR OF INTRODUCTION
		1	1	0	1	P/F	2024

Preamble

This course gives students a comprehensive understanding of the iterative design process and its real-world applications. It covers the fundamentals of design thinking, including concept development, brainstorming, and creativity enhancement. Emphasizing customer needs identification and human-centered design principles, it explores product conceptualization and evaluation, along with prototyping techniques. Additionally, the course addresses ethical considerations and challenges within the design thinking process through diverse case studies. By the end of the course, students will gain practical insights into design thinking methodologies, preparing them to effectively tackle complex design challenges.

Prerequisites

Nil

Course Outcomes

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

CO 1	Exhibit/show a thorough understanding of the fundamental principles of the design thinking methodology. (Cognitive Knowledge Level: Understand)
CO 2	Utilize diverse techniques effectively to generate creative concepts, adopting innovation and ideation. (Cognitive Knowledge Level: Apply)
CO 3	Demonstrate expertise in ideating prototypes, models, and proof-of-concept iterations. (Cognitive Knowledge Level: Analyse)
CO 4	Analyze real-world challenges and develop a practical design thinking framework suitable for their professional endeavors. (Cognitive Knowledge Level: Create)

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	1	2	1			1	1	1		1	3
CO 2	2	2	2	1			1	1	1	1	1	3
CO 3	2	2	2	1			1	1	1	1	1	2
CO 4	2	2	2	1			1	1	1		2	2

Assessment Pattern

Bloom's Category	Continuous Assessment		End Semester Examination (% Marks)
	Test (% Marks)	Case Study Presentation (% Marks)	
Remember	25		20
Understand	25		20
Apply	25		20
Analyse	25		20
Evaluate			
Create		100	20

Mark Distribution

Total Marks	CIE Marks	ESE Marks
100	50	50

Continuous Internal Evaluation Pattern

Attendance	10 marks
Continuous Assessment Test	25 marks
Case study Presentation	15 marks

End Semester Examination Pattern

There will be two parts; Part A and Part B. Part A contain 4 questions carrying 5 marks each. Part B contains 2 questions from each module out of which 1 to be answered and can have maximum 2 sub- divisions. Questions from Module 1&2 carries 8 marks each and Module 3&4 carries 7 marks.

SYLLABUS

MODULE 1 (5 hours)

Design Thinking Approach

Introduction to Design Thinking; Iterative Design Thinking Process Stages: Empathize, Define, Ideate, Prototype and Test; The double-diamond Model of design by British Design Council.

Developing Concepts

Steps to develop concepts from functions; Brainstorming: Mechanism of brainstorming, Ideation; Creativity: How to increase level of creativity.

MODULE 2 (6 hours)

Design Process

Requirements: Identifying customer needs and requirements, market analysis, defining goals; Product concepts: establishing functions, task specifications.

Solution Concept

Conceptualization, evaluating alternatives; embodiment design; Analysis and optimization; experiment; marketing. Human-centred design process.

MODULE 3 (6 hours)

Concepts Evaluation

Evaluating conceptual alternatives: Pugh's Evaluation matrix, decision matrix with examples, QFD and house of quality.

Prototyping

Prototypes, Models and Proofs of concepts; What is Prototype? Why Prototype? Building models and prototypes, Rapid Prototyping; Lean startup method for prototype development; Testing prototypes and models and proving concepts.

MODULE 4 (7 hours)

Ethics in Design

Understanding obligations, code of ethics, familiarity with several code of ethics such as ASCE, ASME, IEEE, VDI etc. code of ethics and moral frameworks.

Challenges in Design Thinking

Design thinking case studies detailing the various aspects detailed above are to be discussed. The case studies are suggested to be from the below listed areas but not to be limited to: Consumer package goods; Education; Financial Services; Health care; Journalism; Non-Profit organizations; Retail; Technology; Transportation sector; Self-improvement.

Text Books

1. Yousef Haik and Tamer M. Shahin, *Engineering Design Process*, Course Technology, 2010.
2. Clive L. Dym, Patrick Little and Elizabeth J Orwin, *Engineering Design-A Project based Introduction*, Wiley, 2014.
3. Don Norman, *The Design of Everyday Things*, Basic Books, 2nd ed,, 2013.
4. Christian Mueller-Roterberg, *Handbook of Design Thinking: Tips and Tools for how to design thinking*, 2018.

Reference Books

1. Daniel Kahneman, *Thinking Fast and Slow*, Farrar, Straus & Giroux, 2017.
2. Rod Judkins, *The art of Creative Thinking*, Penguin Publishing Group, 2016.
3. Donella H. Meadows, *Thinking in Systems*, Chelsea Green Publishing, 2008.
4. Tim Brown, *Change by Design*, Harper Collins, 2019.
5. V. N. Mittle & Arvind Mittal, *Basic Electrical Engineering*, McGraw Hill, 2nd ed., 2006.

COURSE CONTENTS AND LECTURE SCHEDULE

No.	Topic	No of Lecture/Tutorial Hours
	Total Hours	24 Hours
	Module 1	**5**
1.1	Design Thinking Approach: Introduction to Design Thinking; Iterative Design Thinking Process Stages: Empathize, Define, Ideate, Prototype and Test	1
1.2	The double-diamond Model of design by British Design Council	1
1.3	Developing concepts: Steps to develop concepts from functions	1
1.4	Brainstorming: Mechanism of brainstorming, Ideation	1
1.5	Creativity: How to increase level of creativity	1
	Module 2	**6**
2.1	Design Process: Requirements: Identifying customer needs and requirements, market analysis, defining goals	1

2.2	Product concepts: establishing functions, task specifications	2
2.3	Solution Concept: conceptualization, evaluating alternatives	1
2.4	Embodiment design; Analysis and optimization; experiment; marketing	1
2.6	Human centred design process	1
	Module 3	**6**
3.1	Concepts Evaluation: Evaluating conceptual alternatives: Pugh's Evaluation matrix, decision matrix with examples	2
3.2	Prototypes, Models and Proofs of concepts	1
3.3	What is Prototype? Why Prototype? Building models and prototypes, Rapid Prototyping	1
3.4	Lean startup method for prototype development; Testing prototypes and models and proving concepts	2
	Module 4	**7**
4.1	Ethics in Design: Understanding obligations, code of ethics, familiarity with several code of ethics such as ASCE, IEEE, VDI etc. code of ethics and moral frameworks	1
4.2	Challenges in Design thinking	1
4.3	Design thinking case studies detailing the various aspects	5

CO ASSESSMENT QUESTIONS

Course Outcome 1 (CO 1)

1. Describe design thinking and list the different stages in a design thinking process.
2. Illustrate the double-diamond Model of design.
3. Describe how to develop concepts from functions and Mechanism of brainstorming.
4. How to increase the level of creativity and the process of forming ideas from conception to implementation?

Course Outcome 2 (CO 2)

1. How to narrow down to the best design considering the customer needs and requirements, market analysis and defining goals?
2. Illustrate the process of product concepts, forming ideas and embodiment design.
3. Explain the Human-centred design process.

Course Outcome 3 (CO 3)

1. Describe the concept evaluation using Pugh's Evaluation matrix, and decision matrix with examples.
2. Explain the ideation of prototypes, models, and proofs of concepts.
3. Illustrate the concept of Rapid Prototyping, the Lean startup method for prototype development and testing of prototypes.

Course Outcome 4 (CO 4)

1. Discuss as an engineer, how ethics play a decisive role in design.
2. Analyze the Challenges in Design thinking.
3. Design the functional structure of a shopping cart.
4. Examine the changes that can be made in the design of a bag with constraints of cost, reliability issues, production methods and environmental factors.

MODEL QUESTION PAPER

QP CODE: **Pages: 4**

Reg.No.: .....

Name: .....

MAR ATHANASIUS COLLEGE OF ENGINEERING (AUTONOMOUS), KOTHAMANGALAM

FIRST SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2024

Course Code: B24MC1T02

Course Name: DESIGN THINKING

Max. Marks: 50 Duration: 2 hours

PART A

Answer all questions. Each question carries 5 marks.

1. Demonstrate the basic concept of brainstorming and the rules developed for brainstorming session.
2. Briefly explain what is product and solution concepts in design process.
3. Distinguish between prototypes and models.
4. Explain the importance of ethics in design.

PART B

Answer any one question from each module.

5. What do you mean by design thinking and why it is needed. How does the design thinking approach help engineers. (8 marks)

OR

6. Summarize different stages of design thinking process using appropriate examples. (8 marks)

7. Illustrate different phases of extensive prescriptive model of design process. (8 marks)

OR

8. Identify the customer requirements with the help of refrigerator as example. (8 marks)

9. How concepts evaluation can be done using Pugh's evaluation matrix. Compare Pugh's evaluation matrix with the decision matrix. (7 marks)

OR

10. List the different methods in which the prototype of a product can be generated and tested. (7 marks)

11. Design a device/machine that will crush aluminum cans. The device must be fully automatic. The device should switch on automatically, crush the can automatically, eject the crushed can automatically and switch off automatically. (7 marks)

OR

12. Design a new shopping cart that can be used primarily in grocery stores. The shopping cart should solve the common problems in the available carts. There is a tendency to conserve parking space by not designating a return cart area. Leaving cart in the parking lots may lead to serious accidents and car damage. Many customers do not fill their carts when shopping; however, they do not like to carry baskets. Other customers like to sort products as they shop. (7 marks)

B24MC1L01	YOGA AND SPORTS	L	T	P	S	CREDIT	YEAR OF INTRODUCTION
		0	1	1	1	P/F	2024

Preamble

This course enables the learners to understand how to attain physical fitness, mental well-being, and holistic growth through the combined benefits of yoga and sports. The topics covered in this course are Yoga and Lifestyle Physical fitness, wellness and exercise programmes, First aid and Postures and nutrition. This course helps the students to develop appreciation of physical activity as a lifetime pursuit and a means to better health.

Prerequisites

Nil

Course Outcomes

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

CO 1	Demonstrate the need of physical activities and Yoga for the strength, flexibility, and relaxation of mind and body. (Cognitive Knowledge Level: Apply)
CO 2	Use scientific principles of exercise and training in daily routine. (Cognitive Knowledge Level: Apply)
CO 3	Apply first aid promptly and appropriately whenever and wherever the need arises. (Cognitive Knowledge Level: Apply)
CO 4	Understand the importance of postures and nutrition. (Cognitive Knowledge Level: Understand)

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1								2	3	2		2
CO 2								3	3	2		2
CO 3						2		3	3	3		2
CO 4								3	3	2		2

Mark Distribution

Total Marks	CIE Marks
50	50

Continuous Internal Evaluation Pattern

Attendance	10 marks
Regular Assessment	40 marks

Marks for the regular assessment can be based on the CO questions given at the end.

SYLLABUS

MODULE 1 (6 hours)

Yoga and Lifestyle

Meaning and importance of Yoga. Introduction-Asanas: Pranayama, Meditation and Yogic Kriyas. Yoga for concentration and related Asanas (Sukhasana; Tadasana; Padmasana and Shashankasana). Relaxation Techniques for improving concentration-Yog-nidra. Asanas as preventive measure. Hypertension: Tadasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana, Bhujangasana, Sharasana. Obesity: Procedure, Benefits and contraindications for Vajrasana, Hastasana, Trikonasana, Ardh Matsyendrasana. Back pain: Tadasana, Ardh Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana.

MODULE 2 (6 hours)

Physical Fitness and Exercise

Meaning and importance of physical fitness and wellness. Components of physical fitness and health related fitness. Exercise for improving speed, strength, endurance, and flexibility and coordinative abilities. Exercises to prevent back pain, tennis elbow, shoulder injury and knee pain, Neck pain.Fitness test battery for speed, strength, endurance, flexibility. Importance of weight training. Warming up and cooling down. How to deal with everyday stress.

MODULE 3 (6 hours)

First Aid

First aid and principles of first aid.First aid measure for the following: Bleeding through Nose, Snakebite, Dog Bite, Electric Shock, Burns and Drowning. Common injuries and their management: Wounds, Cuts, Sprain, Fracture and Dislocation. Cardio Pulmonary Resuscitation (CPR). How to prevent muscle cramps and its management. How to carry an injured person.

MODULE 4 (6 hours)

Postures and Nutrition

Posture and its importance. Common Postural Deformities-Knock Knee, Flat Foot, Round Shoulders, Lordosis, Kyphosis, Bow Legs and Scoliosis. Corrective Measures for Postural Deformities. Balanced diet, malnutrition and Deficiency diseases. Hydration.

Text Books

1. *Modern Trends and Physical Education* by Ajmer Singh.
2. *Light on Yoga* by B. K. S. Iyengar.
3. *Health and Physical Education*, NCERT (11th and 12th Classes).

Reference Books

1. *Physiological Aspects of Sports Training and Performance* by Jay Hoffman.
2. *Periodization Theory and Methodology of Training* by Tudor O. Bompa and G. Grisgery Haff.
3. *Essential of Strength Training and Conditioning* by Thomas Baechle E. R., Roger W. Earle.
4. *A Practice Guide to Emergency First Aid, Safety Injuries, Illnesses* by Montreal.

COURSE CONTENTS AND LECTURE SCHEDULE

No	Topic	No of Lecture/Tutorial Hours
	Total Hours	24 Hours
	Module 1	**6**
1.1	Meaning and importance of Yoga. Introduction-Asanas, Pranayama, Meditation and Yogic Kriyas. Yoga for concentration and related Asanas (Sukhasana; Tadasana; Padmasana and Shashankasana) Relaxation Techniques for improving concentration-Yog-nidra. Asanas as preventive measures	2
1.2	Hypertension: Tadasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana, Bhujangasana, Sharasana	1

1.3	Obesity: Procedure, Benefits and contraindications for Vajrasana, Hastasana, Trikonasana, Ardh Matsyendrasana	1
1.4	Back pain: Tadasana, Ardh Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana	2
	Module 2	**6**
2.1	Meaning and importance of physical fitness and wellness, Components of physical fitness and health related fitness	1
2.2	Exercise for improving speed, strength, endurance, and flexibility and coordinative abilities	1
2.3	Exercises to prevent back pain, shoulder injury and knee pain	2
2.4	Fitness test battery for speed, strength, endurance, flexibility	1
2.5	Importance of weight training, Warming up and cooling down	1
	Module 3	**6**
3.1	First aid and principles of first aid.First aid measure for the following: Bleeding through Nose, Snakebite, Dog Bite, Electric Shock, Burns and Drowning	2
3.2	Common injuries and their management: Wounds, Cuts, Sprain, Fracture and Dislocation	2
3.3	Cardio pulmonary resuscitation (CPR).	1
3.4	How to prevent muscle cramps and its management. How to carry an injured person	1
	Module 4	**6**
4.1	Posture and its importance. Common Postural Deformities-Knock Knee, Flat Foot, Round Shoulders	2
4.2	Lordosis, Kyphosis, Bow Legs and Scoliosis. Corrective Measures for Postural Deformities	2
4.3	Balanced diet, malnutrition and deficiency disease, Hydration	2

CO ASSESSMENT QUESTIONS

Course Outcome 1 (CO 1)

1. Demonstrate yoga asanas for life style problems.
2. Create a PPT presentation on various yoga asanas.
3. Group Activity - Group discussion about the need and benefits of physical activities and Yoga for the strength, flexibility, and relaxation of mind and body.

Course Outcome 2 (CO 2)

1. Analyze the exercise activities of at least five famous personalities and give a PPT presentation about how each one of them uses physiological principles related to exercise and training in daily routine.
2. Conduct a survey on how the following categories of people follow physiological principles related to exercise and training in daily routine.

   (a) Sports person
   (b) Working woman
   (c) Students
   (d) Ladies in the age group of 25-35, 35-45,45- 55,55-65, above 65
   (e) Gents in the age group of 25-35, 35-45,45- 55,55-65, above 65

Course Outcome 3 (CO 3)

1. With a role play, illustrate various first aid activities that can be followed at various situation in life. In each illustration, try to give emphasis on dos and don'ts to be followed in each situation.

Course Outcome 4 (CO 4)

1. Observe at least 10 students in your class and identify common postural deformities each one of them have. Also identify good posters they follow. Have a discussion with each one of them to identify whether they have already recognized it or not. Prepare a report on this including your thoughts on the diet they take and its impact on their health.

MAR ATHANASIUS COLLEGE OF ENGINEERING

Government Aided, Autonomous Institution
Kothamangalam, Kerala, India

B.TECH ELECTRICAL AND ELECTRONICS ENGINEERING

SEMESTER 2

SYLLABUS

B24MA1T02	ORDINARY DIFFERENTIAL EQUATIONS AND TRANSFORMS	L	T	P	S	CREDIT	YEAR OF INTRODUCTION
		3	1	0	3	4	2024

Preamble

This course introduces the concepts and applications of differential equations, sequence and series including power series and basic transforms such as Laplace and Fourier transforms. The objective of this course is to familiarize the prospective engineers with some advanced concepts and methods in Mathematics which include differential equations, sequence, series and transforms. The topics treated in this course have applications in all branches of engineering.

Prerequisites

Nil

Course Outcomes

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

CO 1	Solve homogeneous and non-homogeneous linear differential equation with constant coefficients (Cognitive Knowledge Level: Apply)
CO 2	Perform various tests to determine whether a given series is convergent, absolutely convergent or conditionally convergent (Cognitive Knowledge Level: Apply)
CO 3	Determine the Taylor and Fourier series expansion of functions and learn their applications. (Cognitive Knowledge Level: Apply)
CO 4	Determine the Fourier transforms of functions and apply them to solve problems arising in engineering (Cognitive Knowledge Level: Apply)
CO 5	Compute Laplace transform and apply them to solve ordinary differential equations arising in engineering (Cognitive Knowledge Level: Apply)

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	1		1							1
CO 2	3	2	1		1							1
CO 3	3	2	1		1							1
CO 4	3	2	1		1							1
CO 5	3	2	1		1							1

Assessment Pattern

Bloom's Category	Continuous Assessment		End Semester Examination (% Marks)
	Test 1 (% Marks)	Test 2 (% Marks)	
Remember	20	20	20
Understand	40	40	40
Apply	40	40	40
Analyse			
Evaluate			
Create			

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern

Attendance	10 marks
Continuous Assessment Test (2 numbers)	25 marks
Assignment/Quiz/Course Project	15 marks

End Semester Examination Pattern

There will be two parts; Part A and Part B. Part A contain 10 questions carrying 3 marks each. Part B contains 2 questions from each module out of which 1 to be answered. Each question carries 14 marks and can have maximum 2 sub divisions.

SYLLABUS

MODULE 1 (9 hours)

Ordinary Differential Equations

Homogenous linear differential equation of second order, superposition principle, general solution, homogenous linear ODEs with constant coefficients-general solution. Solution of Euler-Cauchy equations (second order only). Existence and uniqueness (without proof).

Non homogenous linear ODEs-general solution, solution by the method of undetermined coefficients(for the right hand side of the form x^n, e^{kx}, $sinax$, $cosax$ and their linear combinations), methods of variation of parameters. Solution of higher order equations-homogeneous and non-homogeneous with constant coefficients using method of undetermined coefficients.

(Textbook 2: Relevant topics from sections 2.1, 2.2, 2.5, 2.6, 2.7, 2.10, 3.1, 3.2, 3.3)

MODULE 2 (9 hours)

Sequences and Series

Convergence of sequences and series, convergence of geometric series and p-series (without proof), tests of convergence (comparison, limit comparison, ratio and root tests without proof); Alternating series and Leibnitz test, absolute and conditional convergence.

(Textbook 1: Relevant topics from sections 9.1, 9.3, 9.4, 9.5, 9.6)

MODULE 3 (9 hours)

Fourier Series

Taylor series (without proof, assuming the possibility of power series expansion in appropriate domains), Binomial series and series representation of exponential, trigonometric, logarithmic functions (without proofs of convergence); Fourier series, Euler formula, Convergence of Fourier series (without proof), half range sine and cosine series.

(Textbook 1: Relevant topics from sections 9.8, 9.9. Textbook 2: Relevant topics from sections 11.1, 11.2, 11.6)

MODULE 4 (9 hours)

Fourier Transforms

Fourier integral representation, Fourier sine and cosine integrals. Fourier sine and cosine transforms, inverse sine and cosine transform. Fourier transform and inverse Fourier transform, basic properties. The Fourier transform of derivatives. Convolution theorem (without proof).

(Textbook 2: Relevant topics from sections 11.7, 11.8, 11.9)

MODULE 5 (9 hours)

Laplace Transforms

Laplace Transform and its inverse, Existence theorem (without proof), linearity, Laplace transform of basic functions, first shifting theorem, Laplace transform of derivatives and integrals, solution of differential equations using Laplace transform, Unit step function, Sec-

ond shifting theorem. Dirac delta function and its Laplace transform, Solution of ordinary differential equation involving unit step function and Dirac delta functions. Convolution theorem (without proof) and its application to finding inverse Laplace transform of products of functions.

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

Text Books

1. H. Anton, I. Biven, and S. Davis, *Calculus*, Wiley, 10th ed., 2015.
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley & Sons, 10th ed., 2016.

Reference Books

1. J. Stewart, *Essential Calculus*, Cengage, 2nd ed., 2017.
2. G. B. Thomas and R. L. Finney, *Calculus and Analytic geometry*, Pearson, Reprint, 9th ed., 2002.
3. Peter O. Neil, *Advanced Engineering Mathematics*, Thomson, 7th ed., 2007.
4. Louis C. Barret, and C. Ray Wylie, *Advanced Engineering Mathematics*, Tata McGraw Hill, 6th ed., 2003.
5. Veerarajan T,*Engineering Mathematics for first year*, Tata McGraw-Hill, 2008.
6. B.S. Grewal, *Higher Engineering Mathematics*, Khanna Publishers, 43 ed., 2015.
7. Ronald N. Bracewell, *The Fourier Transform and its Applications*, McGraw–Hill, International Editions, 2000.

COURSE CONTENTS AND LECTURE SCHEDULE

No.	Topic	No of Lecture/Tutorial Hours
	Total Hours	45 Hours
1	**Module 1: Ordinary Differential Equations**	**9**
1.1	Homogenous linear equation of second order, Superposition principle, general solution	1
1.2	Homogenous linear ODEs of second order with constant coefficients	2
1.3	Second order Euler-Cauchy equation	1

1.4	Non homogenous linear differential equations of second order with constant coefficient-solution by undetermined coefficients, variation of parameters	3
1.5	Higher order equations with constant coefficients	2
2	**Module 2: Sequences and Series**	**9**
2.1	Convergence of sequences and series, geometric and p-series	2
2.2	Test of convergence (comparison, ratio and root)	4
2.3	Alternating series and Leibnitz test, absolute and conditional convergence	3
3	**Module 3: Fourier series**	**9**
3.1	Taylor series, Binomial series and series representation of exponential, trigonometric, logarithmic functions	3
3.2	Fourier series, Euler formulas, Convergence of Fourier series (Dirichlet's conditions)	3
3.3	Half range sine and cosine series	3
4	**Module 4: Fourier Transforms**	**9**
4.1	Fourier integral representation	1
4.2	Fourier Cosine and Sine integrals and transforms	2
4.3	Complex Fourier integral representation, Fourier transform and its inverse transforms, basic properties	3
4.4	Fourier transform of derivatives, Convolution theorem	3
5	**Module 5: Laplace Transforms**	**9**
5.1	Laplace Transform, inverse Transform, Linearity, First shifting theorem, transform of basic functions	2
5.2	Transform of derivatives and integrals	1
5.3	Solution of Differential equations, Initial value problems by Laplace transform method	2
5.4	Unit step function - Second shifting theorem	1
5.5	Dirac Delta function and solution of ODE involving Dirac delta function	2
5.6	Convolution and related problems	1

CO ASSESSMENT QUESTIONS

Course Outcome 1 (CO 1): Solve homogeneous and nonhomogeneous linear equation with constant coefficients.

1. Find the general solution to $2x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} - 3y = 0$ given that $y_1(x) = \frac{1}{x}$ is a solution.
2. Solve the initial value problem $x^2y'' - 3xy' + 4y = 0$ given that $y(1) = \pi, y'(1) = 4\pi$
3. By the method of undetermined coefficients, solve $y'' - 2y' + y = e^x cos2x$

Course Outcome 2 (CO 2): Perform various tests to determine whether a given series is convergent, absolutely convergent or conditionally convergent.

1. Find the sum of the series $\sum_{n=1}^{\infty} \frac{1}{9n^2+3n-2}$,if it is convergent.
2. Examine the convergence of $\sum_{n=1}^{\infty} \left(\frac{n}{n+1}\right)^{n^2}$
3. Determine whether the series $\sum_{n=1}^{\infty} \frac{(-1)^n n^4}{4^n}$ is absolutely convergent.

Course Outcome 3 (CO 3): Determine the power series expansion of a given function.

1. Find the Taylor's series representation of $f(x) = sin\pi x$ about $x = 1$
2. Determine the binomial series representation of $\frac{1}{\sqrt{(2+x)^3}}$
3. Find the Fourier series of the periodic function $f(x)$ of period 2, where $f(x) = \begin{cases} -1 & -1 \leq x \leq 0 \\ 2x & 0 \leq x \leq 1 \end{cases}$ and deduce that $1 + \frac{1}{3^2} + \frac{1}{5^2} + \cdots = \frac{\pi^2}{8}$.

Course Outcome 4 (CO 4): Determine the Fourier transforms of functions and apply them to solve problems arising in engineering.

1. Find the Fourier integral representation of function defined by $f(x) = e^{-x}$ for $x > 0$ and $f(x) = 0$ for $x < 0$.
2. What are the conditions for the existence of Fourier Transform of a function $f(x)$?
3. Find the Fourier Transform of $f(x) = x$ for $|x| \leq 1$ and $f(x) = 0$ otherwise.

Course Outcome 5 (CO 5): Compute Laplace transform and apply them to solve ODEs arising in engineering.

1. What is the inverse Laplace Transform of $\frac{3s+2}{(s-1)(s^2+2s+5)}$?
2. Find Laplace Transform of (i) $e^{-t}sin^2t$ (ii) $\delta(t-a)$
3. Solve the differential equation $y'' + 4y = f(t), y(0) = 1, y'(0) = 0$ where $f(t) = \begin{cases} 0 & \text{if } 0 \leq t \leq 4 \\ 3 & \text{if } t \geq \pi \end{cases}$

MODEL QUESTION PAPER

QP CODE: **Pages: 2**

Reg.No.: .....

Name: .....

MAR ATHANASIUS COLLEGE OF ENGINEERING (AUTONOMOUS), KOTHAMANGALAM

SECOND SEMESTER B.TECH DEGREE EXAMINATION, JUNE 2025

Course Code: B24MA1T02

Course Name: ORDINARY DIFFERENTIAL EQUATIONS AND TRANSFORMS
Common to all branches

Max. Marks: 100 Duration: 3 hours

PART A

Answer all questions. Each question carries 3 marks.

1. Check whether x, lnx are linearly independent or not.
2. Solve $y''' + 9y' = 0$.
3. Find the rational number represented by the repeating decimal 5.373737…
4. Examine the convergence of $\sum_{k=1}^{\infty} \frac{1}{k!}$
5. Find the binomial series for $f(x) = (1+x)^{\frac{1}{3}}$ upto third degree term.
6. Obtain the half range sine series expansion of $f(x) = \pi x - x^2$ in $(0, \pi)$.
7. Find the cosine integral representation of the function $f(x) = \begin{cases} 1 & ; 0 < x < 1 \\ 0 & ; x > 1 \end{cases}$
8. Find the Fourier cosine transform of e^{-x} , $x > 0$.
9. Find the Laplace transform of $sin^2 2t$.
10. Find $L^{-1}\left\{\frac{1}{(s-1)(s-2)}\right\}$.

PART B

Answer any one question from each module. Each question carries 14 marks.

11. (a) Solve the initial value problem $y'' + 9y = 0, y(0) = 0.2, y'(0) = -1.5$. (7 marks)

    (b) By the method of variation of parameters solve $y'' + 4y = tan2x$. (7 marks)

OR

12. (a) By the method of undetermined coefficients solve $y'' + 2y' + 4y = 3e^{-x}$. (7 marks)

    (b) Solve $x^2y'' + xy' + 9y = 0, y(1) = 0, y'(1) = 2.5$. (7 marks)

13. (a) Test the convergence of (i) $\sum_{k=1}^{\infty} \frac{3k^3-2k^2+4}{k^7-k^3+2}$ (ii) $\sum_{k=1}^{\infty} \frac{k^k}{k!}$. (7 marks)

    (b) Check the convergence of the series $1 + \frac{1.3}{3!} + \frac{1.3.5}{5!} + \frac{1.3.5.7}{7!} + \dots$ (7 marks)

OR

14. (a) Determine whether the series $\sum_{k=1}^{\infty} \frac{1}{\sqrt{k}+1}$ is absolutely convergent or conditionally convergent. (7 marks)

    (b) Test the convergence of (i)$\sum_{k=1}^{\infty} \frac{k!}{3!(k-1)!3^k}$ (ii) $\sum_{k=1}^{\infty} (\frac{4k-5}{2k+1})^k$ (7 marks)

15. (a) Expand into a Fourier series , $f(x) = e^{-x}, 0 < x < 2\pi$. (7 marks)

    (b) Obtain the half range Fourier sine series of $f(x) = \begin{cases} x & , 0 < x < \frac{\pi}{2} \\ \pi - x & , \frac{\pi}{2} < x < \pi \end{cases}$ (7 marks)

OR

16. (a) Find the Fourier series expansion of $f(x) = x^2$ in the interval $-\pi < x < \pi$. Hence show that $1 - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots = \frac{\pi^2}{12}$. (7 marks)

    (b) Find the half range cosine series for $f(x) = (x-1)^2$in $0 \le x \le 1$. (7 marks)

17. (a) Find the Fourier transform of $f(x) = \begin{cases} 1 & \text{if } |x| < 1 \\ 0 & \text{otherwise} \end{cases}$ (7 marks)

    (b) Find the Fourier sine integral of $f(x) = \begin{cases} sinx & , 0 \le x \le \pi \\ 0 & , x > \pi \end{cases}$ (7 marks)

OR

18. (a) Using Fourier integral representation show that $\int_0^{\infty} \frac{coswx}{1+w^2} dw = \frac{\pi}{2} e^{-x}, x > 0$. (7 marks)

    (b) Find the Fourier sine transform of $f(x) = \begin{cases} k & , 0 < x < a \\ 0 & , x > a \end{cases}$ (7 marks)

19. (a) Find the Laplace transform of (i) $tsin2t$ (ii) $e^{-t}sin3tcos2t$ (7 marks)

    (b) Using convolution theorem find $L^{-1}\left\{\frac{1}{s(s^2+4)}\right\}$ (7 marks)

OR

20. (a) Find $L^{-1}\left\{\frac{4s+5}{(s+2)(s-1)^2}\right\}$. (7 marks)

    (b) Use Laplace transform to solve $y'' + 2y' + 2y = 0, y(0) = y'(0) = 1$. (7 marks)

B24PH1T01A	ENGINEERING PHYSICS (A)	L	T	P	S	CREDIT	YEAR OF INTRODUCTION
		2	1	0	2	3	2024

Preamble

The aim of this course is to equip students with a solid foundation in physics principles and knowledge of their engineering applications. This will enhance the students' ability to analyze and solve complex engineering problems. Ultimately, the goal is to produce graduates who are well prepared to tackle real world engineering challenges with a deep understanding of the underlying physical principles.

Prerequisites

Nil

Course Outcomes

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

CO 1	Understand the principle and structure of lasers and the working of optical fibers. (Cognitive Knowledge Level: Apply)
CO 2	Analyze the behavior of matter in the atomic and subatomic level through the principles of quantum mechanics to perceive the microscopic processes in electronic devices. (Cognitive Knowledge Level: Apply)
CO 3	Quantitatively grasp fundamental semiconductor principles such as energy band theory, carrier statistics and transport phenomena and thus explain the structure and conduction in intrinsic semiconductors. (Cognitive Knowledge Level: Apply)
CO 4	Understand the influence of doping on the energy structure, carrier statistics and transport phenomena and thus explain the structure and conduction in extrinsic semiconductors. (Cognitive Knowledge Level: Apply)
CO 5	Understand the formation and structure of junctions and explain the working of solid state lighting devices. (Cognitive Knowledge Level: Apply)

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	1	1	1			1					1
CO 2	3	2	1	1								1
CO 3	3	2	1	1								1
CO 4	3	2	1	1								1
CO 5	3	1	1				1					1

Assessment Pattern

Bloom's Category	Continuous Assessment		End Semester Examination (% Marks)
	Test 1 (% Marks)	Test 2 (% Marks)	
Remember	30	30	30
Understand	50	50	50
Apply	20	20	20
Analyse			
Evaluate			
Create			

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern

Attendance	20 Marks
Continuous Assessment Test (2 numbers)	25 marks
Assignment/Quiz/Course Project	15 marks

End Semester Examination Pattern

There will be two parts; Part A and Part B. Part A contain 10 questions carrying 3 marks each. Part B contains 2 questions from each module out of which 1 to be answered. Each question carries 14 marks and can have maximum 2 sub divisions.

SYLLABUS

MODULE 1 (7 hours)

Laser and Fibre Optics

Optical processes - Absorption, Spontaneous emission and stimulated emission, - Einstein's relations. Principle of laser - conditions for sustained lasing - components of laser - Population inversion - energy source - Pumping, Metastable states - active medium, optical resonator. Construction and working of Ruby laser. Optic fiber-Principle of propagation of light, Numerical aperture – Derivation. Applications of fibers - Intensity modulated sensors.

MODULE 2 (8 hours)

Quantum Mechanics

Introduction - Concept of uncertainty and conjugate observables (qualitative), Uncertainty principle (statement only), Wave function, its properties and physical interpretation, Formulation of time dependent and time independent Schrodinger equations, Particle in a one dimensional box - Derivation of energy eigenvalues and normalized wave function.

MODULE 3 (8 hours)

Semiconductor Physics I

Electrical Conduction in solids - Density of states function (no derivation), the Fermi-Dirac Probability function, Fermi energy and its physical significance, Charge carriers in semiconductors - Equilibrium distribution of electrons and holes, the n0 and p0 equations, Intrinsic carrier concentration ni, Intrinsic Fermi level position and its dependence on temperature.

MODULE 4 (7 hours)

Semiconductor Physics II

Extrinsic semiconductors - P type semiconductor, N type semiconductor, Carrier concentration in N type semiconductor, Variation of fermi level with temperature, Variation of fermi level with donor concentration, Carrier concentration in P type semiconductor, Variation of fermi level with temperature, Variation of fermi level with acceptor concentration.

MODULE 5 (6 hours)

Semiconductor Devices

Formation of PN junction, Energy band diagram of PN junction - Qualitative description of charge flow across a PN junction - Forward and reverse biased PN Junctions, Photonic devices (Qualitative treatment only) - Light Emitting Diode, Photo detectors (Junction and PIN photodiodes), Solar cells.

Text Books

1. Aruldhas G., *Engineering Physics*, PHI Pvt. Ltd., 2015.
2. M. N. Avadhanulu, P. G. Kshirsagar, and TVS Arun Murthy, *A Textbook of Engineering Physics*, S.Chand & Co., Revised Edition, 2019.
3. Donald A. Neamen, *Semiconductor Physics and Devices - Basic Principles*, McGraw Hill, 4th ed., 2012.

Reference Books

1. Arthur Beiser, *Concepts of Modern Physics*, Tata McGraw Hill Publications, 6th ed., 2003.
2. D. K. Bhattacharya, and Poonam Tandon, *Engineering Physics*, Oxford University Press, 2015.
3. Md. N. Khan and S. Panigrahi *Principles of Engineering Physics 1 & 2*, Cambridge University Press, 2016.
4. S. M. Sze, *Physics of Semiconductor Devices*, John Wiley & Sons, 1969.

COURSE CONTENTS AND LECTURE SCHEDULE

No.	Topic	No of Lecture/Tutorial Hours
	Total Hours	36 Hours
	Module 1: Laser and Fibre Optics	**7**
1.1	Optical processes - Absorption, Spontaneous emission and stimulated emission, - Einstein's relations	2
1.2	Principle of laser - conditions for sustained lasing - components of laser - Population inversion - energy source - Pumping, Metastable states - active medium, optical resonator	2
1.3	Construction and working of Ruby laser	1
1.4	Optic fiber-Principle of propagation of light, Numerical aperture – Derivation	1
1.5	Applications of fibers - Intensity modulated sensors	1
	Module 2: Quantum Mechanics	**7**
2.1	Introduction - Concept of uncertainty and conjugate observables (qualitative), Uncertainty principle (statement only)	1
2.2	Wave function, its properties and physical interpretation	1

2.3	Formulation of time dependent and time independent Schrodinger equations, Particle in a one dimensional box - Derivation of energy eigenvalues and normalized wave function, Numerical Problems	5
	Module 3: Semiconductor Physics I	**8**
3.1	Electrical Conduction in solids - Density of states function (no derivation), the Fermi-Dirac Probability function, Fermi energy and its physical significance	2
3.2	Charge carriers in semiconductors - Equilibrium distribution of electrons and holes, the n0 and p0 equations	3
3.3	Intrinsic carrier concentration ni, Intrinsic Fermi level position and its dependence on temperature	3
	Module 4: Semiconductor Physics II	**8**
4.1	Extrinsic semiconductors - P type semiconductor, N type semiconductor	2
4.2	Carrier concentration in N type semiconductor, Variation of fermi level with temperature, Variation of fermi level with donor concentration	3
4.3	Carrier concentration in P type semiconductor, Variation of fermi level with temperature, Variation of fermi level with acceptor concentration	3
	Module 5: Semiconductor Devices	**6**
5.1	Formation of PN junction, Energy band diagram of PN junction - Qualitative description of charge flow across a PN junction - Forward and reverse biased PN Junctions, the ideal diode equation (no derivation)	3
5.2	Photonic devices (Qualitative treatment only) - Light Emitting Diode, Photo detectors (Junction and PIN photodiodes), Solar cells	3

CO ASSESSMENT QUESTIONS

Course Outcome 1 (CO 1)

1. Describe the principle of LASER.
2. Why are metastable levels needed in a LASER?
3. Write a note on intensity modulated sensors.

Course Outcome 2 (CO 2)

1. Describe the physical significance of wave function.

2. State HUP for position and momentum.
3. How does the size of a box affect the permitted energy levels of a particle?

Course Outcome 3 (CO 3)

1. Determine the number of quantum states in silicon between $(E_V - kT)$ and E_V at T=300K.
2. Describe the concept of Fermi level and its physical significance..
3. Calculate the probability that an energy state above E_F is occupied by an electron. Let T= 300 K. Determine the probability that an energy level 3kT above the Fermi energy is occupied by an electron.

Course Outcome 4 (CO 4)

1. Describe the variation of Fermi level with temperature in an extrinsic semiconductor.
2. Determine the Fermi level and the max. doping concentration for which the Boltzmann approximation is still valid.
3. Sketch a graph of n_0 versus temperature for an n-type material.

Course Outcome 5 (CO 5)

1. Describe the formation of the depletion region.
2. Draw the I-V characteristics of a solar cell.
3. Describe the advantage of a PIN diode over a PN diode when used as a photo detector.

MODEL QUESTION PAPER

QP CODE: **Pages: 3**

Reg.No.: .....

Name: .....

MAR ATHANASIUS COLLEGE OF ENGINEERING (AUTONOMOUS), KOTHAMANGALAM

SECOND SEMESTER B.TECH DEGREE EXAMINATION, JUNE 2025

Course Code: B24PH1T01A

Course Name:ENGINEERING PHYSICS (A)

Max. Marks: 100 Duration: 3 hours

PART A

Answer all questions. Each question carries 3 marks.

1. Explain the term population inversion.
2. Describe the principle of operation of optic fibers.
3. State Heisenberg's Uncertainty principle for conjugate variables.
4. Write the time independent Schrodinger equation.
5. What is meant by Fermi level?
6. Write the Fermi-Dirac distribution function.
7. What are the factors affecting the Fermi level in an extrinsic semiconductor?
8. Plot the variation in E_F against donor concentration in an n-type semiconductor.
9. Sketch the energy bands in an unbiased, reverse-biased and forward-biased PN junction.
10. What is meant by a space charge region?

PART B

Answer any one question from each module. Each question carries 14 marks.

11. (a) Define numerical aperture of an optic fiber and derive an expression for the NA of a step index fiber with a neat diagram. (10 marks)

    (b) Calculate the numerical aperture and acceptance angle of a fiber with a core refractive index of 1.54 and a cladding refractive index of 1.50 when the fiber is inside water of refractive index 1.33. (4 marks)

OR

12. (a) Outline the construction and working of Ruby laser. (10 marks)

    (b) Calculate the N.A. of an optic fiber having core index of 1.54 and cladding index of 1.5 (4 marks)

13. (a) Derive time dependent Schrodinger equation. (10 marks)

    (b) An electron is confined to a one dimensional potential box of length 2Å. Calculate the energies corresponding to the first and second quantum states in eV. (4 marks)

OR

14. (a) Derive the expression for the energy eigenvalues for a particle confined within a box of width L. (10 marks)

    (b) Find the de-Broglie wavelength of an electron whose kinetic energy is 15eV. (4 marks)

15. (a) Derive the equations for the thermal equilibrium concentrations of electrons and holes in terms of the Fermi energy. (10 marks)

    (b) Calculate the density of states per unit volume with energies between 0 eV and 1 eV. (4 marks)

OR

16. (a) Derive the equation for the intrinsic carrier concentration. (10 marks)

    (b) Let T=300 K. Determine the probability that an energy level 3kT above the Fermi energy is occupied by an electron. (4 marks)

17. (a) Derive the fundamental relationship $n_0 p_0 = n_i^2$. (10 marks)

    (b) Consider silicon at T=300 K and assume that $N_c = 2.8 \times 10^{19} cm^{-3}$ and $N_v = 1.04 \times 10^{19} cm^{-3}$. Assuming that the Fermi energy is 0.25 eV below the conduction band and that the bandgap energy of silicon is 1.12 eV, determine the type of silicon under consideration. (4 marks)

OR

18. (a) Derive the equations for n_0 and p_0 in terms of impurity doping concentrations. (10 marks)

    (b) Silicon at T=300 K contains an acceptor impurity concentration of $N_a = 10^{16} cm^{-3}$. Determine the concentration of donor impurity atoms that must be added so that the silicon is n type and the Fermi level is 0.20 eV below the conduction-band edge. (4 marks)

19. (a) Describe the structure of energy bands in a PN junction under zero bias, forward bias and reverse bias and explain why conduction is possible only when it is forward-biased. (10 marks)

    (b) Write the ideal diode equation and draw the corresponding I-V characteristics. (4 marks)

OR

20. (a) Explain the structure of an LED and explain the process of emission of light from the same with the help of the energy band diagram. (10 marks)

    (b) Briefly describe the working of a PIN junction photodiode and explain its advantage over a PN junction photodiode. (4 marks)

B24CY1T01A	ENGINEERING CHEMISTRY (A)	L	T	P	S	CREDIT	YEAR OF INTRODUCTION
		2	1	0	2	3	2024

Preamble

This basic science course will assist the students to acquire understanding in the concepts of chemistry for engineering applications and to familiarize the students with different application oriented topics like electrochemistry, nanomaterials, energy production, energy storage, OLED etc. Moreover, the students will be able to know analytical methods like various spectroscopic techniques, SEM etc. This will empower them to develop abilities and skills that are relevant to the study and practice of chemistry in their respective field of engineering.

Prerequisites

Nil

Course Outcomes

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

CO 1	Develop a comprehensive understanding of nanoscale materials, including their synthesis, fundamental properties and diverse applications. (Cognitive Knowledge Level: Apply)
CO 2	Understand the principles and applications of various spectroscopic techniques and microscopic techniques such as SEM. (Cognitive Knowledge Level: Apply)
CO 3	Demonstrate an inclusive understanding of the principles of electrochemistry and corrosion. Also gain knowledge about various corrosion control methods. (Cognitive Knowledge Level: Apply)
CO 4	Learn about the basics of energy harvesting methods and its application. Apply the knowledge of battery, hydrogen generation and fuel cells in engineering. (Cognitive Knowledge Level: Apply)
CO 5	Apply the knowledge of conducting polymers and advanced materials in engineering. (Cognitive Knowledge Level: Apply)

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	1	2	2	1	1	2					1
CO 2	1	2	2	1	2		2					1
CO 3	3	2	3	1	2	2	1					2
CO 4	3	2	3	2	3	3	3	1	1			2
CO 5	2	1	3	1	3	1	2	1				2

Assessment Pattern

Bloom's Category	Continuous Assessment		End Semester Examination (% Marks)
	Test 1 (% Marks)	Test 2 (% Marks)	
Remember	30	30	30
Understand	50	50	50
Apply	20	20	20
Analyse			
Evaluate			
Create			

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern

Attendance	10 marks
Continuous Assessment Test (2 numbers)	25 marks
Assignment/Quiz/Course Project	15 marks

End Semester Examination Pattern

There will be two parts; Part A and Part B. Part A contain 10 questions carrying 3 marks each. Part B contains 2 questions from each module out of which 1 to be answered. Each question carries 14 marks and can have maximum 2 sub divisions.

SYLLABUS

MODULE 1 (7 hours)

Fundamentals of Nanomaterials

Introduction - Classification - Based on dimension and structural composition - Nanoscale materials – Introduction - Properties and applications of Quantum dots, Graphene and Carbon nanotubes (CNT) – General Properties and applications of nanomaterials - Synthesis of nanomaterials – Top-Down and Bottom-Up approaches – Physical methods of synthesis - Mechanical milling, Laser ablation and Sputtering - Chemical methods of synthesis – Sol-Gel, co-precipitation and reduction.

MODULE 2 (8 hours)

Spectroscopic and Microscopic Techniques

Introduction - Types of spectrum - Electromagnetic spectrum - Molecular energy levels - Beer-Lambert's law – Numerical problems based on Beer-Lambert's law - Electronic spectroscopy (UV-vis) – Principle, instrumentation and applications - Types of electronic transitions - Vibrational spectroscopy (IR) – Principle and applications - Number of vibrational modes - Vibrational modes of CO_2 and H_2O – Force constant equation for diatomic molecules - Numerical problems based on force constant - Microscopic techniques - Scanning Electron Microscope (SEM) - Principle, instrumentation, working and applications.

MODULE 3 (7 hours)

Introduction to Electrochemistry and Corrosion Science

Introduction - Reference electrodes - Calomel electrode - Construction and working - Electrochemical series - Applications – Nernst equation for single electrode and cell (Derivation not required) – Applications – Effect of temperature on emf - Numerical problems based on Nernst equation - Corrosion – Introduction - Galvanic series - Types of corrosion – Galvanic and pitting corrosion - Corrosion control methods - Cathodic protection - Sacrificial anodic protection and impressed current cathodic protection – Electroplating of Copper - Electroless plating of Copper – Anodizing of Aluminium.

MODULE 4 (7 hours)

Energy Storage and Harvesting Technologies

Cells and batteries – Primary and secondary cells – Na-ion battery and Li-ion battery - Construction, working, advantages and applications – Hydrogen generation – Electrolysis of water - Fuel cells – Introduction - Construction and advantages of H_2-O_2 fuel cell, Phosphoric acid fuel cell and Polymer Electrolyte Membrane Fuel Cell (PEMFC) - Supercapacitors - Classification - Construction and applications in hybrid vehicles.

MODULE 5 (7 hours)

Advanced Materials and Devices for Engineering Applications

Conducting polymers – Introduction - Classification - Intrinsically and extrinsically conducting polymers - Conduction mechanism – Band theory - Polyaniline and polypyrrole - Synthesis, properties and applications – Molecular devices based on conducting polymers – Diodes, Field Effect Transistor and Actuators - Introduction and applications - OLED – Construction, working and advantages - Smart materials - Thermo and light responsive materials - Introduction and examples - Sensors – Physical, chemical and biosensors – Introduction and applications.

Text Books

1. Jain and Jain, *Engineering Chemistry*, Dhanpat Rai Publishing Company, 17th ed., 2015.
2. Shashi Chawla, *A Text Book of Engineering Chemistry*, Dhanpat Rai and Co.(P) Limited, 2017.
3. Muhammed Arif, Annette Fernandez, and Kavitha P. Nair, *Engineering Chemistry*, Owl Books, 2019.
4. Ahad J., *Engineering Chemistry*, Jai Publication, 2019.
5. Roy K. Varghese, *Engineering Chemistry*, Crown Plus Publishers, 2019.
6. Soney C. George, and Rino Laly Jose, *Text Book of Engineering Chemistry*, S. Chand and Company Pvt. Ltd., 2019.
7. B. L. Tembe, Kamaluddin, and M. S. Krishnan, *Engineering Chemistry* (NPTEL Web Book), 2018.

Reference Books

1. T. Pradeep, *NANO: The Essentials: Understanding Nanoscience and Nanotechnology*, McGraw-Hill, 2008.
2. B. Rogers, J. Adams, and S. Pennathur, *Nanotechnology: Understanding Small Systems*, CRC Press, 2014.
3. Donald L. Pavia, *Introduction to Spectroscopy*, Cengage Learning India Pvt. Ltd., 2015.
4. J. Goldstein, *Scanning Electron Microscopy and Microanalysis*, Springer, 2012.
5. H. H. Willard, L. L. Merritt, *Instrumental Methods of Analysis*, CBS Publishers, 7th ed., 2005.
6. Samuel Glasstone, *An Introduction to Electrochemistry*, East-West Press Pvt. Ltd., 2006.

7. Pietro Pedeferri, *Corrosion Science and Engineering*, Springer Link, 2018.

8. B. Sunden, *Hydrogen, Batteries and Fuel Cells*, Elsevier Inc., 2019.

9. B. Sorensen and G. Spazzafumo, *Hydrogen and Fuel Cells - Emerging Technologies and Applications*, Elsevier Ltd., 2018.

10. Raymond B. Seymour, and Charles E. Carraher, *Polymer Chemistry: An Introduction*, Marcel Dekker Inc; 4th ed., Revised,1996.

11. J. Janata, *Principles of Chemical Sensors*, Springer, New York, NY, 2009.

12. F-G. Banica, *Chemical Sensors and Biosensors: Fundamentals and Applications*, John Wiley and Sons, 2012.

13. M. Schwartz, *Smart Materials*, CRC Press, 2008.

14. Y. Zhao, and T. Ikeda, *Smart Light-Responsive Materials*, Wiley, 2009.

15. V. Khutoryanskiy, and T. Georgiou, *Temperature-Responsive Polymers: Chemistry, Properties and Applications*, Wiley, 2018.

16. P. W. Atkins, *Physical Chemistry*, Oxford University Press, 10th ed., 2014.

COURSE CONTENTS AND LECTURE SCHEDULE

No.	Topic	No of Lecture/Tutorial Hours
	Total Hours	36 Hours
	Module 1: Fundamentals of Nanomaterials	**7**
1.1	Introduction - Classification - Based on dimension and structural composition	1
1.2	Nanoscale materials – Introduction - Properties and applications of Quantum dots, Graphene and Carbon nanotubes (CNT) – General properties and applications of nanomaterials	3
1.3	Synthesis of nanomaterials – Top-Down and Bottom-Up approaches – Physical methods of synthesis - Mechanical milling, Laser ablation and Sputtering - Chemical methods of synthesis – Sol-Gel, co-precipitation and reduction	3
	Module 2: Spectroscopic and Microscopic Techniques	**8**
2.1	Introduction - Types of spectrum - Electromagnetic spectrum - Molecular energy levels - Beer-Lambert's law – Numerical problems based on Beer-Lambert's law	3

2.2	Electronic spectroscopy (UV-vis) – Principle, instrumentation and applications - Types of electronic transitions - Vibrational spectroscopy (IR) – Principle and applications - Number of vibrational modes - Vibrational modes of CO_2 and H_2O – Force constant equation for diatomic molecules - Numerical problems based on force constant	4
2.3	Microscopic techniques - Scanning Electron Microscope (SEM) - Principle, instrumentation, working and applications	1
	Module 3: Introduction to Electrochemistry and Corrosion Science	**7**
3.1	Introduction - Reference electrodes - Calomel electrode - Construction and working - Electrochemical series - Applications – Nernst equation for single electrode and cell (Derivation not required) – Applications – Effect of temperature on emf - Numerical problems based on Nernst equation	3
3.2	Corrosion – Introduction - Galvanic series - Types of corrosion – Galvanic and pitting corrosion - Corrosion control methods - Cathodic protection - Sacrificial anodic protection and impressed current cathodic protection	2
3.3	Electroplating of Copper - Electroless plating of Copper – Anodizing of Aluminium	2
	Module 4: Energy Storage and Harvesting Technologies	**7**
4.1	Cells and batteries – Primary and secondary cells – Na-ion battery and Li-ion battery - Construction, working, advantages and applications	2
4.2	Hydrogen generation – Electrolysis of water - Fuel cells – Introduction - Construction and advantages of H_2-O_2 fuel cell, Phosphoric acid fuel cell and Polymer Electrolyte Membrane Fuel Cell (PEMFC)	3
4.3	Supercapacitors - Classification - Construction and applications in hybrid vehicles	2
	Module 5: Advanced Materials and Devices for Engineering Applications	**7**
5.1	Conducting polymers – Introduction - Classification - Intrinsically and extrinsically conducting polymers - Conduction mechanism – Band theory - Polyaniline and polypyrrole - Synthesis, properties and applications	3
5.2	Molecular devices based on conducting polymers – Diodes, Field Effect Transistors, and Actuators - Introduction and applications - OLED – Construction, working and advantages	2
5.3	Smart materials - Thermo and light responsive materials - Introduction and examples - Sensors – Physical, chemical and biosensors – Introduction and applications	2

CO ASSESSMENT QUESTIONS

Course Outcome 1 (CO 1)

1. What are carbon nanotubes? Give two applications.
2. Comment on the structure of graphene.
3. How nanomaterials are classified based on structural composition?

Course Outcome 2 (CO 2)

1. State Beer-Lambert's law.
2. Calculate and sketch the vibrational modes of CO_2.
3. What are the limitations of SEM?

Course Outcome 3 (CO 3)

1. How equilibrium constant is determined using electrochemical series?
2. Write the representation and reactions of calomel electrode.
3. Give any two differences between electrochemical series and galvanic series.

Course Outcome 4 (CO 4)

1. Compare Na-ion and Li-ion batteries.
2. List the applications of PEM fuel cell.
3. Discuss the classification of supercapacitors.

Course Outcome 5 (CO 5)

1. Explain the preparation and properties of polypyrrole.
2. Discuss the working of OLED.
3. Compare physical and chemical sensors.

MODEL QUESTION PAPER

QP CODE: **Pages: 2**

Reg.No.: .....

Name: .....

MAR ATHANASIUS COLLEGE OF ENGINEERING (AUTONOMOUS), KOTHAMANGALAM

FIRST SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2024

Course Code: B24CY1T01A

Course Name: ENGINEERING CHEMISTRY (A)

Max. Marks: 100 Duration: 3 hours

PART A

Answer all questions. Each question carries 3 marks.

1. Discuss the properties and applications of quantum dots.
2. How carbon nanotubes are classified based on structure?
3. State Beer-Lambert's law.
4. List the important applications of IR spectroscopy.
5. Explain how galvanic series can be used in corrosion control?
6. What is calomel electrode? Give the reduction reaction.
7. How does a PEM fuel cell differ from the other types of fuel cells?
8. Distinguish between primary and secondary cells with examples.
9. Give example and explain the importance of light responsive smart materials.
10. What are biosensors? Give their applications.

PART B

Answer any one question from each module. Each question carries 14 marks.

11. (a) Explain two methods of chemical synthesis for nanomaterials. (8 marks)

(b) Discuss the classification of nanomaterials based on dimension. (6 marks)

OR

12. (a) What are nanoscale materials? Give the properties and applications of quantum dots and graphene. (9 marks)

    (b) Explain the sputtering method for the synthesis of nanomaterials. (5 marks)

13. (a) Explain the principle, instrumentation and working of SEM. (8 marks)

    (b) Calculate the force constant of HCl molecule, if it shows IR absorption at 2138 cm^{-1}. Given that atomic masses of hydrogen and chlorine are 1 u and 35 u respectively. (6 marks)

OR

14. (a) Illustrate the vibrational modes of CO_2 and H_2O. Justify its IR activity. (9 marks)

    (b) Explain the various energy levels associated with a molecule. (5 marks)

15. (a) How electroless plating of copper is carried out? Give the procedure and reactions. (8 marks)

    (b) Write the cell reactions and calculate the emf of the cell Cu/Cu^{2+} (1M) // Ag^{+} (0.01M) // Ag at 30^{o}C. Given E^0 $Cu^{2+}/Cu = 0.34$ V and E^0 $Ag^{+}/Ag = 0.8V$. (6 marks)

OR

16. (a) What is cathodic protection? Explain two methods. (9 marks)

    (b) Write the Nernst equation for Daniel cell and explain the effect of temperature on emf. (5 marks)

17. (a) Discuss the construction, working and advantages of Li-ion battery. (9 marks)

    (b) What is electrolysis of water? (5 marks)

OR

18. (a) With a neat diagram explain the construction and working of Hydrogen-Oxygen fuel cell. (8 marks)

    (b) Explain the classification of supercapacitors. (6 marks)

19. (a) Discuss the construction and working of OLED with a diagram. (9 marks)

    (b) Explain the synthesis, properties and applications of polyaniline. (5 marks)

OR

20. (a) Elaborate the classification and applications of conducting polymers. (8 marks)

    (b) What are smart materials? Give examples for heat responsive materials. (6 marks)

B24ES1T05A	BASIC CIVIL AND MECHANICAL ENGINEERING (A)	L	T	P	S	CREDIT	YEAR OF INTRODUCTION
		2	2	0	2	4	2024

Preamble

The objective of this course is to provide insight and inculcate the essentials of the Civil and Mechanical Engineering discipline to the students of Electrical Engineering and to provide the students with an illustration of the significance of the Civil and Mechanical Engineering Profession in satisfying the societal needs.

Prerequisites

Nil

Course Outcomes

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

CO 1	Understand Civil Engineering history, disciplines, surveying, and apply sustainable building practices in real-world scenarios. (Cognitive Knowledge Level: Apply)
CO 2	Comprehend the Materials, energy systems, water management, and environment for green buildings. (Cognitive Knowledge Level: Understand)
CO 3	Solve engineering problems by analyzing forces, moments, and equilibrium in coplanar systems using free-body diagrams. (Cognitive Knowledge Level: Apply)
CO 4	Illustrate the workings of IC engines and hydraulic machines. (Cognitive Knowledge Level: Apply)
CO 5	Explain the basic principle of power transmission elements and material handling devices. (Cognitive Knowledge Level: Analyse)
CO 6	Describe the fundamentals of power plant engineering and air conditioning systems. (Cognitive Knowledge Level: Apply)

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	1	2		1	3	3	1				2
CO 2	2	1	2		1	2	3	2				2
CO 3	3	3		1								2
CO 4	3	1	1				1			1		1
CO 5	3	1	2			1				1		1
CO 6	2	1	1			1	1			1		1

Assessment Pattern

Bloom's Category	Continuous Assessment		End Semester Examination (% Marks)
	Test 1 (% Marks)	Test 2 (% Marks)	
Remember	20	20	15
Understand	40	40	35
Apply	40	40	50
Analyse			
Evaluate			
Create			

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern

Attendance	10 marks
Continuous Assessment Test (2 numbers)	25 marks
Assignment/Quiz/Course Project	15 marks

End Semester Examination Pattern

There will be two parts for the end semester examination: Part I – Basic Civil Engineering and Part II – Basic Mechanical Engineering. Part I and Part II carry 50 marks each. Part I contains 2 parts - Part A and Part B. Part A contains 5 questions carrying 4 marks each (not exceeding 2 questions from each module). Part B contains 2 questions from each module out of which one to be answered. Each question carries 10 mark and can have a maximum 2 sub-divisions. The pattern for the end semester examination for Part II is the same as that of Part I. **The student should answer both Part I and Part 2 in separate answer booklets**.

SYLLABUS

MODULE 1 (7 hours)

Introduction to Civil Engineering

Relevance of Civil Engineering in the overall infrastructural development of the country. Brief introduction to major disciplines of Civil Engineering.

Construction Materials: Conventional construction materials - bricks, stones, cement, sand, timber and steel. Cement concrete: Constituent materials and properties. Other construction materials: Glass, Ceramics, Plastics, Composite materials, Thermal and acoustic insulating materials, Decorative panels, Water proofing materials.

Surveying: Basic Principles of surveying, instruments, methods, and measurements (brief discussion only).

Environment: Water Supply and Sanitary Systems, Urban Air Pollution Management, Solid Waste Management, Urban Flood Control (brief discussion only).

Earth Pitting Mechanisms: Increase in ground resistance and its consequences, Impact on equipment safety and reliability.

MODULE 2 (8 hours)

Types of Buildings: Components of a residential building and their functions.

Types of Structures: Load-bearing wall structures and Framed structures.

Building Area: Plinth area, built-up area, floor area, carpet area, and floor area ratio for a building as per KMBR.

Building Rules and Regulations: Relevance of NBC, KBR & CRZ norms (brief discussion only).

Green Buildings: Materials, energy systems, water management and environment for green buildings.

MODULE 3 (9 hours)

Introduction to Statics

Concept of Idealization, System of Forces, Principles of Superposition and Transmissibility, Resolution and Composition of Forces, Law of Parallelogram of Forces. Resultant of Concurrent and Non-concurrent Coplanar Force Systems. Moment of Forces, Couple, Varignon's Theorem, Free Body Diagram. Equations of Equilibrium, Equilibrium of Concurrent and Non-concurrent Coplanar Force Systems.

MODULE 4 (8 hours)

Internal Combustion Engines

Introduction, Terminologies, IC engine parts, Working of SI and CI engine, Two stroke and Four stroke engine, Fuel, Cooling and Lubrication systems, CRDI and MPFI engines. Concept of hybrid engines.

Hydraulic Machines

Classification of hydraulic turbines, Working of Pelton, Francis, and Kaplan turbines (Descriptions with figures only). Pumps: Classification and working of Centrifugal and Reciprocating pumps.

MODULE 5 (8 hours)

Power Transmission Elements

Classification and applications of mechanical drives, Velocity ratio of belt drive, Length of belt, Slip in belt, Power transmitted, simple problems. Gear drive: Types, Gear Ratio, Simple, compound, and epicyclic gear trains (simple descriptions only).

Material Handling

Objective, principle, and selection of material handling equipment, Types of conveyors, parts, and working of belt conveyors, screw conveyors and pneumatic conveyor- Hoisting machine, Elevators, Winches, and Cranes – Types – Concrete Pumps -Types, Working (Descriptions only).

MODULE 6 (8 hours)

Power Plant Engineering

Hydel power plants: Layout, classifications, and study of various components. Steam power plant: Layout, steam generators, study of various components. Gas turbine power plant and combined power plants, Layout. New generation power producing systems.

Air Conditioning

Units of Refrigeration, Refrigeration effect, Psychrometric properties, Psychrometric chart, Comfort conditions, window, split and centralized air condition system, Summer and Winter air-conditioning, Inverter Technology in Air conditioners, Solar Air conditioners.

Text Books

1. S. K. Duggal, *Building Materials*, New Age International Publishers, 4th ed., 2021.
2. B. C. Punmia, Ashok Kumar Jain, and Arun Kumar Jain, *Building Construction*, Laxmi Publications, 11th ed., 2016.
3. S. Timoshenko and D.H. Young, *Engineering Mechanics*, McGraw Hill Education, 5th ed., 2017.
4. I. B. Prasad, *Engineering Mechanics: Statics and Dynamics*, Khanna Publishers, 3rd ed., 2017.
5. J. Benjamin, *Basic Mechanical Engineering*, Pentex Books, 9th ed., 2018
6. P. Balachandran, *Basic Mechanical Engineering*, Owl Books, 1st ed., 2015.

Reference Books

1. M. S. Shetty and A. K. Jain, *Concrete Technology: Theory and Practice*, S. Chand & Company Pvt. Ltd., 9th ed., 2021.
2. R. Subramanian, *Surveying and Levelling*, Oxford University Press, 2nd ed., 2020.
3. Bindu B. Menon and G. Shivanand Rao, *Building Planning and Drawing*, Charotar Publishing House Pvt. Ltd., 1st ed., 2014.
4. S. K. Sharma, *Building Construction*, S. Chand & Company Pvt. Ltd., 3rd ed., 2016.
5. A. K. Tayal, *Engineering Mechanics*, Umesh Publications, 14th ed., 2019.
6. S. S. Bhavikatti, *Engineering Mechanics*, New Age International Publishers, 5th ed., 2018.
7. M. Clifford, K. Simmons, *An Introduction to Mechanical Engineering, Part I*, CRC Press.
8. K. P. Roy, S. K. H. Choudhary, N. Roy, *Elements of Mechanical Engineering.* Media Promoters & Publishers Pvt. Ltd., 7th ed., 2012.
9. S. Ray, *Introduction to material handling*, New Age International, 1st ed., 2008.

COURSE CONTENTS AND LECTURE SCHEDULE

No.	Topic	No of Lecture/Tutorial Hours
	Total Hours	**48 Hours**
1	**Module 1**	**7**
1.1	Introduction to Civil Engineering: Relevance of Civil Engineering in the overall infrastructural development of the country. Brief introduction to major disciplines of Civil Engineering	1
1.2	Construction materials: Conventional construction materials - bricks, stones, cement, sand, timber and steel. Cement concrete: Constituent materials and properties. Other construction materials: Glass, Ceramics, Plastics, Composite materials, Thermal and acoustic insulating materials, Decorative panels, Water proofing materials	2
1.3	Surveying: Basic Principles of surveying, instruments, methods, and measurements (brief discussion only)	1
1.4	Environment: Water Supply and Sanitary Systems, Urban Air Pollution Management, Solid Waste Management, Urban Flood Control (brief discussion only)	2
1.5	Earth Pitting Mechanisms: Increase in ground resistance and its consequences, Impact on equipment safety and reliability	1
2	**Module 2**	**8**
2.1	Types of buildings: components of a residential building and their functions	1
2.2	Types of structures: Load-bearing wall structures and Framed structures	1
2.3	Building area: Plinth area, built-up area, floor area, carpet area, and floor area ratio for a building as per KMBR	2
2.4	Building rules and regulations: Relevance of NBC, KBR & CRZ norms (brief discussion only)	2
2.5	Green buildings: Materials, energy systems, water management and environment for green buildings	2
3	**Module 3**	**9**
3.1	Concept of Idealization, System of Forces, Principles of Superposition and Transmissibility	1
3.2	Resolution and Composition of Forces	1
3.3	Law of Parallelogram of Forces	1
3.4	Resultant of Concurrent and Non-concurrent Coplanar Force Systems	1
3.5	Moment of Forces, Couple	1
3.6	Varignon's Theorem, Free Body Diagram	2
3.7	Equations of Equilibrium, Equilibrium of Concurrent and Non-concurrent Coplanar Force Systems	2

4	**Module 4**	**8**
4.1	Introduction, Terminologies, IC engine parts	1
4.2	Working of four-stroke SI and CI engine, Working of two-stroke SI and CI engine	2
4.3	Fuel, Cooling and Lubrication systems, CRDI and MPFI engines, Concept of hybrid engines	2
4.4	Hydraulic Machines: Classification of hydraulic turbines, Working of Pelton, Francis, and Kaplan turbines (Descriptions with figures only)	2
4.5	Pumps: Classification and working of Centrifugal and Reciprocating pumps	1
5	**Module 5**	**8**
5.1	Power Transmission Elements: Classification and applications of mechanical drives, Velocity ratio of belt drive, Length of belt, Slip in belt, Power transmitted, simple problems	2
5.2	Gear drive: Types, Gear Ratio, Simple, compound, and epicyclic gear trains (simple descriptions only)	2
5.3	Material Handling: Objective, principle, and selection of material handling equipment, Types of conveyors, parts, and working of belt conveyors, screw conveyors, and pneumatic conveyors	2
5.4	Hoisting machine, Elevators, Winches, and Cranes – Types – Concrete Pumps -Types, Working (Descriptions only)	2
6	**Module 6**	**8**
6.1	Power Plant Engineering: Hydel power plants: Layout, classifications and study of various components. Steam power plant: Layout, steam generators, study of various components	2
6.2	Gas turbine power plant and combined power plants, Layout. New generation power producing systems	2
6.3	Air Conditioning: Units of Refrigeration, Refrigeration effect, Psychrometric properties, Psychrometric chart, Comfort conditions, window, split and centralized air condition system	2
6.4	Summer and Winter air-conditioning, Inverter Technology in Air conditioners, Solar Air conditioners	2

CO ASSESSMENT QUESTIONS

Course Outcome 1 (CO 1)

1. Define the role of a civil engineer in society.
2. Address complex challenges in the built environment.

3. How do civil engineers contribute to the development of environmentally conscious infrastructure?

Course Outcome 2 (CO 2)

1. Examine the role of materials in green building construction
2. Evaluate the integration of energy systems in green buildings.
3. How do green building practices address water conservation, reuse, and efficient management of water resources?

Course Outcome 3 (CO 3)

1. Discuss the fundamental principles of forces and moments in static equilibrium.
2. How do engineers apply the principles of statics to solve physical problems?
3. Explore the applications of forces and moments in mechanical systems

Course Outcome 4 (CO 4)

1. Describe the working of a four-stroke diesel engine.
2. Why two stroke engines are less efficient than our stroke engine?
3. How hydraulic turbines are classified?

Course Outcome 5 (CO 5)

1. Derive an expression to determine the length of an open belt drive
2. Solve problem based on velocity ratio of a gear drive
3. What are the important components of a conveyer belt drive? Explain with figure.

Course Outcome 6 (CO 6)

1. With the aid of a neat sketch, explain the working of a thermal power plant.
2. List the advantage of a combined power plant over the steam power plant.
3. How the operation of a summer air conditioner differs from a winter air conditioner?

MODEL QUESTION PAPER

QP CODE: **Pages: 7**

Reg.No.: .....

Name: .....

MAR ATHANASIUS COLLEGE OF ENGINEERING (AUTONOMOUS), KOTHAMANGALAM

FIRST SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2024

Course Code: B24ES1T05A

Course Name: BASIC CIVIL AND MECHANICAL ENGINEERING

Max. Marks: 100 Duration: 3 hours

Answer both PART I and PART II in separate answer booklets.

PART I: BASIC CIVIL ENGINEERING

PART A

Answer all questions. Each question carries 4 marks.

1. How does Civil Engineering contribute to the comprehensive development of a country's infrastructure?
2. How does the increase in ground resistance due to earth pitting mechanisms?
3. Elaborate on how the Floor Area Ratio (FAR) is determined for a building.
4. Compare load-bearing masonry structures and framed structures.
5. Demonstrate the application of parallelogram law of forces in understanding force vectors.

PART B

Answer any one question from each module. Each question carries 10 marks.

6. Provide a concise overview of the basic principles, instruments, methods, and measurements involved in surveying.

(10 marks)

OR

7. How do water supply and sanitary systems, urban air pollution management, solid waste management, and urban flood control collectively contribute to environmental sustainability in urban areas? (10 marks)

8. How do green buildings incorporate sustainable practices in terms of materials, energy systems, water management, and overall environmental considerations? (10 marks)

OR

9. Explain the essential components of a residential building and elaborate on their functions within the functionality of the structure. (10 marks)

10. What are the laws to add two forces and several concurrent, coplanar forces? Explain in detail. (10 marks)

OR

11. Explain various force systems with neat sketches. (10 marks)

PART II: BASIC MECHANICAL ENGINEERING

PART A

Answer all questions. Each question carries 4 marks.

1. With the neat block diagram, explain the fuel system of a CI engine.
2. Illustrate the working of an epicyclic gear train.
3. Explain the principles of material handling.
4. Explain cooling and dehumidification processes.
5. Define: Specific humidity, relative humidity and dew point temperature.

PART B

Answer any one question from each module. Each question carries 10 marks.

6. Explain the working of a 4-stroke CI engine with the help of a neat diagram. (10 marks)

OR

7. With the aid of a neat sketch, describe the working of a Francis turbine. (10 marks)

8. (a) Discuss the factors to be considered while selecting a material handling equipment.

(4 marks)

(b) What are the different types of belt conveyers? Explain its important parts of a flat belt conveyer system. (6 marks)

OR

9. Two flat belt pulleys having a centre-to-centre distance of 137 cm have drive diameter of 72 cm and 36 cm. (10 marks)

i. Determine the length of the belt if both pulleys will rotate in same direction.

ii. Determine the angle of contact on the small and big pulley.

iii. Calculate the belt length if the belt will be cross-connected to make the pulleys rotate in opposite directions.

iv. Determine the angle of contact for opposite direction.

10. Explain the general layout of a hydroelectric power plant. (10 marks)

OR

11. (a) How summer air conditioners differ from winter air conditioners.

(5 marks)

(b) Explain the working of summer air conditioner with the air of a neat sketch.

(5 marks)

B24EE1T03	ELECTRICAL MEASUREMENTS	L	T	P	S	CREDIT	YEAR OF INTRODUCTION
		2	1	0	2	3	2024

Preamble

The course aims to build a solid foundation that empowers to analyze and comprehend the measurement of the circuit parameters and magnetic quantities. It provides the basic knowledge about the construction, principles, and applications of analog and digital measuring instruments. Upon successful completion of the course students will be thorough with various measuring techniques that are required for an electrical engineer.

Prerequisites

Nil

Course Outcomes

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

CO 1	Identify and analyze the factors affecting the performance of the measuring system and select appropriate instruments for the measurement of voltage and current in DC measurements. (Cognitive knowledge level: Apply)
CO 2	Understand the measurement of power and energy in poly-phase systems. (Cognitive knowledge level: Understand)
CO 3	Design electrical bridges to measure resistance, inductance, capacitance, and frequency. (Cognitive knowledge level: Apply)
CO 4	Understand the principle of operation of CRO and apply the methods to measure magnetic and electric parameters. (Cognitive knowledge level: Apply)
CO 5	Understand the importance and working of digital instruments. (Cognitive knowledge level: Understand)

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	3	2	2		2	1	1	1	1	1	2
CO 2	3	2	2	2		2	1	1	1	1	1	2
CO 3	3	3	3	2	1	2	1	1	1	1	1	2
CO 4	3		2	2	1	2	1	1	1	1	1	2
CO 5	3		2	2	3	2	2	1	1	1	1	2

Assessment Pattern

Bloom's Category	Continuous Assessment		End Semester Examination (% Marks)
	Test 1 (% Marks)	Test 2 (% Marks)	
Remember	30	40	30
Understand	40	40	50
Apply	30	20	20
Analyse			
Evaluate			
Create			

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern

Attendance	10 marks
Continuous Assessment Test (2 numbers)	25 marks
Assignment/Quiz/Course Project	15 marks

End Semester Examination Pattern

There will be two parts; Part A and Part B. Part A contain 10 questions carrying 3 marks each. Part B contains 2 questions from each module out of which 1 to be answered. Each question carries 14 marks and can have maximum 2 sub divisions.

SYLLABUS

MODULE 1 (7 hours)

Measurement Systems

Measurement standards, static and dynamic characteristics of instruments, errors in instruments, need for calibration, classification of instruments, secondary instruments, indicating, integrating and recording, operating forces, essentials of indicating instruments - deflecting, damping, controlling torques - Numerical problems.

Measurement of Current and Voltage

Moving coil and moving iron instrument- constructional details and operation, ammeter shunts, voltmeter multipliers - Numerical problems.

MODULE 2 (10 hours)

Measurement of Power and Energy

Dynamometer type wattmeter - construction and working, low power factor wattmeter, power in polyphase systems, measurement of power in three phases balanced and unbalanced systems, measurement of reactive volt-amperes, Induction type single phase energy meters- construction, theory and operation, errors, compensation and adjustments, direct and phantom loading.

Instrument Transformers

Principle of working, ratio and phase angle errors, extension of range.

MODULE 3 (6 hours)

Measurement of Resistance, Inductance, and Capacitance

Ammeter-voltmeter method, Kelvin's double bridge, Wheatstone bridge, loss of charge method, measurement of earth resistance, Maxwell inductance bridge, Schering bridge, Wien bridge - Numerical problems. General principle of slide wire potentiometer and Crompton potentiometer.

MODULE 4 (6 hours)

Magnetic Measurements

Measurement of flux/flux density, determination of BH curve and hysteresis loop - step-by-step method, method of reversals, permeability measurement, ballistic galvanometer and flux meter - construction and principle of operation.

Oscilloscopes

Principle of operation of general purpose CRO - basics of vertical and horizontal deflection system, XY mode - Lissajous Pattern.

MODULE 5 (7 hours)

Digital Meters

Advantages and disadvantages of digital instruments, resolution, accuracy, and error in digital instruments. Digital voltmeters and frequency meters using electronic counters, digital multimeters, clamp-on meters, Time of Day meter (TOD), smart metering (description only), and Phasor Measurement Unit (PMU) (description only). Power quality analyzer, digital insulation resistance tester, proximity sensor, introduction to virtual instrumentation systems - Simulation software LabVIEW (description only).

Text Books

1. A. K. Sawhney, *A course in Electrical and Electronic Measurements and Instrumentation*, Dhanpat Rai, 19th ed., 2015.
2. J. B. Gupta, *A course in Electrical & Electronic Measurement and Instrumentation*, S.K Kataria & Sons, 14th ed., 2014.
3. H. S. Kalsi, *Electronic Instrumentation*, Tata McGraw Hill, 3rd ed., 2017.
4. E.O Doebelin and D.N Manik, *Doebelin's Measurements Systems: Application and Design*, McGraw Hill Education, 6th ed., 2017.

Reference Books

1. E. W. Golding, *Electrical Measurements & Measuring Instruments*, Pitman 3rd ed., 2011
2. William D. Cooper and Albert D. Helfrick, *Modern Electronic Instrumentation and Measurement Techniques*, Prentice Hall India Learning 1st ed., 1992.
3. Melville B. Stout, *Basic Electrical Measurements*, Prentice Hall Inc., 2nd ed., 1961.
4. David A. Bell, *Electronic Instrumentation and Measurements*, Oxford University Press, 3rd ed. 2013.

COURSE CONTENTS AND LECTURE SCHEDULE

No.	Topic	No of Lecture/Tutorial Hours
	Total Hours	36 Hours
	Module 1	**7**
1.1	Measurement standards, static and dynamic characteristics of instruments	1
1.2	Errors in instruments, need for calibration	1
1.3	Classification of instruments, secondary instruments, indicating, integrating, and recording	1
1.4	operating forces, essentials of indicating instruments - deflecting, damping, controlling torques - Numerical problems	1
1.5	Moving coil instrument- constructional details, principle of operation, and numerical Problems	1
1.6	Moving iron instrument- constructional details, the principle of operation, and numerical Problems	1
1.7	Ammeter shunts, voltmeter multipliers - Numerical problems	1
	Module 2	**10**
2.1	Dynamometer-type wattmeter - construction and working.	1
2.2	Low power factor wattmeter, power in polyphase systems	1
2.3	Measurement of power in three phases, balanced and unbalanced systems, measurement of reactive volt-amperes	2
2.4	Induction type single-phase energy meters- construction, theory and operation, errors, compensation, and adjustments	2
2.5	Direct and Phantom Loading	1
2.6	Single phase transformer- principle and working	1
2.7	Instrument transformers – current and potential transformers- principle of working -ratio and phase angle errors. Extension of range	2
	Module 3	**6**
3.1	Measurement of resistance- Ammeter voltmeter method, Kelvin's double bridge, Wheatstone bridge	1
3.2	loss of charge method, measurement of earth resistance	1
3.3	Measurement of inductance and capacitance: Maxwell inductance bridge, Schering bridge, Numerical problems	1
3.4	Wien bridge - Numerical problems	1
3.5	General principle of slide wire potentiometer and Crompton potentiometer	2
	Module 4	**6**
4.1	Measurement of flux/flux density, determination of BH curve and hysteresis loop - step-by-step method, method of reversals	2

4.2	Ballistic galvanometer -construction and principle of operation	1
4.3	Flux meter - construction and the principle of operation	3
4.4	Oscilloscopes - Principle of operation of general purpose CRO - basics of vertical and horizontal deflection system, XY mode - Lissajous Pattern	2
	Module 5	**7**
5.1	Digital Meters: Advantages and disadvantages of digital instruments, resolution, accuracy, and error in digital instruments	1
5.2	Digital voltmeters and frequency meters using electronic counters	1
5.3	Digital multimeters, clamp-on meters, Time of Day meter (TOD), smart metering (description only), and Phasor Measurement Unit (PMU) (description only)	2
5.4	Power quality analyzer, digital insulation resistance tester, proximity sensor	2
5.5	Introduction to Virtual Instrumentation Systems - Simulation software LabVIEW (description only)	1

CO ASSESSMENT QUESTIONS

Course Outcome 1 (CO 1)

1. Explain classification and characteristics of measuring systems.
2. Explain the construction and working of indicating Instruments.
3. Problems related to indicating Instruments.

Course Outcome 2 (CO 2)

1. Describe the principle of operation and construction of energy meters.
2. Describe the principle of operation and construction of the wattmeter.
3. Illustrate the principle and working of Instrument Transformers.

Course Outcome 3 (CO 3)

1. Explain the operation of basic AC/DC bridges.
2. Problems related to the measurement of inductance, capacitance, and frequency.

3. Explain the principle of operation of DC potentiometers.

Course Outcome 4 (CO 4)

1. Explain the principle of operation of the fluxmeter and ballistic galvanometer.
2. Describe the procedure for plotting the BH curve and Hysteresis loop of a magnetic specimen.
3. Block diagram and working principle of CRO.

Course Outcome 5 (CO 5)

1. Explain the Basics of Digital Instruments.
2. Block diagram of DMM, PMU, and TOD.
3. Illustrate the principle of the Power Quality Analyzer, Proximity Sensor, and Digital Insulation Resistance Tester.

MODEL QUESTION PAPER

QP CODE: **Pages: 4**

Reg.No.: .....

Name: .....

MAR ATHANASIUS COLLEGE OF ENGINEERING (AUTONOMOUS), KOTHAMANGALAM

FIRST SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2024

Course Code: : B24EE1T03

Course Name: : ELECTRICAL MEASUREMENTS

Max. Marks: 100 Duration: 3 hours

PART A

Answer all questions. Each question carries 3 marks.

1. Define the following terms in measurement: i) accuracy, ii) resolution, and iii) precision.
2. The weight of 5 kg is used as the control weight in a gravity-controlled instrument. Find its distance from the spindle if the deflecting torque for a deflection of 600 is $1.13X10^{-3}$.
3. With a neat circuit diagram, show how power can be measured in a 3-phase circuit using two-watt meters in unbalanced load conditions.
4. Explain the working principle of a potential transformer with the help of neat diagrams.
5. Explain how insulation resistance can be measured using the loss of charge method.
6. With neat diagrams, outline the principle of slide wire potentiometer.
7. Show how a Ballistic Galvanometer can be used to determine the flux density in a magnetic specimen.
8. Using the diagram, label the parts of Cathode Ray Tube.
9. Explain the working of a Phasor Measurement Unit (PMU).
10. Illustrate the principle of the Power Quality Analyzer.

PART B

Answer any one question from each module. Each question carries 14 marks.

11. (a) What are the different torques needed for the proper operation of an indicating instrument? (6 marks)

    (b) Explain the construction and principle of operation of a PMMC instrument in a neat diagram. Derive the expression for deflection. (8 marks)

OR

12. (a) Explain three mechanisms for producing damping torque in electrical measuring instruments with neat diagrams. (7 marks)

    (b) Demonstrate how the range of the instrument can be extended in PMMC ammeter and voltmeter. (7 marks)

13. (a) Illustrate with a neat diagram the construction and working of an electrodynamometer wattmeter. (8 marks)

    (b) Develop the expression for the torque of a single-phase induction-type energy meter. (6 marks)

OR

14. (a) Demonstrate how the expression for ratio and phase angle error in a current transformer can be derived with the help of a phasor diagram (10 marks)

    (b) Explain phantom loading and its advantages. (4 marks)

15. (a) With necessary diagram, demonstrate how the Kelvin's double bridge can be used for the measurement of low resistances. (6 marks)

    (b) Explain how unknown self-inductance is measured using Maxwell's Inductance bridge with a neat circuit diagram. Derive the expression for unknown self-inductance. Draw the phasor diagram. (8 marks)

OR

16. (a) With necessary diagram and phasor, explain how unknown capacitance is measured using the Schering Bridge. (8 marks)

    (b) The arm of a four-arm bridge ABCD supplied with a sinusoidal voltage has the following values. Arm AB a resistance of 250 Ω in parallel with a capacitance of 2 μF, Arm BC 425 Ω ,Arm CD 999 Ω, Arm DA a resistance R2 in series with a 2.5 μF capacitance. Find the value of R2 and find the frequency at which the bridge will balance. (6 marks)

17. (a) Explain the measurement of flux in a ring specimen using Flux meter (8 marks)

(b) What are Lissajous patterns? How are they used for the measurement of frequency and phase angle?

(6 marks)

OR

18. (a) Define the function of each block of a Cathode Ray Oscilloscope using the necessary diagrams.

(10 marks)

(b) Illustrate with figures the step by step method used for the determination of BH curve of a magnetic material (4 marks)

19. (a) With neat figures, explain the working principle of frequency meters using electronic counters.

(b) Show how the rotational speed is measured using Proximity sensors. (6 marks)

OR

20. (a) Explain the basic principle and working of the Digital Insulation Resistance Tester. (6 marks)

(b) Summarize the working of (i)Digital Multi Meter (ii) Clamp-on meter (8 marks)

B24ES1L04A	BASIC CIVIL AND MECHANICAL ENGINEERING WORKSHOP (A)	L	T	P	S	CREDIT	YEAR OF INTRODUCTION
		0	0	2	2	1	2024

Preamble

This course equips students with practical knowledge in both Civil and Mechanical Engineering, linking theoretical studies to real-world applications and problem-solving. It provides hands-on training in essential tools, materials, and processes, preparing students to manage and execute engineering projects in a collaborative learning environment.

Prerequisite

Nil

Course Outcomes

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

CO 1	Identify and choose key plumbing components and building materials for real-world scenarios. (Cognitive Knowledge Level: Apply)
CO 2	Apply the principles of setting out in construction by successfully setting out a single-room building according to a given building plan, utilizing tape for accurate measurements. (Cognitive Knowledge Level: Apply)
CO 3	Apply the triangle law of forces to solve practical engineering problems involving the equilibrium of forces. (Cognitive Knowledge Level: Apply)
CO 4	Master carpentry joints and tools, smithy forging techniques, and foundry molding and casting processes. (Cognitive Knowledge Level: Apply)
CO 5	Gain proficiency in fitting, welding, conventional machining, and advanced methods like CNC machining and 3D printing. (Cognitive Knowledge Level: Apply)
CO 6	Understand the operation and application of centrifugal, self-priming, and reciprocating pumps, as well as Pelton, Francis, and Kaplan turbines. (Cognitive Knowledge Level: Analyse)

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	2				2	1		3	1		2
CO 2	3	3	2		2	1			3	1		3
CO 3	3	3	2		2	1			3	1		3
CO 4	1	1	1						2	1	1	2
CO 5	1	1	1						2	1	1	2
CO 6	1	1	1						2	1	1	2

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
100	70	30	1 Hour

Continuous Internal Evaluation Pattern

Attendance	20 marks
Class Work/ Assessment Viva-Voce	50 marks
End semester examination (Internally by college)	30 marks

End Semester Examination Pattern

The college will internally conduct the end semester examination. Separate ESE's will be held for the Civil workshop and the Mechanical workshop, each in the form of a one-hour written objective exam. The total marks for this course will be equally divided between the Civil and Mechanical workshops.

SYLLABUS

LIST OF EXPERIMENTS

PART I

CIVIL WORKSHOP

(Any 05 experiments are mandatory)

1	Plumbing: Introduction to plumbing and sanitary fittings.
2	Building Materials: Familiarization of various building materials- bricks, wood, steel and concrete with demonstration of its testing for fitness.
3	Calculate the area of a built-up space and a small parcel of land using standard measuring tape and digital distance measuring device.
4	Compute the area and/or volume of various building elements - door and window, quantity of bricks required to construct a wall of a building, quantity of steel bars used in windows (to create an awareness of measurements and units).
5	Setting out of a building: The student should set out a building (single room only) as per the given building plan using tape only.
6	Verification of triangle law of forces.

PART II

MECHANICAL WORKSHOP

(Five models from exercises 1 to 5 are mandatory. Additionally, the study and demonstration of the remaining exercises are also required.)

1	Carpentry: Study of Carpentry tools, Carpentry joints practices: T-Lap joint, Cross lap joint / Cross halving joint, Dove tail halving joint, Mortice & Tenon Joint.
2	Smithy: Study of different tools & forged models in Smithy shop, Forging Practices: Square prism, Hexagonal headed bolt, octagonal prism.
3	Foundry: Study of Foundry tools, Molding practices: Bench molding, Floor molding, Core making, Casting.
4	Fitting: Study of fitting tools in a workshop, Fitting shop joints practices: Square Joint, V-Joint, Male and Female fitting.
5	Welding: Study of welding tools, equipment's and methods, Welding practices: Arc Welding, MIG Welding, Oxy-Acetylene Gas Welding.
6	Conventional Machines: Study and demonstration of conventional machines like Shaping and Slotting machine, Lathe, Milling machine, Grinding machines & Radial drilling machine.
7	Advanced Manufacturing Methods: Study and demonstration of CNC machines and 3D printing.
8	Study and demonstration of pumps: Centrifugal, Self-priming and Reciprocating pumps. Study and demonstration of hydraulic turbines: Pelton, Francis and Kaplan Turbine.

Reference Books

1. S. C. Rangwala, *Water Supply and Sanitary Engineering*, Charotar Publishing House Pvt. Ltd., 28th ed., 2019.
2. A.K. Jain, Basic Construction Materials, Khanna Publishers, 1st ed., 2019.
3. S.K. Duggal, *Building Materials*, New Age International Publishers, 4th Edition, 2021.
4. M.S. Shetty and A.K. Jain, *Concrete Technology: Theory and Practice*, S. Chand & Company Pvt. Ltd., 9th ed., 2021.
5. B.C. Punmia, *Surveying*, Vol. 1, Laxmi Publications, 17th ed., 2021.
6. S.K. Garg, *Building Construction*, Khanna Publishers, 32nd ed., 2020.
7. W. A. J. Chapman, *Workshop Technology - Parts 1 & 2*, CBS Publishers & Distributors Pvt. Ltd., 4th ed., 2007.
8. A. O'Bren, (Editor), *Welding Handbook*, Vol. 1, 2, 3. American Welding Society, 9th ed., 2001.
9. 9. J. Anderson, *Shop Theory*, Tata McGraw Hill, 6th ed. 2017.
10. J. H. Douglass, *Wood Working with Machines*, Illinois, McKnight & McKnight Pub. Co., 1995.
11. P.L. Jain, *Principles of Foundry Technology*, Tata McGraw Hill, 5th ed. 2017.
12. S.K. Hajra Choudhury, *Elements of Workshop Technology*, Vol 2, Media Promoters & Publishers, 2010.

B24EE1L02	ELECTRONIC CIRCUITS LAB I	L	T	P	S	CREDIT	YEAR OF INTRODUCTION
		0	0	3	3	2	2024

Preamble

The electronic circuits lab aims to equip the students with the basics of implementation of electronic circuits. It covers the design and implementation of wave shaping circuits and transistor-based circuits. This course builds a solid foundation that empowers to analyze and comprehend the application of electronic circuits.

Prerequisite

Electronic Circuits I

Course Outcomes

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

CO 1	Identify and test various electronic components and fabricate single-sided PCB. (Cognitive Knowledge Level: Understand)
CO 2	Design and test differentiator, integrator, clipping, clamping, and rectifier circuits. (Cognitive Knowledge Level: Apply)
CO 3	Design and set up voltage regulator, transistor-based amplifier, oscillator, and multivibrator circuits. (Cognitive Knowledge Level: Apply)
CO 4	Design and simulate simple circuits using PSpice with OrCAD Capture. (Cognitive Knowledge Level: Apply)
CO 5	Develop team management skills and prepare laboratory reports that logically and scientifically communicate experimental information. (Cognitive Knowledge Level: Apply)

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	3	2		1	1	1	3	1	2	2
CO 2	3	2	3	2		1	1	1	3	1	2	2
CO 3	3	3	3	2		1	1	1	3	1	2	2
CO 4	3	3	3	2	3	1	1	1	3	1	2	2
CO 5	3	1	1	2		3	2	3	3	3	3	3

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
150	50	100	3 hours

Continuous Internal Evaluation Pattern

Attendance	10 marks
Class Work/ Assessment Viva-Voce	20 marks
Viva-Voce/ Test	20 marks

End Semester Examination (ESE) Pattern

The following guidelines should be followed regarding the award of marks

1. Preliminary work : 25 Marks
   (a) Circuit Diagram: 15 Marks
   (b) Theory and Procedure: 10 Marks
2. Implementing the work/Conducting the experiment : 30 Marks (usage of equipment and troubleshooting)
3. Result and Inference : 15 Marks
4. Viva Voce : 25 Marks
5. Record : 5 Marks

SYLLABUS

LIST OF EXPERIMENTS

1	a) Familiarization/Identification of electronic components, testing instruments, and commonly used tools. b) Study Functionality, type, size, color coding, package, symbol, cost [Active, Passive components], Multimeter, Function generator, Power supply, and DSO.
2	a) Study the types of Printed circuit boards (PCB) (single-sided double-sided, PTH), Processing methods. b) Design and fabricate a single-sided PCB for a simple circuit with manual etching (Ferric chloride) and drilling.
3	a) Design and realize the integrator and differentiator circuits. b) Design and set up different types of clipping and clamping circuits.
4	a) Design and test half wave rectifier circuit with and without filter and plot the regulation characteristics. b) Design and test full wave rectifier circuit (center tapped and bridge circuit) with and without filter delivering 200 mA at 9V dc and plot the regulation characteristics.
5	a) Design and set up a transistor series regulated power supply and plot the regulation characteristics. b) Design and set up transistor sweep generator.
6	Design and set up an RC-coupled amplifier using BJT in CE configuration. Plot the frequency response characteristics and measure the gain and bandwidth.

7	a) Design and set up an RC phase shift oscillator for a frequency of 1 kHz. b) Design and set up an LC Oscillator and determine the inductance value used.
8	Design and set up an Astable Multivibrator for a frequency of 1 kHz.
9	Design and set up a Monostable Multivibrator for a frequency of 1kHz.
10	Study PSpice Software and simulate simple circuits using PSpice with OrCAD Capture.

Reference Books

1. Chinmoy Saha, Arindham Halder and Debarati Ganguly, *Basic Electronics - Principles and Applications*, Cambridge University Press, 1st ed., 2018.
2. Michael Dsouza and Dsouza Michael, *PCB Design: Printed Circuit Board*, Kindle Edition, 1st ed., 2017.
3. Bell D. A., *Electronic Devices and Circuits*, Prentice Hall of India, 11th ed., 2015.
4. Malvino A. and D. J. Bates, *Electronic Principles*, Tata McGraw Hill, 7th ed., 2017.
5. Boylestad R. L. and L. Nashelsky, *Electronic Devices and Circuit Theory*, Pearson Education India, 11th ed., 2015.
6. Floyd T.L., *Fundamentals of Analog Circuits*, Pearson Education, 2nd ed., 2012.
7. Anant Agarwal, Jeffrey Lang, *Foundations of Analog Electronic Circuits*, Morgan Kaufmann Publishers, 1st ed., 2005.

B24PH1L01A & B24CY1L01A	ENGINEERING PHYSICS LAB (A) AND ENGINEERING CHEMISTRY LAB (A)	L	T	P	S	CREDIT	YEAR OF INTRODUCTION
		0	0	2	2	1	2024

PART I

ENGINEERING PHYSICS LAB (A)

Preamble

This course is designed to complement and enhance the students' understanding of fundamental principles in physics through hands-on experimentation and practical application. The primary aim of this laboratory course is to provide students with an experience that bridges the gap between theoretical concepts and real-world challenges. By actively engaging in experiments, students will develop crucial skills in observation, measurement, analysis, problem-solving and team work. These skills are essential in preparing students to tackle complex engineering problems in their future career.

Prerequisite

Nil

Course Outcomes

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

CO 1	Develop analytical / experimental skills and impart prerequisite hands-on experience for engineering laboratories. (Cognitive Knowledge Level: Apply)
CO 2	Understand the need for precise measurement practices for data recording. (Cognitive Knowledge Level: Apply)
CO 3	Understand the principle, concept, working and applications of relevant technologies and compare results with theoretical calculations. (Cognitive Knowledge Level: Apply)
CO 4	Develop technical skills associated with the usage of modern scientific tools. (Cognitive Knowledge Level: Apply)
CO 5	Develop basic communication skills through working in groups in performing the laboratory experiments and interpreting the results. (Cognitive Knowledge Level: Apply)

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	1			1			1	2			1
CO 2	3	1			1			1	2	1		1
CO 3	3	1			1			1	2	1		1
CO 4	3	1			2			1	3			1
CO 5	3	1			1			3	3			1

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
50	35	15	30 minutes

Continuous Internal Evaluation Pattern

Attendance	10 marks
Class Work/ Assessment Viva-Voce	25 marks
End semester examination (Internally by the college)/ Test	15 marks

End Semester Examination Pattern

The college will internally conduct an end semester examination in the form of a 30 minutes written objective examination.

SYLLABUS

LIST OF EXPERIMENTS

1	WDSO-Measurement of frequency and amplitude of wave forms.
2	Optic Fiber -Measurement of Splice Loss.
3	Junction Diode - Measurement of E_R.
4	Photoelectric cell - Calculation of Planck's constant.
5	Optic Fiber - Measurement of Numerical Aperture.
6	I-V characteristics of solar cells.
7	Optic Fiber - Measurement of Bending Loss.
8	LED Characteristics.

Reference Books

1. S.L. Gupta and Dr. V. Kumar, *Practical Physics with viva voice*, Pragati Prakashan Publishers, Revised Edition, 2009.
2. M.N. Avadhanulu, A.A. Dani and Pokely P.M, *Experiments in Engineering Physics*, S.Chand & Co, 2008.
3. S. K. Gupta, *Engineering Physics Practicals*, Krishna Prakashan Pvt. Ltd., 2014 .
4. P. R. Sasikumar, "Practical Physics", PHI Ltd., 2011.
5. D.R Mehta, *Laboratory Manual Physics*, D.K Publishing House.

PART II

ENGINEERING CHEMISTRY LAB (A)

Preamble

The aim of this course is to develop a scientific approach and to bridge the gap between theoretical chemistry and the applications of chemistry in the field of engineering. This course is designed to familiarize the students with experimental skills through hands-on training, and the students will demonstrate an understanding of the practical applications of these skills while carrying out the research projects in their respective branch of engineering.

Prerequisite

Nil

Course Outcomes

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

CO 1	Understand and practice fundamental techniques in chemistry to generate experimental skills. (Cognitive Knowledge Level: Apply)
CO 2	Learn to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments. (Cognitive Knowledge Level: Apply)
CO 3	Acquire the ability to understand different methods of chemical synthesis and instrumental techniques to solve various engineering problems. (Cognitive Knowledge Level: Apply)
CO 4	Function as a team member, communicate effectively and engage in further learning while carrying out the experiment. (Cognitive Knowledge Level: Apply)
CO 5	Understand the importance of chemistry in the curriculum and how it addresses the social, economical and environmental problems. (Cognitive Knowledge Level: Apply)

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2		1	1	1							2
CO 2	2	2	2	2	1							2
CO 3	2	2	2	1	2							2
CO 4	2								3	3	2	3
CO 5	2	1				2	3					3

Mark Distribution

Total Marks	CIE Marks	ESE Marks	ESE Duration
50	35	15	30 minutes

Continuous Internal Evaluation Pattern

Attendance	10 marks
Class Work/ Assessment Viva-Voce	25 marks
End semester examination (Internally by the college)/ Test	15 marks

End Semester Examination Pattern

The college will internally conduct an end semester examination in the form of a 30 minutes written objective examination.

SYLLABUS

LIST OF EXPERIMENTS
(MINIMUM FOUR EXPERIMENTS ARE MANDATORY)

1	Determination of molar absorptivity of a compound.
2	Potentiometric redox titration.
3	Verification of Nernst equation using Daniel cell.
4	Determination of wavelength of absorption maximum and colorimetric estimation of Fe^{3+} ions in the solution.
5	Electroplating with copper.
6	Synthesis of iron oxide nanoparticles.
7	Estimation of sodium ions by flame photometry.
8	Synthesis of conducting polyaniline from aniline.

Reference Books

1. G. Svehla, B. Sivasankar, *Vogel's Qualitative Inorganic Analysis*, Pearson, 2012.
2. R. K. Mohapatra, *Engineering Chemistry with Laboratory Experiments*, PHI Learning, 2017.
3. Muhammed Arif, *Engineering Chemistry Lab Manual*, Owl publishers, 2019.
4. Roy K. Varghese, *Engineering Chemistry Laboratory Manual*, Crown plus Publishers, 2019.
5. Soney C. George, and Rino Laly Jose, *Lab Manual of Engineering Chemistry*, S. Chand & Company Pvt Ltd., New Delhi, 2019.
6. S. M. Ashraf, *A Laboratory Manual of Polymers"*, I. K. International Publishing House Pvt. Ltd., 2008
7. Ulrich Schubert, Nicola Hüsing, *Material Synthesis: A Practical Guide*, Springer Vienna, 2008.
8. Anu Tresa Sunny, Prajitha Velayudhan, and Sabu Thomas, *Colloidal metal Oxide Nanoparticles: Synthesis, Characterization and Applications*, Elsevier Science, 2019.

B24MC1T03	PROFESSIONAL COMMUNICATION AND ETHICS	L	T	P	S	CREDIT	YEAR OF INTRODUCTION
		2	0	1	3	P/F	2024

Preamble

This course aims to provide the students with the vital skills needed to excel in listening, reading, writing, and speaking. Whether conveying technical ideas or non-technical information, mastering these communication elements is crucial for aspiring professionals. The goal is to equip students with the ability to comprehend and successfully articulate ideas while also honing their persuasive communication skills. The course also aims to create in students awareness on ethics and human values.

Prerequisite

Nil

Course Outcomes

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

CO 1	Expand vocabulary and linguistic proficiency pertinent to the field of engineering (Cognitive Knowledge Level: Apply)
CO 2	Examine, comprehend, and succinctly describe a range of textual material. (Cognitive Knowledge Level: Apply)
CO 3	Produce clear, technically sound documents and presentations that follow all required conventions. (Cognitive Knowledge Level: Apply)
CO 4	Manifest acute ethical awareness and effectively apply ethical principles in practical engineering scenarios. (Cognitive Knowledge Level: Apply)
CO 5	Analyze and address global ethical issues, showcasing an understanding of their roles as ethical leaders and contributors to technological development. (Cognitive Knowledge Level: Apply)

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1						2	1	2	3	1	2	
CO 2						3	1	3	3	2	2	
CO 3						3	1	3	3	3	3	
CO 4	3	3	2	2	2	2	2	3	2	2	2	2
CO 5	2	2	2	2	2	2	2	3	2	2	2	3

Assessment Pattern

Bloom's Category	Continuous Assessment	End Semester Examination (% Marks)
	Test (% Marks)	
Remember	30	30
Understand	40	40
Apply	30	30
Analyse		
Evaluate		
Create		

Mark Distribution

Total Marks	CIE Marks	ESE Marks
100	50	50

Continuous Internal Evaluation Pattern

Attendance	10 marks
Regular Assessment	15 marks
Series Test (one test, conducted for 50 marks and reduced to 25)	25 marks

Regular assessment

Project report presentation and technical presentation through PPT	4 marks
Listening test	2 marks
Group discussion/mock job interview	4 marks
Resume submission	2 marks
Assignment/Case study	3 marks

End Semester Examination Pattern

Total Marks: 50, Time: 2 hours. There will be two parts; Part A and Part B. Part A contain 4 questions carrying 5 marks each. Part B contains one question from each module in two sets of which students should answer one from each set. Each question can have a maximum of 2 sub-divisions and carry 15 marks each.

SYLLABUS

MODULE 1 (9 hours)

Communication Process

Modes, Verbal and Non-Verbal Communication, Verbal Aptitude- Misspelled Words, synonyms, paraphrasing, sentence completion using appropriate words, subject-verb agreement, Reading-Strategies for Effective Reading, types, Listening-Active and Passive Listening, Barriers, Taking notes while listening Activity- Worksheets, Exercises, Synthesizing and deriving conclusions from technical articles videos, and podcasts

MODULE 2 (9 hours)

Professional Discipline

Public Speaking- Technical Talks- Formal and Informal Letters- Emails- Resume Preparation, Video Profile- GD Vs Debate-Dynamics of Professional Presentation (Individual and Group)- Format of Report, Proposal and Minutes.
Activity- Public Speaking, Podcast preparation, Resume preparation, Video profile creation, Company profiling, Group discussion, Technical Proposal, Structured Flow Analysis using AI.

MODULE 3 (9 hours)

Fundamentals of Ethical Engineering

Introduction to Human Values - Morals, Ethics, and Integrity - Academic and Work Ethics - Service Learning and Civic Virtue - Respect, Peaceful Living, Caring, and Sharing - Values of Honesty, Courage, Cooperation, Commitment, Empathy, and Self-Confidence - Senses of Engineering Ethics - Moral Autonomy and Ethical Theories - Moral Issues and Dilemmas in Engineering.

MODULE 4 (9 hours)

Professional Responsibility in a Global Context

Engineering as Social Experimentation - Responsible Experimentation and Codes of Ethics - Customs, Religion, and their Role in Engineering Ethics - Collegiality, Loyalty, and Conflict Management - Confidentiality, Conflicts of Interest, and Occupational Crime - Rights and Responsibilities in Engineering - Global Ethical Issues: Multinational Corporations, Environmental Ethics, Business Ethics, and Computer Ethics - Engineers as Leaders, Expert Witnesses, and Contributors to Technological Development.

Text Books

1. Ashraf Rizvi, *Effective Technical Communication*, McGraw Hill Education, 2nd ed., 2017.

2. Meenakshi Raman and Sangeetha Sharma, *Technical Communication: Principles and Practice*, Oxford University Press, 2nd ed., 2011.

3. M. Govindarajan, S. Natarajan and V. S. Senthil Kumar, *Engineering Ethics*, Prentice-Hall of India, 2012.

4. R S Naagarazan, *A textbook on professional ethics and human values*, New Age International, 2006.

Reference Books

1. *English for Engineers and Technologists*, (Combined edition, Vol.1 and 2), Orient Blackswan, 2010.

2. Stephen P. Robbins and Phillip L.Hunsaker, *Training in Interpersonal Skills: Tips for Managing People at Work*, Pearson Education, India, 6th ed., 2015.

3. Mike W Martin and Roland Schinzinger, *Ethics in Engineering*, Tata McGraw Hill, 4th ed., 2014.

4. Charles D Fleddermann, *Engineering Ethics*, Pearson Education/ Prentice Hall of India, 2004.

5. Charles E Harris, Michael S Protchard and Michael J Rabins, *Engineering Ethics-Concepts and Cases*, Wadsworth Thompson Learning, United states, 2005.

COURSE CONTENTS AND LECTURE SCHEDULE

No.	Topic	No of Lecture/Tutorial Hours
	Total Hours	36 Hours
	Module 1: Communication Process	**9**
1.1	Modes, Verbal and Non-Verbal Communication	1
1.2	Verbal Aptitude- Misspelled Words, synonyms, paraphrasing	1
1.3	Sentence completion using appropriate words, subject verb agreement	1
1.4	Reading-Strategies for Effective Reading, types	1

1.5	Listening-Active and Passive Listening, Barriers, Taking notes while listening	1
1.6	Activity- Public Speaking, Podcast preparation, Resume preparation, Video profile creation, Company profiling, Group discussion, Technical Proposal	4
	Module 2: Professional Discipline	**9**
2.1	Public Speaking- Technical Talks- Formal and Informal Letters	1
2.2	Emails- Resume Preparation, Video Profile, GD Vs Debate	1
2.3	Dynamics of Professional Presentation (Individual and Group)	1
2.4	Format of Report, Proposal and Minutes	1
2.3	Activity- Public Speaking, Podcast preparation, Resume preparation, Video profile creation, Company profiling, Group discussion, Technical Proposal	5
	Module 3: Fundamentals of Ethical Engineering	**9**
3.1	Introduction to Human Values - Morals, Ethics, and Integrity	1
3.2	Academic and Work Ethics - Service Learning and Civic Virtue - Respect, Peaceful Living, Caring, and Sharing	2
3.3	Values of Honesty, Courage, Cooperation, Commitment, Empathy, and Self-Confidence	2
3.4	Senses of Engineering Ethics - Moral Autonomy and Ethical Theories	2
3.5	Moral Issues and Dilemmas in Engineering	2
	Module 4: Professional Responsibility in a Global Context	**9**
4.1	Engineering as Social Experimentation - Responsible Experimentation and Codes of Ethics	1
4.2	HCustoms, Religion, and their Role in Engineering Ethics - Collegiality, Loyalty, and Conflict Management	2
4.3	Confidentiality, Conflicts of Interest, and Occupational Crime	1
4.4	Rights and Responsibilities in Engineering - Global Ethical Issues	1
4.5	Multinational Corporations, Environmental Ethics, Business Ethics, and Computer Ethics	2
4.6	Multinational Corporations, Environmental Engineers as Leaders, Expert Witnesses, and Contributors to Technological Development	2

CO ASSESSMENT QUESTIONS

Course Outcome 1 (CO 1)

1. Analyze how different modes of communication impact the overall message.
2. Identify and use appropriate verbal communication skills in various contexts.
3. Identify different types of reading and apply suitable strategies accordingly.
4. Recognize and overcome barriers to effective listening.

Course Outcome 2 (CO 2)

1. Demonstrate confidence and competence in public speaking.
2. Compose well-structured written communications.
3. Participate effectively in group discussions and debates, showcasing critical thinking and communication skills.

Course Outcome 3 (CO 3)

1. Understand the format and structure of professional reports and proposals.
2. Summarize and organize information effectively in meeting minutes.
3. Adapt presentation style based on the context and audience.

Course Outcome 4 (CO 4)

1. Explain the role of professional ethics in technological development.
2. Explain the need for environmental ethics in engineering projects.
3. How civic virtue and integrity contribute to application of ethical principles?

Course Outcome 5 (CO 5)

1. Explain how ethical issues in the workplace affect the development of a company.
2. Show how occupational crimes are resolved by keeping the rights of employees.
3. Explain the necessity of code of conduct for digital ethics.

MODEL QUESTION PAPER

QP CODE: **Pages: 2**

Reg.No.: .....

Name: .....

MAR ATHANASIUS COLLEGE OF ENGINEERING (AUTONOMOUS), KOTHAMANGALAM

SECOND SEMESTER B.TECH DEGREE EXAMINATION, JUNE 2025

Course Code: B24MC1T03

Course Name: PROFESSIONAL COMMUNICATION AND ETHICS

Max. Marks: 50 Duration:2 hours

PART A

Answer all questions. Each question carries 5 marks.

1. Find out which pair of words 'can be filled-up in the blanks in the sentence in the same sequence to make the sentence grammatically correct and meaningfully complete.
   (a) He was ..... not to ..... done the exercise himself.
   a) expected, be b) required, being c) needed, get d) supposed, have.
   (b) A committee has been……to……the transformation of the city into an international finance center.
   a) Constituted, convert b) appointed, oversee c) inducted, change d) converged, evaluate.
2. Highlight the differences between a group discussion (GD) and a debate.
3. Briefly explain morals, values, and ethics.
4. Provide an explanation on conflicts of interest with an example.

PART B

Answer any one question from each set. Each question carries 15 marks.

5. (a) "In today's world, being a good listener is more important than being a good Speaker." Enumerate. (7 marks)

(b) Help your friend by suggesting and explaining methods to improve his/her reading skills.

(8 marks)

OR

6. (a) Compare and contrast the formats of a proposal and a report. (7 marks)

   (b) Discuss the challenges and benefits of delivering a presentation in a group setting. (8 marks)

7. (a) Exemplify a comprehensive review of integrity and respect for others. (8 marks)

   (b) Explain how caring and sharing differ or exhibit similarities. (7 marks)

OR

8. (a) Explain in detail about professional rights and employee rights. (8 marks)

   (b) Explain the necessity of code of conduct for digital ethics. (7 marks)

B24MC1L02	IDEA LAB	L	T	P	S	CREDIT	YEAR OF INTRODUCTION
		0	0	3	3	P/F	2024

Preamble

This course enables the students to understand the concepts of design, development and documentation tools under various domains in engineering. The various topics covered in this course are concepts of 2D and 3D design, cutting, routing, engraving, milling, slicing, printing and fabrication. Students will be exposed to PCB design and populating. They will learn Microcontroller programming, embedded system design and technical documentation. This course helps students to analyse real-life problems and find solutions using multidisciplinary engineering.

Prerequisite

Nil

Course Outcomes

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

CO 1	Create 2D and 3D models using appropriate tools. (Cognitive Knowledge Level: Analyse)
CO 2	Design and fabricate circuits using PCB Design and fabrication mechanisms. (Cognitive Knowledge Level: Analyse)
CO 3	Develop project using appropriate Microcontroller Programming. (Cognitive Knowledge Level: Apply)
CO 4	Build a product for some applications using design and fabrication technologies. (Cognitive Knowledge Level: Create)
CO 5	Create electronic documentation for the system/project using appropriate tools. (Cognitive Knowledge Level: Apply)

Mapping of Course Outcomes with Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	2	1	3		2				1	1		
CO 2	1		1		1						1	1
CO 3	2	2	2	2	2	1	1	1	2	2	2	2
CO 4	1	2	3	2	3	2	3	3	3	3	3	3
CO 5						1				3		

Mark Distribution

Total Marks	CIE Marks	ESE Marks (Internal) Micro Project
100	50	50

Continuous Internal Evaluation Pattern

Attendance	10 marks
Class Work/ Assessment	30 marks
Viva-Voce/ Test	10 marks

End Semester Evaluation Pattern

Micro project Demonstration	20 marks
Micro Project Presentation	20 marks
Micro Project Report	10 marks

Note: The microproject has to be completed by the students as a group of a maximum of four students.

SYLLABUS

LIST OF EXPERIMENTS

Complete at least six experiments and one micro project from the given list.

1	Prepare a 2D and 3D model using any standard tool.
2	Use the 2D model to engrave and cut the acrylic sheet using laser cutter. Assemble the laser-cut parts to fabricate the final model.
3	Use the 2D model for the fabrication of a model by using CNC milling.
4	Use a 3D model to engrave the pattern using CNC milling on the acrylic/wood/-plastic block.
5	Use the 3D design for the fabrication of a model by using a 3D printer. Use a slicing software and generate the corresponding G-codes.
6	Write a program to read the input port pins of a micro controller and write the same to the output pins. Use a development board.
7	Write a program to read a sensor (temperature) and display it.

8	Write a program in Arduino IDE for Arduino development board to design a temperature controller. Control the speed of a fan based on the room temperature. Display the temperature on an LCD display.
9	Design a system to display the data send from the embedded system on a GUI in another Embedded system or PC. (Wired – UART, I2C, SPI. Wireless – Bluetooth, Wifi)
10	Complete a Microproject. Prepare a technical report using latex for the temperature controller system in the standard template of the university.

Reference Books

1. Veeranna D.K. *Workshop/Manufacturing Practices(with Lab Manual)|AICTE Prescribed Textbook (English)*, Khanna Book Publishing.
2. Dr. SabrieSoloman, *3D Printing and Design*, Khanna Book, ISBN: 978-9386173768.
3. Chris Hackett, *The Big Book of Maker Skills: Tools and Techniques for Building Great Tech Projects*, Weldon Owen, 2018, ISBN-13: 978-1681884325.
4. Sean Michael Ragan, *The Total Inventors Manual (Popular Science): Transform Your Idea into a Top Selling Product*, Weldon Owen, 2017, ISBN-13:978-1681881584.
5. Charles Platt, *Make: Tools: How They Work and How to Use Them*, Shroff/Maker Media, 2018, ISBN-13: 978- 352137374.
6. Paul Horowitz and Winfield Hill, *The Art of Electronics*, Cambridge University Press, 3rd ed., ISBN: 9780521809269.
7. Paul Sherz and Simon Monk, *Practical Electronics for Inventors* McGraw Hill, 4th ed., ISBN-13: 978-1259587542.
8. Charles Platt, *Encyclopedia of Electronic Components* (Volume 1, 2 and 3), Shroff Publishers. ISBN-13: 978-9352131945, 978-9352131952, 9789352133703.
9. John H. Moore, Christopher C. Davis, Michael A. Coplan and Sandra C. Greer, *Building Scientific Apparatus*, Cambridge University Press, 4th ed., ISBN-13: 978-0521878586.
10. Simon Monk, *Programming Arduino: Getting Started with Sketches*, McGraw Hill, 2nd ed., ISBN-13: 978-1259641633.
11. Simon Monk and Duncan Amos, *Make Your Own PCBs with EAGLE: From Schematic Designs to Finished Boards*, McGraw Hill Education, ISBN-13: 978-1260019193.
12. Scott Chacon and Ben Straub, *Pro GIT*, 2nd ed., Apress, 2014, ISBN-13: 9781484200773.
13. Venuvinod, P. K. and Ma W., *Rapid Prototyping – Laser Based and Other Technologies*, Kluwer.
14. Ian Gibson, David W. Rosen, and Brent Stucker, *Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing*, Springer, 2010.
15. Chapman W. A. J, *Workshop Technology*, Volume I, II, III, CBS Publishers and Distributors, 5th ed., 2002.