MAR ATHANASIUS COLLEGE OF ENGINEERING
KOTHAMANGALAM, KERALA, 686 666

(Government Aided Autonomous Institution)

B.TECH ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

2024 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 & PROGRAMMING TECHNIQUES	2-1-0-2	3	3
C	B24PH1T01A	ENGINEERING PHYSICS (A)	2-1-0-2	3	3
D	B24CY1T01A	ENGINEERING CHEMISTRY (A)	2-1-0-2	3	3
E	B24ES1T02	BASICS OF ELECTRICAL & ELECTRONICS ENGINEERING	2-2-0-2	4	4
F	B24ES1L02	BASIC ELECTRICAL AND ELECTRONICS WORKSHOP	0-0-2-2	2	1
G	B24ES1L01A	PROGRAMMING LAB	0-0-3-3	3	2
H	B24PH1L01A	ENGINEERING PHYSICS LABORATORY (A)	0-0-1-1	2	1
	B24CY1L01A	ENGINEERING CHEMISTRY LABORATORY (A)	0-0-1-1		
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**	**21**

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	B24ES1T03A	COMPUTER AIDED ENGINEERING GRAPHICS	2-0-2-4	4	3
C	B24CS1T01	LOGIC SYSTEM DESIGN	3-1-0-3	4	4
D	B24CS1T02	INDUSTRIAL PROGRAMMING	2-1-0-2	3	3
E	B24CS1T03	OBJECT ORIENTED PROGRAMMING	3-1-0-3	4	4
G	B24CS1L01	INDUSTRIAL PROGRAMMING LAB	0-0-3-3	3	2
H	B24CS1L02	OBJECT ORIENTED PROGRAMMING LAB	0-0-3-3	3	2
I	B24MC1T03	PROFESSIONAL COMMUNICATION & ETHICS	2-0-1-3	3	P/F
J	B24MC1L02	IDEA LAB	0-0-2-2	2	P/F
TOTAL				**30**	**22**

SEMESTER 3

SLOT	COURSE NO.	COURSES	L-T-P-S	HOURS	CREDIT
A	B24MA2T03C	DISCRETE MATHEMATICS	3-1-0-3	4	4
B	B24CS2T01	DATA STRUCTURES	3-1-0-3	4	4
C	B24CS2T02	COMPUTER ORGANIZATION AND ARCHITECTURE	3-1-0-3	4	4
D	B24CS2T03	COMPUTER NETWORKS	2-1-0-2	3	3
E	B24HU2T01	BUSINESS ECONOMICS AND FINANCIAL MANAGEMENT	3-0-0-3	3	3
G	B24CS2L03	DATA STRUCTURES LAB	0-0-3-3	3	2
H	B24CS2L04	NETWORKING 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	
TOTAL				**32**	**22**

SEMESTER 4

SLOT	COURSE NO.	COURSES	L-T-P-S	HOURS	CREDIT
A	B24MA2T04C	GRAPH THEORY	3-1-0-3	4	4
B	B24CS2T04	OPERATING SYSTEMS	3-1-0-3	4	4
C	B24CS2T05	FORMAL LANGUAGES AND AUTOMATA THEORY	3-1-0-3	4	4
D	B24CS2T06	DATABASE MANAGEMENT SYSTEMS	3-1-0-3	4	3
E	B24HU2T03	ENTREPRENEURSHIP AND SOFTWARE MANAGEMENT SYSTEMS	2-1-0-2	3	3
F	B24CD2T01	MACHINE LEARNING CONCEPTS	2-1-0-2	3	3
G	B24CS2L05	LOGIC SYSTEM DESIGN AND OPERATING SYSTEMS LAB	0-0-3-3	3	2
H	B24CS2L06	DATABASE LAB	0-0-3-3	3	2
M		MINOR	3-1-0-3	4	
N		HONORS	3-1-0-3	4	
TOTAL				**36**	**25**

SEMESTER 5

SLOT	COURSE NO.	COURSES	L-T-P-S	HOURS	CREDIT
A	B24CD3T01	DATA ANALYTICS	3-1-0-3	4	4
B	B24AM3T01	BIG DATA PROCESSING	3-1-0-3	4	4
C	B24CS3T03	COMPILER DESIGN	3-1-0-3	4	4
D	B24CS3T04	ALGORITHM ANALYSIS AND DESIGN	3-1-0-3	4	4
E	B24CS3T05	ARTIFICIAL INTELLIGENCE	2-1-0-2	3	3
F	B24CS3P1x	PROGRAMME ELECTIVE I	2-1-0-2	3	3
G	B24CD3L07	DATA ANALYTICS LAB	0-0-3-3	3	2
H	B24AM3L08	MACHINE LEARNING LAB	0-0-3-3	3	2
M		MINOR	3-1-0-3	4	
N		HONORS	3-1-0-3	4	
TOTAL				**36**	**26**

PROGRAMME ELECTIVE I

B24CS3P11	PROGRAMMING PARADIGMS (Bucket-I)
B24CS3P12	NUMBER THEORY (Bucket-II)
B24CS3P13	INTERNET OF THINGS (General-I)
B24CS3P14	DISTRIBUTED COMPUTING (General-II)

Note:- Six programme electives are offered from semester 5 onwards as per the curriculum. This curriculum envisages to offer a learner an opportunity to earn proficiency in one of two areas in Computer Science, namely Software Engineering (Bucket -I) and Security in Computing (Bucket -II). Six courses each from the above areas are included through Elective Buckets. Also learners have the option to choose general elective courses which are categorised as General-I and General-II instead of courses in buckets. Learners can choose any one of the buckets in semester 5 and they have to follow the same bucket in the subsequent semesters. Once they are out of the bucket by choosing General courses as electives, they will not be allowed to choose the subjects from any of the bucket. For example, a learner who is interested in the Software Engineering area may opt to take the elective courses -Programming Paradigms from Elective-I in S5, Object Modeling and Design from Elective-II in S6 and Software Performance and Scalability from Elective-III & Software Testing Architecture from Elective-IV in S7 and Business Analytics from Elective-V & Software Testing Platforms and Tools from Elective-VI in S8. The department may offer Elective Courses to enable students to utilize this opportunity, depending on the availability of faculty.

SEMESTER 6

SLOT	COURSE NO.	COURSES	L-T-P-S	HOURS	CREDIT
A	B24CD3T06	DATA MINING	3-1-0-3	4	4
B	B24AM3T07	CONCEPTS OF NATURAL LANGAUGE PROCESSING	3-1-0-3	4	4
C	B24AM3T08	DATA HANDLING AND VISUALIZATION	3-1-0-3	4	4
D	B24AM3T09	ROBOTICS AND INTELLIGENCE SYSTEMS	3-1-0-3	4	4
E	B24CS3P2x	PROGRAMME ELECTIVE II	2-1-0-2	3	3
F	B24CS3G1x	OPEN ELECTIVE I	2-1-0-2	3	3
G	B24AM3L09	ARTIFICIAL INTELLIGENCE LAB	0-0-3-3	3	2
H	B24CS3L10	MINI PROJECT	0-0-3-3	3	2
M		MINOR	3-1-0-3	4	
N		HONORS	3-1-0-3	4	
TOTAL				**36**	**26**

PROGRAMME ELECTIVE II

B24CS3P21	OBJECT MODELLING AND DESIGN (Bucket-I)
B24CS3P22	CRYPTOGRAPHY AND NETWORK SECURITY (Bucket-II)
B24CS3P23	LAN TECHNOLOGIES (General-I)
B24CS3P24	WEB MINING (General-II)

OPEN ELECTIVE I

B24CS3G11	INTRODUCTION TO DATASTRUCTURES
B24CS3G12	COMPUTER GRAPHICS
B24CS3G13	DIGITAL IMAGE PROCESSING

SEMESTER 7

SLOT	COURSE NO.	COURSES	L-T-P-S	HOURS	CREDIT
A	B24CD4T01	DEEP LEARNING TECHNIQUES	2-1-0-2	3	3
B	B24CS4P3x	PROGRAMME ELECTIVE III	2-1-0-2	3	3
C	B24CS4P4x	PROGRAMME ELECTIVE IV	2-1-0-2	3	3
D	B24CS4G2x	OPEN ELECTIVE II	2-1-0-2	3	3
E	B24HU4T04	DISASTER MANAGEMENT AND INDUSTRIAL SAFETY	2-1-0-2	3	3
G	B24AM4L11	NATURAL LANGAUGE PROCESSING LAB	0-0-3-3	3	2
H	B24AM4L12	PROJECT PHASE 1	0-0-6-6	6	3
J	B24AM4L13	SEMINAR	0-0-4-4	4	2
K	B24AM4T02	VIVA VOCE	0-0-0-0	-	1
M		MINOR	3-1-0-3	4	
N		HONORS	3-1-0-3	4	
TOTAL				**36**	**23**

PROGRAMME ELECTIVE III

B24CS3P31	SOFTWARE PERFORMANCE AND SCALABILITY (Bucket-I)
B24CS3P32	INFORMATION AND DATA SECURITY (Bucket-II)
B24CS3P33	HIGH PERFORMACE COMPUTING (General-I)
B24CS3P34	MODERN DATABASES (General-II)

PROGRAMME ELECTIVE IV

B24CS3P41	SOFTWARE TESTING ARCHITECTURE (Bucket-I)
B24CS3P42	CYBER FORENSICS (Bucket-II)
B24CS3P43	EMBEDDED SYSTEMS (General-I)
B24CS3P44	CLIENT SERVER COMPUTING (General-II)

OPEN ELECTIVE II

B24CS3G21	INTRODUCTION TO DATABASE
B24CS3G22	BASICS OF LAN TECHNOLOGIES
B24CS3G23	INTRODUCTION TO MOBILE COMPUTING

SEMESTER 8

SLOT	COURSE NO.	COURSES	L-T-P-S	HOURS	CREDIT
A,B,C		INTERNSHIP & MOOC COURSES(3 NUMBERS)			9
OR					
A	B24CS4P5x	PROGRAMME ELECTIVE V	2-1-0-2	3	3
B	B24CS4P6x	PROGRAMME ELECTIVE VI	2-1-0-2	3	3
C	B24CS4G3x	OPEN ELECTIVE III	2-1-0-2	3	3
AND					
H	B24AM4L14	PROJECT PHASE II	0-0-12-12	12	6
M		MINOR PROJECT*	0-0-3-3	3	
N		HONORS PROJECT*	0-0-6-6	6	
TOTAL				**30**	**15**

PROGRAMME ELECTIVE V

B24CS3P51	BUSINESS ANALYTICS (Bucket-I)
B24CS3P52	CLOUD SECURITY (Bucket-II)
B24CS3P53	BIOMETRICS (General-I)
B24CS3P54	PROGRAMMING IN R (General-II)

PROGRAMME ELECTIVE VI

B24CS3P61	SOFTWARE TESTING PLATFORMS AND TOOLS (Bucket-I)
B24CS3P62	BLOCK CHAIN TECHNOLOGIES (Bucket-II)
B24CS3P63	MOBILE COMPUTING (General-I)
B24CS3P64	SOFT COMPUTING (General-II)

OPEN ELECTIVE III

B24CS3G31	INTRODUCTION TO OPERATING SYSTEMS
B24CS3G32	BASICS OF CLIENT SERVER COMPUTING
B24CS3G33	INTRODUCTION TO DISTRIBUTED COMPUTING

PROGRAMME ELECTIVE LISTS

Elective	BUCKET–I (Software Engineering)	BUCKET–II (Security in Computing)	General-I	General-II
I	PROGRAMMING PARADIGMS	NUMBER THEORY	INTERNET OF THINGS	DISTRIBUTED COMPUTING
II	OBJECT MODELING AND DESIGN	CRYPTOGRAPHY AND NETWORK SECURITY	LAN TECHNOLOGIES	WEB MINING
III	SOFTWARE PERFORMANCE AND SCALABILTY	INFORMATION AND DATA SECURITY	HIGH PERFORMACE COMPUTING	MODERN DATABASES
IV	SOFTWARE TESTING ARCHITECTURE	CYBER FORENSICS	EMBEDDED SYSTEMS	CLIENT SERVER COMPUTING
V	BUSINESS ANALYTICS	CLOUD SECURITY	BIOMETRICS	PROGRAMMING IN R
VI	SOFTWARE TESTING PLATFROMS AND TOOLS	BLOCK CHAIN TECHNOLOGIES	MOBILE COMPUTING	SOFT COMPUTING

MINOR

SEMESTER	BUCKET - I (Programming Methodologies)	BUCKET – II (Machine Learning)	BUCKET – III (Networking)
III	PYTHON PROGRAMMING	MATHEMATICS FOR MACHINE LEARNING	DATA COMMUNICATION CONCEPTS
IV	OBJECT ORIENTED PROGRAMMING IN JAVA	INTRODUCTION TO MACHINE LEARNING	INTRODUCTION TO COMPUTER NETWORKS
V	DATABASE PROGRAMMING	CONCEPTS IN DEEP LEARNING	CLIENT SERVER SYSTEMS
VI	WEB TECHNOLOGIES	PYTHON FOR MACHINE LEARNING	WIRELESS NETWORKS AND IOT APPLICATIONS
VII	MINI PROJECT	MINI PROJECT	MINI PROJECT
VIII	MINI PROJECT	MINI PROJECT	MINI PROJECT

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

HONOURS

SEMESTER	BUCKET- I (Computer Vision)	BUCKET- II (Computational Biology)	BUCKET- III (Formal Methods)
IV	ADVANCED TOPICS IN COMPUTER GRAPHICS	COMPUTATIONAL FUNDAMENTALS FOR BIOINFORMATICS	PRINCIPLES OF PROGRAM ANALYSIS AND VERIFICATION
V	ADVANCED CONCEPTS IN COMPUTER VISION	MACHINE LEARNING IN COMPUTATIONAL BIOLOGY	PRINCIPLES OF MODEL CHECKING
VI	IMAGE AND VIDEO PROCESSING	COMPUTATIONAL HEALTH INFORMATICS	THEORY OF COMPUTABILITY AND COMPLEXITY
VII	SURVEILLANCE VIDEO ANALYTICS	COMPUTER AIDED DRUG DESIGN	LOGIC FOR COMPUTER SCIENCE
VIII	MINI PROJECT	MINI PROJECT	MINI PROJECT

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

MAR ATHANASIUS COLLEGE OF ENGINEERING

Government Aided, Autonomous Institution
Kothamangalam, Kerala, India

B.TECH ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

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.

Prerequisites: 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 (Linear Algebra)

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

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), Eigen values and eigenvectors. Diagonalization of matrices, orthogonal transformation, quadratic forms and their canonical forms.

MODULE 2 (Multivariable Calculus-Differentiation)

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

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.

MODULE 3 ((Multivariable Calculus-Integration))

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

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).

MODULE 4 (Calculus of vector functions)

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

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).

MODULE 5 (Vector integral theorems)

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

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.

Text Books

1. H. Anton, I. Biven, S. Davis, "Calculus", Wiley, 10^{th} edition, 2015.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10^{th} edition, John Wiley & Sons, 2015.

Reference Books

4. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9^{th} Edition, Pearson, Reprint,2002.
5. J. Stewart, Essential Calculus, Cengage, 2^{nd} edition, 2017.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43^{rd} Edition, 2015.
7. Peter O Neil, Advanced Engineering Mathematics, 7^{th} Edition, Thomson, 2007.
8. 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	**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	Eigen values and eigen vectors	2
1.4	Diagonalization of matrices	2
1.5	Orthogonal transformation, quadratic forms and their canonical forms.	2
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	**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	**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	**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, diagonalize 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 **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

(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

OR

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

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

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

(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

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

(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

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

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

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

(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

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

(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

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

(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

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

(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

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

(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

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

OR

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

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

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

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

OR

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

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

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

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

OR

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

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

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

        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

OR

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

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

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

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

OR

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

    (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

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

Reference Books

4. Arthur Beiser, "Concepts of Modern Physics ", Tata McGraw Hill Publications, 6^{th} Edition 2003.

5. D.K. Bhattacharya, Poonam Tandon, "Engineering Physics", Oxford University Press, 2015.

6. Md.N.Khan & S.Panigrahi "Principles of Engineering Physics 1&2", Cambridge University Press, 2016.

7. Aruldhas G., "Engineering Physics", PHI Pvt. Ltd., 2015.

8. 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.

1. (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

   (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

OR

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

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

3. (a) Derive time dependent Schrodinger equation. 10

   (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

OR

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

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

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

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

OR

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

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

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

   (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

OR

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

   (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

9. (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

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

OR

10. (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

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

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, 17^{th} edition 2015.
2. Shashi Chawla, "A Text Book of Engineering Chemistry", Dhanpat Rai and Co. (P) Limited, 2017.
3. Muhammed Arif, Annette Fernandez, 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, Rino Laly Jose, "Text Book of Engineering Chemistry", S. Chand and Company Pvt. Ltd., 2019.
7. B. L. Tembe, Kamaluddin, M. S. Krishnan, "Engineering Chemistry (NPTEL Web Book)", 2018.

Reference Books

8. T. Pradeep, "NANO: The Essentials: Understanding Nanoscience and Nanotechnology", McGraw-Hill, 2008.
9. B. Rogers, J. Adams, S. Pennathur, "Nanotechnology: Understanding Small Systems" , CRC Press, 2014.
10. Donald L. Pavia, "Introduction to Spectroscopy", Cengage Learning India Pvt. Ltd., 2015.
11. J. Goldstein, "Scanning Electron Microscopy and Microanalysis", Springer, 2012.
12. H. H. Willard, L. L. Merritt, "Instrumental Methods of Analysis", CBS Publishers, 7^{th} Edition, 2005.
13. Samuel Glasstone, "An Introduction to Electrochemistry", East-West Press Pvt. Ltd., 2006.
14. Pietro Pedeferri, "Corrosion Science and Engineering", Springer Link, 2018.
15. B. Sunden, "Hydrogen, Batteries and Fuel Cells", Elsevier Inc., 2019.
16. B. Sorensen and G. Spazzafumo, "Hydrogen and Fuel Cells - Emerging Technologies and Applications", Elsevier Ltd., 2018.
17. Raymond B. Seymour, Charles E. Carraher, "Polymer Chemistry: An Introduction", Marcel Dekker Inc; 4^{th} Revised Edition,1996.
18. J. Janata, "Principles of Chemical Sensors" Springer, New York, NY, 2009.
19. F-G. Banica, "Chemical Sensors and Biosensors: Fundamentals and Applications", John Wiley and Sons, 2012.

20. M. Schwartz, "Smart Materials", CRC Press, 2008.

21. Y. Zhao, T. Ikeda, "Smart Light-Responsive Materials", Wiley, 2009.

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

23. P. W. Atkins, "Physical Chemistry", Oxford University Press, 10^{th} edn., 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

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

OR

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

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

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

(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

OR

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

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

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

(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

OR

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

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

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

(b) What is electrolysis of water? 5

OR

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

(b) Explain the classification of supercapacitors. 6

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

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

OR

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

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

B24ES1T02	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	S	CREDIT	YEAR OF INTRODUCTION
		2	2	0	2	4	2024

Preamble

This course aims to provide fundamentals of circuit analysis, electrical components, machines, power systems, and safety practices. It also provide an overview of evolution of electronics, and introduce the working principle and examples of fundamental electronic devices and circuits.Course also aims to provide an introduction to digital electronics. Completing the course, students gain the necessary knowledge for more advanced courses and practical applications

Prerequisites

Nil

Course Outcomes

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

CO 1	Understand the essential circuit components and the fundamental circuit laws governing electrical circuits. (Cognitive Knowledge Level: Understand)
CO 2	Recall the basics of electromagnetism and the fundamentals of electrical machines and three-phase systems. (Cognitive Knowledge Level:Understand)
CO 3	Apply the basic knowledge of household wiring components and analyze electrical wiring layout for small residential buildings. (Cognitive Knowledge Level: Apply)
CO 4	identify the active and passive electronic component and their specifications (Cognitive Knowledge Level: Understand)
CO 5	Design and analyze Rectifiers and Voltage amplifiers (Cognitive Knowledge Level: Apply)
CO 6	Explain the elements of digital system abstractions such as digital representations of information, digital logic and Boolean algebra (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	1		1	1	1	1	1	1	1
CO 2	3	3	2	1		1	1	1	1	1	1	1
CO 3	3	2	2	1		1	1	1	1	1	1	1
CO 4	2	1	1									1
CO 5	2	1	1									1
CO 6	2	1	1									1

Assessment Pattern

Bloom's Category	**BASIC ELECTRICAL**			**BASIC ELECTRONICS**		
	Continuous Assessment		**End Semester Examination (% Marks)**	**Continuous Assessment**		**End Semester Examination (% Marks)**
	Test 1 (%Marks)	**Test 2 (%Marks)**		**Test 1 (%Marks)**	**Test 2 (%Marks)**	
Remember	15	15	15	15	15	30
Understand	20	20	20	25	25	50
Apply	15	15	15	10	10	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 I – Basic Electrical Engineering and Part II – Basic Electronics Engineering. Part I and PART II carries 50 marks each. For the end semester examination, part I contain 2 parts - Part A and Part B. Part A contain 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 maximum 2 subdivisions. The pattern for end semester examination for part II is same as that of part I.

SYLLABUS

MODULE 1 (7 hours)

DC Electric Circuits

Passive components - R, L, and C, Sources - current and voltage sources, Resistances in series and parallel, current and voltage division rule, Ohm's Law, Kirchoff's Laws (Numerical problems).

Alternating Current Fundamentals

Generation of single-phase voltage - frequency, time period, average value, RMS value (sine wave concept only), Form and peak factors-Phasor representation of R,L,C, RL, RC, and RLC circuits - concept of impedance, power - active, reactive, and apparent, power factor (Numerical problems).

MODULE 2 (8 hours)

DC Machines and Transformers

Faraday's laws, Lenz's law, statically and dynamically induced EMF. DC Generator- construction and working principle, types, applications. DC motor - working principle, types of DC motors, applications. Transformer (single-phase only) - Construction, types-Working principle. Construction types

Three-Phase AC Systems

Generation of three-phase voltages - phase sequence, Y-Δ connection (balanced only), relation between line and phase quantities, three-phase power, Single line diagram of a power system from generation to distribution.

MODULE 3 (8 hours)

Electrical wiring design

Electrical wiring system in domestic building - types of wiring, cables, Conduits, Switches and Outlets, switch boards, and distribution boards. Common power ratings of domestic

gadgets, Codes and standards- Salient features of NEC, NBC and IE rule, NEC Symbols used in electrical wiring layout. Electrical lay out (single line diagram) for low- class domestic installation. Electrical load calculation- connected load method (Numerical problems).

Electrical Installation in Buildings

Protection devices - MCB, MCCB, ELCB/RCCB and RCBO- Principle of Operation-Rating and Specification, fuses-working and types. Electrical hazards and safety Precautions-Earthing need of earthing, types.

MODULE 4 (8 hours)

Introduction to Electronics Components

Overview of the Evolution and Applications of Electronics. Familiarization of basic electronic components: Resistors, Capacitors, Inductors: Types, Specifications, Standard values, Color Coding.

Introduction to Semiconductor devices

Understanding PN Junction diode: Structure and Principle of Operation, V-I Characteristics, Diode Current equation (Simple problems), Special Diode: Zener Diode, Break down mechanisms, Bipolar junction Transistor: NPN and PNP Structure, Principle of operation of NPN Transistor

MODULE 5 (7 hours)

Introduction to Basic electronic circuits:

Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple Zener voltage regulator, Input and Output Characteristics of Common Emitter Configuration, Amplifier: RC Coupled Amplifier using Voltage divider bias- Frequency Response-Bandwidth

MODULE 6 (7 hours)

Introduction to Digital Electronics

Number Systems: Decimal, Binary, Octal, and Hexadecimal number systems, Number Base Conversions, Binary Arithmetic: Addition, Subtraction, Multiplication, Logic gates, Universal Gates, Truth table, Realization of NOT gate using transistor

Text Books

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering," 3^{rd} Edition, Tata McGraw Hill."Electric Circuits & Networks", Pearson Education, 2009.
2. J. B. Gupta, "Theory and Performance of Electrical Machines" 15^{th} Edition, S. K. Katarina Sons.
3. M.K. Giridharan, Electrical System Design.

4. Chinmoy Saha, Arindham Halder and Debarati Ganguly, Basic Electronics - Principles and Applications, Cambridge University Press, 2018.

5. M.S.Sukhija and T.K.Nagsarkar, Basic Electrical and Electronics Engineering, Oxford University Press, 2012.

Reference Books

1. C. L. Wadhwa, "Basic Electrical Engineering," 4^{th} Edition, New Age International Publisher

2. V. N. Mittle, "Basic Electrical Engineering," Tata McGraw Hill.

3. V. K. Mehta Rohit Mehta, "Principles of Electrical Engineering," 6^{th} Edition, S. Chand Co. PVT. LTD

4. S. K. Bhattacharya, "Basic Electrical and Electronics Engineering," 2^{nd} Edition, Pearson Education.

5. D C Kulshreshtha, "Basic Electrical Engineering," 2^{nd} Edition Tata McGraw Hill.

6. Del Toro V, "Electrical Engineering Fundamentals," 2^{nd} Edition, New Delhi Prentice Hall of India.

7. Hughes, "Electrical and Electronic Technology", 10^{th} Edition, Pearson Education.

8. R. K. Rajput, "Basic Electrical Engineering," 2^{nd} Edition, Laxmi Publications PVT. LTD

9. Anant Agarwal, Jeffrey Lang, Foundations of Analog and Digital Electronic Circuits, Morgan Kaufmann Publishers, 2005.

10. Bernard Grob, Basic Electronics, McGraw Hil

COURSE CONTENTS AND LECTURE SCHEDULE

No	Topic	No of Lecture/Tutorial Hours
	Total Hours	45 Hours
	Module 1: DC Electric Circuits & Alternating Current Fundamentals:	7
1.1	DC Electric Circuits: Passive Components - R, L, and C, sources - current and voltage sources	1
1.2	Resistances in series and parallel, current and voltage division rule (Numerical problems).	1
1.3	Ohm's Law, Kirchoff's Laws (Numerical problems).	2

1.4	Alternating Current Fundamentals: Representation of sinusoidal waveforms - frequency, time period, average value, RMS value.	1
1.5	Phasor representation of R, RL, RC, RLC circuits - concept of impedance, power - active, reactive and apparent, power factor (Numerical problems).	2
	Module 2:DC Machine and Three-Phase AC Systems:	8 .
2.1	Electromagnetic Induction: Faraday's laws, Lenz's law, statically and dynamically induced EMF	1
2.2	DC Machines: Construction and working principle - DC Generator – Types-applications.	2
2.3	DC motor - Construction and working principle- Types-applications	1
2.4	Transformers (single phase only): Working principle.	1
2.5	Three-Phase AC Systems: Generation of three-phase voltages - phase sequence.	1
2.6	Y-Δ connection (balanced only), relation between line and phase quantities, three phase power.	2
	Module 3: Electrical wiring design & Electrical Installation in Buildings:	8
3.1	Electrical wiring design: Electrical wiring system in domestic building - types of wiring, cables, Conduits, Switches and Outlets, switch boards, and distribution boards.	1
3.2	Common power ratings of domestic gadgets, Codes and standards- Salient features of NEC, NBC and IE rule, NEC Symbols used in electrical wiring layout.	1
3.3	Electrical lay out (single line diagram) for low- class domestic installation. Electrical load calculation- connected load method (Numerical problems).	2
3.4	Electrical Installation in Buildings: Protection devices - MCB, MCCB, ELCB/RCCB and RCBO- Principle of operation, fuses-working and types	2
3.5	lectrical hazards and safety precautions-Earthing & need of earthing, types, Electrical Safety & Precautions	2
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: Introduction to Semiconductor devices	8
4.1	Overview of the Evolution and Applications of Electronics.	1
4.2	Familiarization of basic electronic components: Resistors, Capacitors, Inductors: Types, Specifications, Standard values, Color Coding.	3

4.3	Understanding PN Junction diode: Structure and Principle of Operation	1
4.4	V-I Characteristics, Diode Current equation (Simple problems	1
4.5	Special Diode: Zener Diode, Break down mechanisms	1
4.6	Bipolar junction Transistor : NPN and PNP Structure, Principle of operation of NPN Transistor	1
	Module 5: Introduction to Basic electronic circuits:	7
5.1	Rectifiers and power supplies: Block diagram description of a dc power supply, Working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple Zener voltage regulator.	4
5.2	Input and Output Characteristics of Common Emitter Configuration	1
5.3	Amplifier: RC Coupled Amplifier using Voltage divider bias- Frequency response-Bandwidth .	2
	Module 6: Introduction to Digital Electronics:	7
6.1	Number Systems: Decimal ,Binary, Octal, and Hexadecimal number systems, Number Base Conversions	2
6.2	Binary Arithmetic : Addition, Subtraction, Multiplication	2
6.3	Logic gates, Universal Gates, Truth table .	2
6.4	Realization of NOT gate using transistor .	1

CO ASSESSMENT QUESTIONS

Course Outcome 1 (CO 1):

1. Solve problems based on series and parallel circuits.
2. Solve problems based on current and voltage division rules.
3. Solve problems using Kirchoff's laws.
4. Phasor representation of R, RL, RC and RLC circuits.
5. Problems on rms and average values of periodic waveforms.
6. Problems related to power and power factor.

Course Outcome 2 (CO 2):

1. Construction and working of DC generator and DC motor.
2. Different types and applications of DC generator and DC motor.

3. Working principle of single-phase transformer.
4. Problems on three-phase line phase quantities for a balanced load.

Course Outcome 3 (CO 3):

1. Electrical wiring system in domestic building.
2. Codes and standards .
3. Electrical lay out (single line diagram).
4. Electrical load calculation- connected load method (Numerical problems).
5. Protection devices and its principle of operation.
6. Electrical hazards and safety Precautions-Earthing & need of earthing, types, Electrical Safety & Precautions.

Course Outcome 4 (CO 4):

1. Explain the significance of color coding in identifying the values of resistors.
2. Describe the structure of a PN junction diode and its principle of operation
3. Describe the structure of a PN junction diode and its principle of operation

Course Outcome 5 (CO 5):

1. What is the need of voltage divider biasing in an RC coupled amplifier?
2. Analyze the importance of selection of operating point in the context of a BJT amplifier.
3. Why is it required to have a voltage amplifier in a public address system?

Course Outcome 6 (CO 6):

1. Convert 203:5210 to binary and hexadecimal.
2. Implement an AND gate using NOR gate.
3. Define logic gates and explain their fundamental role in digital electronics.

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: : B24ES1T02

Course Name:BASICS OF ELECTRICAL ENGINEERING

Max. Marks: 100 Duration: 3 hours

PART 1:BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

PART A

Answer all questions. Each question carries 4 marks.

1. State and explain Kirchhoff's laws with examples.
2. Differentiate between statically and dynamically induced emf.
3. Derive the relation between line and phase current in a 3-phase delta-connected system.
4. Distinguish between MCB and MCCB.
5. What is the need for earthing? Describe the different types of earthing.

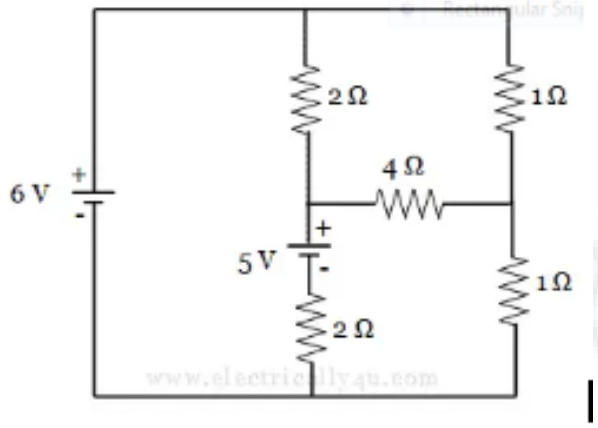
PART B

Answer any one full question . Each question carries 10 marks.

6. A resistance of 10Ω and inductance of 0.3H and a capacitance of 100 F are connected in series across 230V, 50Hz single-phase supply. Calculate the 10
   (a) Impedance of the circuits
   (b) Current through the circuits
   (c) Voltage across R, L, and C
   (d) Power consumed by the circuit.

OR

7. For the circuit shown below, determine the current flows through all the resistors using Kirchoff's law. 10



8. A 3-phase, 400V, 4 wire system has a balanced star connected load with impedance Z=15+j10 Ω each. Find the line currents and the total power consumed by the load. 10

OR

9. (a) State Faraday's laws of electromagnetic induction. 4
   (b) Explain the construction and working principle of DC motor. 6

.

10. What is the role of NEC and NBC in building design? 10

OR

11. (a) Explain the different types of wiring. 5
    (b) What are the different NEC symbols used in electrical wiring layout? 5

PART 2:BASICS OF ELECTRONICS ENGINEERING

PART A

Answer all questions. Each question carries 4 marks.

1. (a) Identify the colour code for the given resistor values.
       i. 1Ω + 5
       ii. 3.3kΩ + 1
   (b) Identify the capacitor value with unit.

2. Explain the break down mechanisms of Zener diode

3. Briefly Discuss the block diagram of a DC power supply.
4. For a NPN transistor =0.98 and I_B=100 A . Find I_E and I_C
5. Which gates are called universal gates and why?

PART B

Answer any one full question . Each question carries 10 marks.

6. (a) Explain with necessary diagrams the principle of operation of NPN transistor 5
   (b) Write the diode current equation, If the reverse saturation current of Germanium diode at room temperature is 0.4 micro ampere. Determine the current flowing through the diode when 0.2V is applied at room temperature. 5

OR

7. (a) Plot and explain the V-I characteristics of a PN junction Diode 5
   (b) Describe the color coding of a resistor with suitable example. 5
8. With necessary diagrams explain the working of a full wave bridge rectifier 10

OR

9. Describe the input and output characteristics of Common emitter configuration. 10
10. Convert the following numbers to binary 10
    (a) $EE9_{16}$
    (b) $FD654 - 1_6$
    (c) 33_{10}
    (d) 17_{10}
    (e) 1142_8

OR

11. Draw the symbol and truth table of AND, OR, NAND, NOR and XOR 10

B24ES1L02	BASIC ELECTRICAL AND ELECTRONICS WORKSHOP	L	T	P	S	CREDIT	YEAR OF INTRODUCTION
		0	0	2	2	1	2024

Preamble

The course aims to impart fundamentals of electrical wiring, safety measures, and troubleshooting to students. The course will expose student to the concepts various wiring methods and distribution systems. It also gives the basic introduction of electronic hardware systems and provides hands-on training with familiarization, identification, testing, assembling, dismantling, fabrication and repairing such systems by making use of the various tools and instruments available in the Electronics Workshop.

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. (Cognitive Knowledge Level: Apply)
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	Estimate and develop the electric circuits for wiring domestic and industrial buildings. .(Cognitive Knowledge Level – Apply)
CO 4	Demonstrate proficiency in identifying various electronic components, including active, passive, electrical, electronic, and electromechanical components (Cognitive Knowledge Level-Understand)
CO 5	Develop and illustrate electronic circuit diagrams using recognized standards such as BIS/IEEE symbols and utilize Electronic Design Automation (EDA) tools for schematic capture and simulation. (Cognitive Knowledge Level-Apply)
CO 6	Design and fabricate electronic circuits on boards, trouble shooting of minor problems in electronic equipment and handling of test and measuring equipment (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	1		3	1	1	3	3	2	3
CO 2	3	2	3	1		3	1	1	3	3	2	3
CO 3	3	3	3	3		3	1	1	3	3	3	3
CO 4	3	1	1	1					1	1		2
CO 5	3	2	2	1	2				2	1		2
CO 6	3	2	2	1	2				2	1		1

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
Viva voce / test	30 marks

End Semester Examination Pattern

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

SYLLABUS

LIST OF EXPERIMENTS
PART I

ELECTRICAL

1	(a) Familiarization with electrical symbols, measuring instruments, lighting and wiring accessories, tools, and various wiring systems. (b) Familiarization with earthing in electrical installations ,precautions against electric shock phenomenon and safety procedures .
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,RCCB and selection of fuse rating 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.

Reference Books

1. H Cotton, Advanced Electrical Technology, Reem Publications, 2011.
2. Suresh Kumar K.S, Electrical Circuit and Networks, Pearson Education, New Delhi, 2009.
3. EW. Golding, Electrical Measurements and Measuring Instruments,5^{th} ed. Reem Publications, 2011.
4. A course in electrical installation estimating and costing, J Bh Gupta, 9^{th} editon , 2012

PART II
ELECTRONICS

1	Familiarization/Identification of electronic components with specification (Functionality, type, size, colour coding, package, symbol, cost etc. [Active, Passive, Electrical, Electronic, Electro-mechanical, Wires, Cables, Connectors, Fuses, Relays, Crystals, Displays, Heat sink etc.) .
2	Drawing of electronic circuit diagrams using BIS/IEEE symbols and introduction to EDA tools (such as Dia ,XCircuit, LT SPICE).
3	Familiarization/Application of testing instruments and commonly used tools. [Multimeter, Function generator, Power supply, DSO etc.] [Soldering iron, Desoldering pump, Pliers, Cutters, Wire strippers, Screw drivers, Tweezers etc.
4	Testing of electronic components [Resistor, Capacitor, Diode, Transistor and JFET using multimeter.
5	Inter-connection methods using Bread board and soldering practice. [Soldering - types - selection of materials and safety precautions, soldering practice in connectors and general purpose PCB] .
6	Design and fabrication of a single sided PCB for a simple circuit with manual etching (Ferric chloride) and drilling.
7	Assembling of electronic circuit/system on general purpose PCB or breadboard, test and show the functioning (Any Two circuits). (a) Fixed voltage power supply with transformer, rectifier diode, capacitor filter, Zener/IC regulator. (b) Astable Multivibrator using Transistor (c) Sine wave generation using IC 741 OP-AMP in IC base. (d) RC coupled amplifier with transistor BC107. .

Reference Books

1. "Electronic Devices and Circuit Theory" by Robert L. Boylestad and Louis Nashelsky.
2. "Fundamentals of Electric Circuits" by Charles K. Alexander and Matthew N.O. Sadiku .
3. "The Soldering Handbook" by M.W. Schwartz.
4. "Electronic Devices Conventional current version", by Floyd 9^{th} Edition.

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

B24PH1L01A & B24CY1L01A	ENGINEERING PHYSICS LAB (A) & 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, 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, Sabu Thomas, "Colloidal metal Oxide Nanoparticles: Synthesis, Characterization and Applications", Elsevier Science, 2019.

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"; First Edition; Wiley Publishing Ltd, 2015.

6. Larry James, "The First Book of Life Skills"; First Edition, Embassy Books, 2016.

7. Shalini Verma, "Development of Life Skills and Professional Practice"; First Edition; Sultan Chand (G/L) Company, 2014.

8. Daniel Goleman, "Emotional Intelligence"; Bantam, 2006.

9. Remesh S., Vishnu R.G., "Life Skills for Engineers", Ridhima Publications, First Edition, 2016.

10. Butterfield Jeff, "Soft Skills for Everyone", Cengage Learning India Pvt Ltd; 1 edition, 2011.

11. Training in Interpersonal Skills: Tips for Managing People at Work, Pearson Education, India; 6 editions, 2015. Ace of Soft Skills: Attitude, Communication and Etiquette for Success, Pearson Education; 1 edition, 2013

12. Prasanna Chandra, "Fundamentals of Financial Management", McGraw Hill Education (India) Private Ltd,2020

13. Edward de Bono, "Lateral Thinking"

14. 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 Assessment Pattern

Bloom's Category	**Continuous Assessment**		**End Semester Examination (% Marks)**
	Test (%Marks)	**Case Study Presentation (Marks) (%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 Tamer M Shahin, "Engineering design process", Course Technology, 2010.
2. Clive L Dym, Patrick Little Elizabeth J Orwin, "Engineering Design-A Project based Introduction", Wiley, 2014.
3. Don Norman, "The Design of Everyday Things", Basic Books; 2nd edition, 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, 201.
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”, HarperCollins, 2019.

5. V.N.Mittle & Arvind Mittal, ”Basic Electrical Engineering ” 2^{nd} Edition, McGraw Hill, 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 Desing 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: 2**

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

OR

6. Summarize different stages of design thinking process using appropriate examples.. 8
7. Illustrate different phases of extensive prescriptive model of design process. 8

OR

8. Identifyl the customer requirements with the help of refrigerator as example, 8

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

OR

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

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

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

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 Lifestyle Physical fitness, wellness and exercise programmes, First aid and Postures 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 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 co ordinative 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 every day 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 Prof. Ajmer Singh.
2. Light on Yoga by B.K.S. Iyengar.
3. Health and Physical Education- NCERT (11th and 12th Classes)

Reference Books

4. Physiological aspects of sports training and performance by Jay Hoffman.
5. Periodization theory and methodology of training by Tudor O Bompa and G Grisgery Haff.
6. Essential of strength training and conditioning by Thomas Baechle E R, Roger W Earle.
7. 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 co ordinative 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):

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):

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 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

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 (Ordinary Differential Equations)

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

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.

MODULE 2 (Sequences and Series)

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

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.

MODULE 3 (Fourier Series)

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

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.

MODULE 4 (Fourier Transforms)

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

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).

MODULE 5 (Laplace Transforms)

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

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, Second 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.

Text Books

1. H. Anton, I. Biven, S. Davis, "Calculus", Wiley, 10^{th} edition, 2015.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 10^{th} edition, John Wiley& Sons, 2016.

Reference Books

3. J. Stewart, "Essential Calculus", Cengage,2^{nd} edition, 2017.
4. G.B. Thomas and R.L. Finney, "Calculus and Analytic geometry", 9^{th} Edition, Pearson, Reprint,2002.
5. Peter O Neil, "Advanced Engineering Mathematics", 7^{th} Edition, Thomson, 2007.
6. Louis C Barret, C Ray Wylie, "Advanced Engineering Mathematics", Tata McGraw Hill, 6^{th} edition, 2003.
7. Veerarajan T,"Engineering Mathematics for first year", Tata McGraw - Hill, 2008.
8. B.S. Grewal,"Higher Engineering Mathematics", Khanna Publishers, 43 Edition, 2015.
9. 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
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
	Total	**45 Hours**

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

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

OR

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

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

    7

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

    (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

OR

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

    (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

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

    (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

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

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

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

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

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

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

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

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

OR

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

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

B24ES1T03A	COMPUTER AIDED ENGINEERING GRAPHICS(A)	L	T	P	S	CREDIT	YEAR OF INTRODUCTION
		2	0	2	4	3	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 have 20 marks and will be from Part A. Test 2 will be from Part B and will also carry 20 marks. Regarding Assignments/Class work, 15 marks will be awarded for Part A and the remaining 25 marks should be based on class works/assignments from Part B (minimum 5 exercises).

End Semester Examination Pattern

ESE will have questions only from Part A and with a duration of 2-hours. The exam will be for 50 marks and will have to be drawn on A4 size answer booklets. The question paper shall contain two parts; Part I contains three questions, one question each from the three modules, each carrying 12 marks. Part II contains two questions (from any of the three modules) carrying 14 marks each. The 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:

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 (6 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.

MODULE 5 (8 hours)

Isometric Projection using CAD:

Isometric View and Projections of Prisms, Pyramids, Cone, Cylinder, Frustum of Pyramid, Frustum of Cone.

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.
2. John, K.C. Engineering Graphics, Prentice Hall India Publishers.
3. K.N. Anilkumar, Engineering Graphics, Adhyuth Narayan Publishers.
4. P. I. Varghese, Engineering Graphics, Tata McGraw Hill Education.

Reference Books

1. Agrawal, B. and Agrawal, C.M., Engineering Drawing, Tata McGraw Hill Publishers.
2. Duff, J.M. and Ross, W.A., Engineering Design and Visualisation, Cengage Learning.
3. Kulkarni, D.M., Rastogi, A.P. and Sarkar, A.K., Engineering Graphics with Auto-CAD, PHI.
4. Luzaddff, W.J. and Duff, J.M., Fundamentals of Engineering Drawing, PHI.

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	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	6
4.1	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 & 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 .	2
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. .	2
	Module 5: Isometric Projection using CAD	8
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	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.

Course Outcome 5 (CO 5):

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

MODEL QUESTION PAPER

QP CODE: **Pages: 1**

Reg.No.: .....

Name: .....

MAR ATHANASIUS COLLEGE OF ENGINEERING (AUTONOMOUS), KOTHAMANGALAM

SECOND SEMESTER B.TECH DEGREE EXAMINATION, JUNE 2025

Course Code: B24ES1T03A

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 end point A of a line is 20mm above HP and 10mm in front of VP. The other end of the line is 50mm above HP and 15mm behind VP. The distance between the end projectors is 70mm. 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 25mm and height 40mm, 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 30mm and height 50mm. 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 40mm and height 70mm 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 30mm and 10mm. 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.

B24CS1T01	LOGIC SYSTEM DESIGN	L	T	P	S	CREDIT	YEAR OF INTRODUCTION
		3	1	0	3	4	2024

Preamble

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

Prerequisites

Nil

Course Outcomes

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

CO 1	Simplify a given Boolean Function and design a combinational circuit to implement the simplified function using Digital Logic Gates (Cognitive Knowledge level: Apply)
CO 2	Analyze and understand various combinational digital circuits. (Cognitive Knowledge level: Apply)
CO 3	ADesign of sequential circuits with flip flops.(Cognitive Knowledge level: Apply
CO 4	Understand the design of shift registers and shifters. (Cognitive Knowledge level: Under-stand)
CO 5	Understand the algorithms of decimal, binary and BCD numbers for performing addition, subtraction, multiplication and division. (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	3	2	1	2			1			
CO 2	2	1	3	2	1	2	1				1	
CO 3	2	1	3	2	1	2						
CO 4	2	1	3	2	1	2		1		1		2
CO 5	3	1	3	2	1	2			1			

Assessment Pattern

Bloom's Category	**Continuous Assessment**		**End Semester Examination (% Marks)**
	Test 1 (%Marks)	**Test 2 (%Marks)**	
Remember	20	20	20
Understand	35	35	35
Apply	45	45	45
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)

Boolean Algebra:

Postulates of Boolean Algebra. Basic theorems and Properties of Boolean Algebra. Boolean Functions - Canonical and Standard forms. Simplification of Boolean Functions- Using Karnaugh- Map Method (up to five variables), Don't care conditions, Product of sums simplification, Tabulation Method.

MODULE 2 (8 hours)

Combinational Logic Circuits:

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

MODULE 3 (9 hours)

Sequential logic circuits:

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

MODULE 4 (9 hours)

Shift registers and Verilog:

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

Verilog:-HDL Abstraction; Modern digital design flow - Verilog constructs: data types, the module, Verilog operators. Procedural assignment, Conditional Programming constructs, Test benches, Modeling a D flip flop in Verilog.

MODULE 5 (11 hours)

Arithmetic algorithms:

Algorithms for addition, subtraction, division and multiplication of Decimal number

system. Algorithms for addition, subtraction of binary numbers in signed magnitude and 2's complement representations. Algorithms for multiplication, Array multiplier, Booth's multiplication algorithm and division (restoring method) of binary numbers. Algorithm for addition, subtraction, multiplication and division of BCD numbers.

Text Books

1. M. Morris Mano, Digital Logic Computer Design, 4/e, Pearson Education, 2013 .
2. Thomas L Floyd, Digital Fundamentals, 10/e, Pearson Education, 2009.
3. M. Morris Mano, Computer System Architecture, 3/e, Pearson Education, 2007.
4. Brock J. La Meres , Introduction to Logic Circuits Logic Design with Verilog, 2/e, Springer International Publishing, 2017
5. Michael D Ciletti, Advanced Digital Design with the Verilog HDL,2/e,Pearson,2024

Reference Books

6. M. Morris Mano, Michael D Ciletti , Digital Design With An Introduction to the Verilog HDL, 5/e, Pearson Education, 2013.
7. Donald D Givone, Digital Principles and Design, Tata McGraw Hill, 2003
8. Sarah L. Harris, David Harris, Digital Design and Computer Architecture - RISC-V, 1/e Morgan Kaufmann,2022

COURSE CONTENTS AND LECTURE SCHEDULE

No	Topic	No of Lecture/Tutorial Hours
	Total Hours	45 Hours
	Module 1:Boolean Algebra:	8
1.1	Introduction to Boolean Algebra: Postulates of Boolean Algebra.	1
1.2	Basic theorems and Properties of Boolean Algebra.	1
1.3	Boolean Functions: Canonical and Standard Forms.	1
1.4	Simplification of Boolean Functions: Karnaugh -Map Method (upto five variables), Don't care conditions .	2
1.5	Products of Sum simplification.	1
1.6	Tabulation method.	2

	Module 2:Combinational Logic Circuits :	8
2.1	Design Procedure & Implementation of Combinational Circuits.	1
2.2	Binary Adders: Implementation of Half Adder, Full Adder.	1
2.3	Binary Subtractors: Implementation of Half Subtractor,Full Subtractor.	1
2.4	Implementation of Binary Parallel Adder ,Carry look ahead Adder, Carry Save Adder, BCD Adder .	2
2.5	Implementation of Decoder, Demultiplexer.	1
2.6	Implementation of Encoder, Multiplexer.	1
2.7	Implementation of Parity Generator/Checker.	1
	Module 3:Sequential logic circuits:	8
3.1	Flip flops: SR, JK, T and D flip- flops.	1
3.2	Triggering of flip-flops, Master slave flip- flop, Edge- triggered flip-flops.	1
3.3	Excitation table and characteristic equations of flip- flops.	1
3.4	Registers- Register with parallel load.	1
3.5	Counter Design: Asynchronous counters- Binary and BCD counters- timing sequences and state diagrams.	1
3.6	Asynchronous counters- Binary and BCD counters- timing sequences and state diagrams.	1
3.7	Synchronous counters- Binary Up- down counter, BCD counter	1
3.8	Using the Delegation Model.	1
	Module 4: Shift registers and design:	9
4.1	Shift Registers - Serial In Serial Out, Serial In Parallel Out.	2
4.2	Bidirectional Shift Register with Parallel load.	1
4.3	Shift register counters - Ring Counter.	1
4.4	Johnson Counter- timing sequences and state diagrams.	1
4.5	Cerilog: HDL Abstraction, Modern digital design flow.	1
4.6	Verilog constructs: data types, the module, Verilog operators	1
4.7	Procedural assignment, Conditional Programming constructs; Test benches.	1
4.8	Modeling a D flip flop in Verilog.	1
	Module 5:Arithmetic algorithms	12
5.1	Algorithms for addition, subtraction, division and multiplication of Decimal number system.	2
5.2	Algorithms for addition, subtraction of binary numbers in signed magnitude and 2's complement representations.	2
5.3	Algorithms for multiplication, Array multiplier, Booth's multiplication algorithm and division (restoring method) of binary numbers.	2
5.4	Algorithm for addition, subtraction, multiplication and division of BCD numbers.	2
5.5	Algorithm for addition and subtraction of BCD numbers.	2

5.6	Representation of floating point numbers (IEEE Standard representations).	1
5.7	Algorithms for floating point addition and subtraction.	1

CO ASSESSMENT QUESTIONS

Course Outcome 1 (CO 1):

1. Given a Boolean function F and don't care conditions D, using Karnaugh map obtain the simplified expression in (i) SOP and (ii) POS:
   (a) F(A, B, C, D) = $A'\ B'\ D' + A'$CD + A'BC
   (b) D(A, B, C, D) = A'B C'D + ACD + A B'D

Course Outcome 2 (CO 2):

1. Design a 4X2 encoder circuit..

Course Outcome 3 (CO 3):

1. Design a BCD to Excess-3 Code Convertor.

Course Outcome 4 (CO 4):

1. Design a 4- bit binary ripple counter.
2. What are Verilog parallel case and full case statements?

Course Outcome 5 (CO 5):

1. Demonstrate multiplication algorithm for BCD numbers .

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: B24CS1T01

Course Name: LOGIC SYSTEM DESIGN

Max. Marks: 100 Duration: 3 hours

PART A

Answer all questions. Each question carries 3 marks.

1. Find the dual and complement of the boolean function F = AB' + B(A +B').
2. Using K-map, reduce the expression: A! B + A BC + A BC + BC.
3. Design a half subtractor with NAND gates only.
4. 4. Distinguish between decoder and demultiplexer.
5. Design a combinational circuit that multiplies an input decimal digit by 5 represented in BCD. The output is also in BCD. Show that the outputs can be obtained from the input lines without using any logic gates.
6. Differentiate between ripple counter and synchronous counter.
7. Construct D flip- flop using NAND gates. Also give its truth table.
8. What is Virtual and Pure virtual function in Verilog.
9. Discuss the four modes of shift registers.
10. Design a 3x 2 array multiplier?

PART B

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

11. (a) Prove that 8

    i. AB + A(B + C) + B(B + C) = B + AC

    ii. AB + A(B + C) + B(B + D) = A

    (b) Using K-map, simplify the Boolean function F in sum of products form, using the don't care conditions d:
    F(w, x, y, z) = $w'(x'y + x'\ y' + x\ yz) + x'\ z'(y + w)$
    d(w, x, y, z) = $w'x\ (y'z + y\ z') + wy$ 6

OR

12. (a) Simplify the following expressions using Karnaugh- map method. 6

    i. F = Σ(0,2,4,6,9,11,13,15,17,21,25,27,29,31)

    ii. F = Π(0,2,5,7)

    (b) Convert the following to the other canonical form: 8

    i. F(x, y, z, a) = (1,3,7)

    ii. F(x, y, z) = Π(0,3,6,7)

    iii. F(A, B, C, D) = Π(0,1,2,3,4,6,12)

13. (a) Implement Full adder circuit using NAND gate only. 6

    (b) Design a code converter for converting BCD to Excess 3 code 8

OR

14. (a) With a neat diagram explain 4-bit carry look-ahead adder. 6

    (b) Design a Gray to binary code converter using a 4x1 MUX. Draw the circuit diagram and explain 8

15. (a) Design a counter that count the states 0,3,5,6,0… using T flip- flops. 6

    (b) Write the characteristics equation, excitation table of JK, T and D flip flop. 8

OR

16. (a) Explain race around condition and how it can be avoided. 6

    (b) Design a synchronous Binary Up-Down Counter. 8

17. (a) With a neat diagram explain universal shift register. 6

    (b) What are the data types in Verilog and explain the uses of verilog. 8

OR

18. (a) Design and draw a combinational logic shifter using multiplexers with two l0 selection variables, H1 and H0. The operations of shifter should be as specified in the following table:

H0	**H1**	**Operation**	**Function**
0	0	S<–0	Transfer 0's to S
0	1	S<– ShlF	Shift left F into S
1	0	S<– ShrF	Shift right F into S
1	1	S<– F	No Shift

7

(b) Explain with the help of a block diagram the design of a 4 bit status register for an 8 bit ALU. The four status bits are C(carry),S(sign),Z(zero) and V(overflow).Clearly indicate the purpose of each status bit and how they are set or reset. 7

19. (a) Write algorithm for binary number addition and subtraction. 6

(b) Explain the restoring method in division with proper example. 8

OR

20. (a) Perform -9x 13 multiplication with booth algorithm, 7

(b) Write the algorithm for multiplication of BCD numbers. 7

B24CS1T02	INDUSTRIAL PROGRAMMING	L	T	P	S	CREDIT	YEAR OF INTRODUCTION
		2	1	0	2	3	2024

Preamble

The objective of the course is to equip the learners to develop multi-module software solutions for real-world computational problems using Python. It encompasses the Python programming environment, syntax, data representations, intermediate level features, GUI programming, Object Oriented Programming and data processing. This course lays the foundation to develop modular software solutions including complex interactive applications, network applications, and data-driven intelligent applications.

Prerequisites

Nil

Course Outcomes

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

CO 1	Write, test and debug Python programs (Cognitive Knowledge level: Apply)
CO 2	Develop programs by utilizing the Python programming constructs such as Lists, Tuples, Sets and Dictionaries. (Cognitive Knowledge level: Apply)
CO 3	Develop graphical user interface for solutions using Python libraries. (Cognitive Knowledge level: Apply)
CO 4	Implement Object Oriented programs with exception handling. (Cognitive Knowledge level: Apply)
CO 5	Write programs in Python to process data stored in files by utilizing NumPy, Matplotlib, and Pandas. (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	2	1	1	1		1				1
CO 2	2	2	2	1	1	1		1				1
CO 3	2	3	2	1	2	1		1				1
CO 4	2	2	2	1	1	1		1				1
CO 5	2	3	2	1	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	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 (5 hours)

Programming Environment and Python Basics:

Getting started with Python programming – Interactive shell, IDLE, IPython Notebooks, Detecting and correcting syntax errors, How Python works. The software development process –A case study. Basic coding skills – strings, assignment, and comments, Numeric data types and character sets, Expressions, Using inbuilt functions and modules. Control

statements – Iteration with for/while loop, Formatting text for output- A case study. Selection structure (if-else, switch case), Conditional iteration with while - A case study, Testing control statements, Lazy evaluation.

MODULE 2 (8 hours)

Building Python Programs:

Strings and text files – Accessing characters, substrings, Data encryption, Strings and number system, String methods, Text files, A case study on text analysis. Design with Functions – Functions as Abstraction Mechanisms, Problem solving with top-down design, Design with recursive functions, Managing a program's namespace, Higher-Order Functions. Lists - Basic list Operations and functions, List of lists, Slicing, Searching and sorting list, List comprehension. Work with tuples. Sets. Work with dates and times, A case study with lists. Dictionaries - Dictionary functions, dictionary literals, adding and removing keys, accessing and replacing values, traversing dictionaries, reverse lookup. Case Study – Data Structure Selection.

MODULE 3 (6 hours)

Graphics:

Terminal-based programs, Simple Graphics using Turtle, Operations, 2D Shapes, Colors and RGB Systems, A case study. Image Processing – Basic image processing with inbuilt functions. Graphical User Interfaces – Event-driven programming, Coding simple GUI-based programs : Windows, Labels, Displaying images, Input text entry, Popup dialog boxes, Command buttons, A case study.

MODULE 4 (7 hours)

Object Oriented Programming:

Design with classes - Objects and Classes, Methods, Instance variables, Constructor, Accessor and Mutator, Data-Modeling Examples, Structuring classes with inheritance and polymorphism. Abstract classes, Interfaces, Exceptions Handle a single exception, handle multiple exceptions.

MODULE 5 (9 hours)

Data Processing:

Python built-in modules - "os", "sys", NumPy - Basics, Creating arrays, Arithmetic, Slicing, Matrix Operations, Random numbers. Plotting and visualization-Matplotlib - Basic plot, Ticks, Labels, and Legends. Working with CSV files – Pandas Reading, Manipulating, and Processing Data. Introduction to Micro services using Flask.

Text Books

1. Kenneth A Lambert., Fundamentals of Python: First Programs, 2/e, Cengage Publishing, 2016
2. Wes McKinney, Python for Data Analysis, 2/e, Shroff / O'Reilly Publishers, 2017
3. Flask: Building Python web services, Jack Stouffer, Shalabh Aggarwal, Gareth Dwyer, PACKT Publishing Limited, 2018

Reference Books

4. Y. DAniel Liang,Introduction to Python Programming and Data Structures,3^rd Edition, Pearson, 2024
5. Kennedy Behrman, Foundational python for data science,Pearson,2024
6. Zed A Shaw, Learn Python 3 The Hard Way, Addison-Wesley, 2017
7. Allen B. Downey, Think Python: How to Think Like a Computer Scientist, 2/e, Shroff, 2016
8. Michael Urban and Joel Murach, Python Programming, Shroff/Murach, 2016
9. Charles Severance, Python for Informatics: Exploring Information,

COURSE CONTENTS AND LECTURE SCHEDULE

No	Topic	No of Lecture/Tutorial Hours
	Total Hours	35 Hours
	Module 1: Programming Environment and Python Basics	5
1.1	Getting started with Python programming – Interactive shell, IDLE, iPython Notebooks, Detecting and correcting syntax errors, How Python works.	1
1.2	The software development process – A case study.	1
1.3	Basic coding skills – strings, assignment, and comments, Numeric data types and character sets, Expressions, Using inbuilt functions and modules.	1
1.4	Control statements – Definite Iteration with for loop, Formatting text for output, Selection structure (if-else, switch-case), Conditional iteration with while loop, A case study	1
1.5	Testing the control statements, Lazy evaluation.	1

	Module 2: Building Python Programs	8
2.1	Strings – Accessing characters, substrings, Data encryption, Strings and number system, String methods,	1
2.2	Text files, A case study on text analysis.	1
2.3	Design with Functions – Functions as Abstraction Mechanisms, Problem solving with top-down design,	1
2.4	Design with recursive functions, Managing a program's namespace, Higher- Order Functions.	1
2.5	Lists - Basic list Operations and functions, List of lists, Slicing, Searching and sorting list, List comprehension.	1
2.6	Work with tuples. Sets. Work with dates and times, A case study with lists.	1
2.7	Dictionaries - Dictionary functions, dictionary literals, adding and removing keys, accessing and replacing values, traversing dictionaries, reverse lookup.	1
2.8	Case Study - Data Structure Selection.	1
	Module 3: Graphics	6
3.1	Graphics – Simple Graphics using Turtle, Operations, 2D Shapes, Colors and RGB Systems, A case study.	1
3.2	Image Processing – Basic image processing with inbuilt functions.	1
3.3	Graphical User Interfaces – Event-driven programming	1
3.4	Coding simple GUI-based programs: Windows, Labels, Displaying images,	1
3.5	Coding simple GUI-based programs: Input text entry, Popup dialog boxes, Command buttons	1
3.6	A case study - GUI	1
	Module 4: Object Oriented Programming	7
4.1	Design with classes: Objects and Classes, Methods, Instance Variables	1
4.2	Constructor, Accessors, and Mutators	1
4.3	Structuring classes with Inheritance	1
4.4	Polymorphism	1
4.5	Abstract classes	1
4.6	Interfaces	1
4.7	Exceptions: Handle a single exception, handle multiple exceptions	1
	Module 5: Data Processing	9
5.1	The os and sys modules, NumPy : Basics, Creating arrays, Arithmetic, Slicing	1
5.2	Matrix Operations, Random numbers.	1
5.3	Matplotlib : Basic plot, Ticks, Labels, and Legends	1
5.4	Working with CSV files	1
5.5	Pandas : Reading, Manipulating	1
5.6	Pandas : Processing Data and Visualize.	1
5.7	Introduction to Microservices using Flask	1
5.8	Introduction to Microservices using Flask	1

5.9	Introduction to Microservices using Flask	1

CO ASSESSMENT QUESTIONS

Course Outcome 1 (CO 1):

1. What is type conversion? How is it done in Python?
2. Write a note on the Python editors.
3. What is printed when the below code is executed?

```
mysum = 0
for i in range(5, 11, 2):
    mysum += i
    if mysum == 5:
        break
    mysum += 1
print(mysum)
```

What would be the output if 'break' is replaced with 'continue' in the above code fragment?

Course Outcome 2 (CO 2):

1. Given is a list of words, wordlist, and a string, name. Write a Python function which takes wordlist and name as input and returns a tuple. The first element of the output tuple is the number of words in the wordlist which have name as a substring in it. The second element of the tuple is a list showing the index at which the name occurs in each of the words of the wordlist and a 0 if it doesn't occur
2. What is the value of L after you run the code below?

```
L = ["life", "answer", 42, 0]
for thing in L:
    if thing == 0:
        L[thing] = "universe"
    elif thing == 42:
        L[1] = "everything"
```

3. Illustrate how to change a key from a dictionary

Course Outcome 3 (CO 3):

1. A bouncy program is defined as follows – The program computes and displays the total distance travelled by a ball, given three inputs—the initial height from which it is dropped, its bounciness index, and the number of bounces. Given the inputs write a GUI-based program to compute the total distance traveled.
2. Write a Python program to find the quadrant of a point, say (x,y).
3. Write a program to change a color image to black and white.

Course Outcome 4 (CO 4):

1. Write a Python program to implement the addition, subtraction, and multiplication of complex numbers using classes. Use constructors to create objects. The input to the program consist of real and imaginary parts of the complex numbers.
2. Explain inheritance in Python using suitable examples.
3. Illustrate the use of exceptions.

Course Outcome 5 (CO 5):

1. Given a file "auto.csv" of automobile data with the fields index, company, body-style, wheelbase, length, engine-type, num-of-cylinders, horsepower, average-mileage, and price, Write a python code to
   (i) Clean and Update the CSV file
   (ii) Print total cars of all companies
   (iii) Find the average mileage of all companies
   (iv) Find the highest priced car of all companies.
2. Given two matrices A and B, write a program to find the product of A and B.
3. Write a program to plot the histogram of an image.

MODEL QUESTION PAPER

QP CODE: **Pages: 4**

Reg.No.: .....

Name: .....

MAR ATHANASIUS COLLEGE OF ENGINEERING (AUTONOMOUS), KOTHAMANGALAM

SECOND SEMESTER B.TECH DEGREE EXAMINATION, JUNE 2025

Course Code: B24CS1T02

Course Name: INDUSTRIAL PROGRAMMING

Max. Marks: 100 Duration: 3 hours

PART A

Answer all questions. Each question carries 3 marks.

1. Write a Python program to reverse a number and also find the sum of digits of the number. Prompt the user for input.
2. Explain the concept of scope and lifetime of variables in Python programming language, with a suitable example.
3. Illustrate format specifiers and escape sequences with examples.
4. Compare tuples, lists, and dictionaries with examples. Describe the following dictionary methods with an example.
5. Describe the following dictionary methods with example:
   i. get( )
   ii. Keys( )
   iii. pop( )
   iv. update( )
   v. values( )
   vi. items( )
6. Differentiate the terminal-based and GUI-based programming in Python.
7. What is polymorphism? Give an example in the context of OOP in Python.

8. How is exception handling accomplished in Python programs?
9. Explain the os and os.path modules in Python with examples. Also discuss walk() and getcwd() methods of the os module.
10. What are the important characteristics of CSV file format?

PART B

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

1. (a) Write a Python code to check whether a given year is a leap year or not [A year is a leap year if it's divisible by 4 but not divisible by 100 except for those divisible by 400]. 6

   (b) What are the possible errors in a Python program. Write a Python program to print the value of $22n + n + 5$ for n provided by the user. 8

OR

2. (a) Write a Python program to find the value for $\sin(x)$ up to n terms using the series

$$\sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \cdots$$

   where x is in degrees. 6

   (b) Write a Python code to determine whether the given string is a Palindrome or not using slicing. Do not use any string function. 8

3. (a) Write a Python code to create a function called `list_of_frequency` that takes a string and prints the letters in non-increasing order of the frequency of their occurrences. Use dictionaries. 5

   (b) Write a Python program to read a list of numbers & sort the list in ascending order without using any built-in functions. A separate function should be written to sort the list where the name of the list is passed as the parameter. 9

OR

4. (a) Illustrate the following Set methods with an example. 6
   i. `intersection()`
   ii. `union()`
   iii. `issubset()`
   iv. `difference()`
   v. `update()`
   vi. `discard()`

   (b) Write a Python program to check the validity of a password given by the user. The Password should satisfy the following criteria: 8
   i. Contains at least one letter between a and z
   ii. Contains at least one number between 0 and 9

iii. Contains at least one letter between A and Z
iv. Contains at least one special character from $, #,
v. Minimum length of password: 6

5. (a) Write a program to draw a hexagon using turtle. 5
   (b) Write a note on the image processing function in Python. 9

OR

6. (a) Describe the features of event-driven programming. 4
   (b) Write a GUI-based program that allows the user to convert temperature values between degrees Fahrenheit and degrees Celsius. The interface should have labeled entry fields for these two values. These components should be arranged in a grid where the labels occupy the first row and the corresponding fields occupy the second row. At start-up, the Fahrenheit field should contain 32.0, and the Celsius field should contain 0.0. The third row in the window contains two command buttons, labeled »» and ««. When the user presses the first button, the program should use the data in the Fahrenheit field to compute the Celsius value, which should then be output to the Celsius field. The second button should perform the inverse function. 10

7. (a) How can a class be instantiated in Python? Write a Python program to express the instances as return values to define a class RECTANGLE with parameters height, width, corner_x, and corner_y and member functions to find center, area, and perimeter of an instance. 10
   (b) Explain inheritance in Python. Give examples for each type of inheritance. 4

OR

8. (a) Write a Python class named Circle constructed by a radius and two methods which will compute the area and the perimeter of a given circle. 6
   (b) Write Python program to create a class 'Complex' and implement ___add___( ) method to add two complex numbers. Display the result by overloading the + operator. 8

9. (a) Write a Python program to add two matrices and also find the transpose of the resultant matrix. 8
   (b) Given a file "auto.csv" of automobile data with the fields index, company, body-style, wheel-base, length, engine-type, num-of-cylinders, horsepower, average-mileage, and price, write Python codes using Pandas to 6
      i. Clean and Update the CSV file
      ii. Print total cars of all companies
      iii. Find the average mileage of all companies
      iv. Find the highest priced car of all companies.

OR

10. (a) Write Python program to write the data given below to a CSV file. 5

SN	**Name**	**Country**	**Contribution**	**Year**
1	Linus Tovalds	Finland	Linux Kernal	1991
2	Tim Berners Lee	England	World Wide Web	1990
3	Guido Van Rossum	Netherlands	3 Python	1991

(b) Given the sales information of a company as CSV file with the following fields month_number, facecream, facewash, toothpaste, bathingsoap, shampoo, moisturizer, total_units, total_profit. Write Python codes to visualize the data as follows:

i. Toothpaste sales data of each month and show it using a scatter plot.

ii. Face cream and face wash product sales data and show it using the bar chart. Calculate total sale data for last year for each product and show it using a Pie chart. 9

B24CS1T03	OBJECT ORIENTED PROGRAMMING	L	T	P	S	CREDIT	YEAR OF INTRODUCTION
		3	1	0	3	4	2024

Preamble

The purpose of this course is to enable learners to solve problems by breaking it down to object level while designing software and to implement it using Java. This course covers Object Oriented Principles, Object Oriented Programming in Java, Inheritance, Exception handling, Event handling, multithreaded programming, basics of networking with Java and working with window-based graphics. This course helps the learners to develop Desktop GUI Applications, Mobile applications, Enterprise Applications, Scientific Applications and Web based Applications.

Prerequisites

Nil

Course Outcomes

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

CO 1	Utilise datatypes, operators and control statements in Java programs.(Cognitive Knowledge Level: Understand)
CO 2	Write Java programs using the object oriented concepts - classes, objects, constructors, data hiding, inheritance and polymorphism. (Cognitive Knowledge Level: Apply)
CO 3	Use built in packages and interfaces, Input/ Output Streams and Files in Java to develop programs. Illustrate how robust programs can be written in Java using exception handling mechanism and Implement Java networking programs using sockets. (Cognitive Knowledge Level: Apply)
CO 4	Write application programs in Java using multithreading and database connectivity (Cognitive Knowledge Level: Apply)
CO 5	Write Graphical User Interface based application programs by utilising event handling features and Swing in Java. (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	2	3	3								2
CO 2	1	2	2	2								2
CO 3	1	2	2	1						1		1
CO 4	1	1	2	2								1
CO 5	1	2	2	1								1

Assessment Pattern

Bloom's Category	**Continuous Assessment**		**End Semester Examination (% Marks)**
	Test 1 (%Marks)	**Test 2 (%Marks)**	
Remember	30	30	30
Understand	30	30	30
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 (8 hours)

Introduction:

Approaches to Software Design - Functional Oriented Design, Object Oriented Design. Basic Object-Oriented Concepts, Object Modeling Using Unified Modeling Language (UML)- UML diagrams- Use case model, Class diagram, Interaction diagram.
Introduction to Java- Java programming Environment and Runtime Environment, Development Platforms -Standard, Enterprise. Java Virtual Machine (JVM), Java compiler, Bytecode, Java applet, Java Buzzwords, Java program structure, Garbage Collection, Lexical Issues.
Primitive Data types - Integers, Floating Point Types, Characters, Boolean. Literals, Type Conversion and Casting, Variables, Arrays, Strings, Vector class.
Operators - Arithmetic Operators, Bitwise Operators, Relational Operators, Boolean Logical Operators, Assignment Operator, Conditional (Ternary) Operator, Operator Precedence.
Control Statements - Selection Statements, Iteration Statements and Jump Statements.

MODULE 2 (10 hours)

Object Oriented Programming in Java:

Class Fundamentals, Declaring Objects, Object Reference, Introduction to Methods, Constructors, this Keyword, Method Overloading, Using Objects as Parameters, Returning Objects, Recursion, Access Control, Static Members, Final Variables, Inner Classes, Command Line Arguments, Variable Length Arguments.
Inheritance - Super Class, Sub Class, The Keyword super, protected Members, Calling Order of Constructors, Method Overriding, the Object class, Abstract Classes and Methods, using final with Inheritance
String handling: String Constructors, String Length. Special String Operations - Character Extraction, String Comparison, Searching Strings, Modifying Strings, using valueOf(), Comparison of StringBuffer and String.

MODULE 3 (12 hours)

More Features of Java:

Packages and Interfaces - Defining Package, CLASSPATH, Access Protection, Importing Packages, Interfaces.
Exception Handling - Checked Exceptions, Unchecked Exceptions, try Block and catch Clause, Multiple catch Clauses, Nested try Statements, throw, throws and finally.
Input/Output - I/O Basics, Reading Console Input, Writing Console Output, PrintWriter Class, Object Streams and Serialization, Working with Files.
Network Programming with Java – Socket Programming in Java, Client Sockets, Server Sockets, Data Transmission through sockets, TCP/IP Programming with Java, Datagram

Packet, Datagram Server and Client, A client/Server Example, Sending and receiving objects.

MODULE 4 (8 hours)

Advanced features of Java:

Collections framework - Collections overview, Collections Interfaces- Collection Interface, List Interface. Collections Class – ArrayList class. Accessing a Collection via an Iterator.
Multithreaded Programming - The Java Thread Model, The Main Thread, Creating Thread, Creating Multiple Threads, Synchronization, Suspending, Resuming and Stopping Threads.
Event handling - Event Handling Mechanisms, Delegation Event Model, Event Classes, Sources of Events, Event Listener Interfaces, Using the Delegation Model.

MODULE 5 (7 hours)

Graphical User Interface and Database Support of Java:

Swing fundamentals - Swing Key Features, Model View Controller (MVC), Swing Controls, Components and Containers, Swing Packages, Event Handling in Swing, Swing Layout Managers, Exploring Swing –JFrame, JLabel, The Swing Buttons, JTextField.
Java DataBase Connectivity (JDBC) - JDBC overview, Creating and Executing Queries – create table, delete, insert, select.

Text Books

1. Herbert Schildt, Java: The Complete Reference, 8/e, Tata McGraw Hill, 2011.
2. Paul Deitel, Harvey Deitel, Java How to Program, Early Objects 11th Edition, Pearson, 2018.
3. Y. Daniel Liang, Introduction to Java Programming and Data Structures, 12/e, Pearson, 2024.

Reference Books

1. Nageswararao R., Core Java: An Integrated Approach, Dreamtech Press, 2008
2. Flanagan D., Java in A Nutshell, 5/e, O'Reilly, 2005.
3. Barclay K., J. Savage, Object Oriented Design with UML and Java, Elsevier, 2004.
4. Sierra K., Head First Java, 2/e, O'Reilly, 2005.
5. Balagurusamy E., Programming JAVA a Primer, 5/e, McGraw Hill, 2014.

COURSE CONTENTS AND LECTURE SCHEDULE

No	Topic	No of Lecture/Tutorial Hours
	Total Hours	45 Hours
	Module 1: Introduction	8
1.1	Approaches to Software Design - Functional Oriented Design, Object Oriented Design. Basic Object-Oriented Concepts.	1
1.2	Object Modeling Using Unified Modeling Language (UML)- UML diagrams- Use case model, Class diagram, Interaction diagram.	1
1.3	Java programming Environment and Runtime Environment, Development Platforms -Standard, Enterprise. JVM, Java compiler, Bytecode.	1
1.4	Java applet, Java Buzzwords, Java program structure, Comments, Garbage Collection, Lexical Issues.	1
1.5	Primitive Data types - Integers, Floating Point Types, Characters, Boolean.	1
1.6	JLiterals, Type Conversion and Casting, Variables, Arrays, Strings, Vector class.	1
1.7	Operators - Arithmetic Operators, Bitwise Operators, Relational Operators, Boolean Logical Operators, Assignment Operator, Conditional (Ternary) Operator, Operator Precedence.	1
1.8	Control Statements - Selection Statements, Iteration Statements and Jump Statements.	1
	Module 2: Object Oriented Programming in Java	10
2.1	Class Fundamentals, Declaring Objects, Object Reference.	1
2.2	Introduction to Methods, Constructors, this Keyword, Method Overloading, Using Objects as Parameters.	1
2.3	Returning Objects, Recursion, Access Control.	1
2.4	Static Members, Final Variables, Inner Classes, Command Line Arguments, Variable Length Arguments.	1
2.5	Inheritance - Super Class, Sub Class, The Keyword super, protected Members.	1
2.6	Calling Order of Constructors, Method Overriding, the Object class.	1
2.7	Calling Order of Constructors, Method Overriding, the Object class.	1
2.8	String Handling – String Constructors, String Length.	1
2.9	String handling: Special String Operations - Character Extraction, String Comparison, Searching Strings.	1
2.10	Modifying Strings, using valueOf(), Comparison of StringBuffer and String.	1

	Module 3: More Features of Java	12
3.1	Packages and Interfaces - Defining Package, CLASSPATH, Access Protection, Importing Packages.	1
3.2	Interfaces.	1
3.3	Exception Handling - Checked Exceptions, Unchecked Exceptions, try Block and catch Clause.	1
3.4	Multiple catch Clauses, Nested try Statements. Throw, throws and finally.	1
3.5	Input/Output - I/O Basics, Reading Console Input, Writing Console Output, PrintWriter Class.	1
3.6	Object Streams and Serialization.	1
3.7	Working with Files.	1
3.8	Network Programming with Java – Socket Programming in Java, Client Sockets, Server Sockets.	1
3.9	Data Transmission through sockets, TCP/IP Programming with Java.	1
3.10	Datagram Packet, Datagram Server and Client.	1
3.11	A client/Server Example.	1
3.12	Sending and receiving objects.	1
	Module 4: Advanced features of Java	8
4.1	Collections framework - Collections overview, Collections Interfaces- Collection Interface.	1
4.2	List Interface, Collections Class – ArrayList class.	1
4.3	Accessing a Collection via an Iterator.	1
4.4	Advanced features of Java: Multithreaded Programming - The Java Thread Model, The Main Thread, Creating Thread.	1
4.5	Creating Multiple Threads, Synchronization, Suspending, Resuming and Stopping Threads.	1
4.6	Event handling - Event Handling Mechanisms, Delegation Event Model.	1
4.7	Event Classes, Sources of Events, Event Listener Interfaces.	1
4.8	Using the Delegation Model.	1
	Module 5: Graphical User Interface and Database Support of Java	7
5.1	Swing fundamentals - Swing Key Features, Model View Controller (MVC).	1
5.2	Swing Controls, Components and Containers.	1
5.3	Swing Packages, Event Handling in Swing.	1
5.4	Swing Layout Managers.	1
5.5	Exploring Swing –JFrame, JLabel, The Swing Buttons, JTextField.	1
5.6	Java DataBase Connectivity (JDBC) - JDBC overview.	1
5.7	Creating and Executing Queries – create table, delete, insert, select.(Basics only, DBMS Course is not a prerequisite)	1

CO ASSESSMENT QUESTIONS

Course Outcome 1 (CO 1):

1. How is platform independence achieved in Java?
2. Discuss the advantages and disadvantages of OOD.
3. Compare and contrast Java Applets and Java Application.

Course Outcome 2 (CO 2):

1. Write a Java program to evaluate a post fix expression containing two operands and a single operator using stack. Stack should be implemented as a separate entity so as to reflect OOP concepts.
2. Demonstrate with example, one method each, from the String class, which performs the below special string operations: Character Extraction, Searching Strings and Modifying Strings.
3. Summarize the need of constructors in Java and list the different types of constructors allowed in Java programs.

Course Outcome 3 (CO 3):

1. Write a program in java to read a paragraph from a text file and print to console.
2. Demonstrate the significance of the keywords 'try', 'catch', 'finally', 'throw' and 'throws' in exception handling of Java with appropriate examples.
3. How do you create and import a package in Java?
4. Explain accept() function in socket programming.

Course Outcome 4 (CO 4):

1. Write a program to demonstrate the start, run, sleep and join methods in Thread class.
2. Write a Java program that creates multiple child threads to print odd and even numbers from 50-100
3. Write a Java program to compare two linked lists. List 1 has the names of 5 colours and list 2 has 4 colours. Print the colours that are not present in both.

Course Outcome 5 (CO 5):

1. Write a GUI based program with separate buttons to add, delete and display student details i.e. name, student ID, current semester and branch of study based on student ID.

2. Using Swing create a JFrame with a JLablel and JButtons. Set the texts of JButtons as "Yes" and "No" respectively. Set the JLabel's text to the text of the Button currently being pressed.Initially the JLabel's text is blank.

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: B24CS1T03

Course Name: OBJECT ORIENTED PROGRAMMING

Max. Marks: 100 Duration: 3 hours

PART A

Answer all questions. Each question carries 3 marks.

1. Briefly explain the portable, secure and robust features of Java.
2. Describe the concepts of object and class with a suitable Java program.
3. Explain the concept of method overriding with an example.
4. What is the use of the keyword final in Java?
5. Explain the concept of streams.
6. Explain any two applications of Serialization.
7. List any six event listener interfaces.
8. What are Collections in Java? Explain any one Collection interface in Java.
9. Explain any two properties of Swing components in Java.
10. Explain JLabel component. With suitable examples explain any two of its constructors.

PART B

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

11. (a) Describe in detail any three Object Oriented Programming principles. Illustrate with suitable examples. 9

    (b) What is Java Runtime Environment? What is the role of Java Virtual Machine in it? 5

OR

12. (a) Explain automatic type conversion in Java with an example. What are the two conditions required for it? 6

    (b) Explain in detail the primitive data types in Java. 8

13. (a) Using a suitable Java program explain the difference between private and public members in the context of inheritance. 8

    (b) Is it possible to use the keyword super within a static method? Give justification for your answer. 6

OR

14. (a) Outline the significance of String class in Java and list any of its five built in functions. 5

    (b) Write a Java program to show the significance of method overriding in achieving run time polymorphism. Discuss the difference between method overriding and method overloading 9

15. (a) Explain in detail about byte streams and character streams with suitable code samples. 6

    (b) Describe in detail about exception handling, try block and catch clause with the help of a suitable Java program. 8

OR

16. (a) Write a program to establish socket connection between a client and server. Let the client enter two numbers to the server. The server adds the numbers and send back the sum to the client. 8

    (b) Explain throw, throws and finally constructs with the help of a Java program. 6

17. (a) Describe in detail the creation of a thread using the Runnable interface and the Thread class with suitable examples. 10

    (b) Explain List Interface. Mention any two exceptions thrown by its methods. 4

OR

18. (a) Explain in detail the Delegation Event model for event handling in Java. 7

    (b) Write a simple program by extending appropriate class to demonstrate the working of threads in java. 7

19. (a) Write a Java program to demonstrate the use of JLabel and JButton by adding them to JFrame. 7

    (b) Explain the step-by-step procedure of using Java Database Connectivity in Java programs. 7

OR

20. (a) Explain the class hierarchy of Java Swing components. 7

    (b) Write a Java Program to create a student table and to add student details to it using JDBC. 7

B24CS1L01	INDUSTRIAL PROGRAMMING LAB	L	T	P	S	CREDIT	YEAR OF INTRODUCTION
		0	0	3	3	2	2024

Preamble

The aim of the course is to equip the learners to develop multi-module software solutions for real world computational problems using Python. The students will have a hands-on experience in Python programming environment, syntax, data representations, intermediate level features, GUI programming, Object Oriented Programming and data processing. After the lab session student will be able to design, implement, test, and deploy robust and scalable Python applications for various industrial applications.

Prerequisite

Basic knowledge in Computational Problem Solving

Course Outcomes

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

CO 1	Experiment with concepts of iteration, function, string and list (Cognitive Knowledge level: Apply)
CO 2	Develop python programs which uses tuples, dictionary traversal, dictionary methods, files and operations (Cognitive Knowledge level: Apply)
CO 3	Design turtle graphics and develop graphical user interface for solutions (Cognitive Knowledge level: Apply)
CO 4	Implement Object Oriented programs with exception handling. (Cognitive Knowledge level: Apply)
CO 5	Develop programs in Python to process data stored in files by utilizing NumPy, Matplotlib, and Pandas (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	2	1	1	1		1				1
CO 2	2	2	2	1	1	1		1				1
CO 3	2	3	2	1	2	1		1				1
CO 4	2	2	2	1	1	1		1				1
CO 5	2	3	2	1	2	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	Write a program to find the largest of three numbers.
2	Write a program to print the multiplication table of a number n.
3	Write a program to replace a word by another word in a sentence.
4	Write a program to find Surface area and volume of a cylinder using function.
5	Write a program to confirm the validity of an email id by verifying its format.
6	Write a program to remove duplicates from a list.
7	Write a program to add two matrices.
8	Write a program to read a tuple of numbers and print even tuple and odd tuple.
9	Create a dictionary with a set of book title and corresponding stock. Write a program to update the stock and to add or delete books.
10	A set of numbers are stored in a file. Write a program to print the prime numbers among them.
11	Write a program to count the number of words, sentences, upper case letters, lowercase letters and special symbols in a text stored in file.

12	The Payroll Department keeps a list of employee information for each pay period in a text file. The format of each line of the file is the following: `<last name> <hourly wage> <hours worked>` Write a program that inputs a filename from the user and prints to the terminal a report of the wages paid to the employees for the given period. The report should be in tabular format with the appropriate header. Each line should contain an employee's name, the hours worked, and the wages paid for that period.
13	Write a Python program to find the value for `sin(x)` up to n terms using the series using functions $$\sin(x) = \frac{x}{1!} - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \cdots$$ where x is in degrees.
14	Write a recursive function that expects a pathname as an argument. The pathname can be either the name of a file or the name of a directory. If the pathname refers to a file, its name is displayed, followed by its contents. Otherwise, if the pathname refers to a directory, the function is applied to each name in the directory.
15	Higher order functions: a) Write the code for a mapping that generates a list of the absolute values of the numbers in a list named `numbers`. b) Write the code for a filtering that generates a list of the positive numbers in a list named `numbers`. You should use a lambda to create the auxiliary function. c) Write the code for a reducing that creates a single string from a list of strings named `words`.
16	Turtle graphics: a) Write a menu driven program to draw turtle graphics circle, triangle, square, rectangle, pentagon and hexagon. b) Write a python function to read a shape and display a radial pattern of that shape
17	GUI Programs: a) Temperature Converter: Create a GUI application that allows users to convert temperature between Celsius and Fahrenheit. b) Simple Calculator: Develop a basic calculator application with buttons for arithmetic operations (+, -, *, /) and display for input and output. c) Image Viewer: Create a simple image viewer application that allows users to browse and display images from their computer.

18	Object Oriented Programs: a) Define a student class with attributes such as name, age, and grade. Include methods to calculate the students average grade and display student details. b) Develop a menu-driven program to perform addition, subtraction, and other arithmetic operations on complex numbers. c) Create a menu-driven application for executing arithmetic operations on rational numbers. Employ an exception handling mechanism to manage potential errors. d) Design and implement a blackjack game using Python. The game should allow one player to play against the computerized dealer. The player should be able to hit, stand, double down, and split according to the standard rules of blackjack. Additionally, implement betting functionality where players can place bets before each hand. The game should display the player's hand, the dealer's visible card, and the current balance. Ensure that the game adheres to standard blackjack rules and provides an interactive and enjoyable gaming experience for the player.
19	Data Visualization Using Matplotlib: a) Develop a program to plot a simple line graph using Matplotlib, with data read from a CSV file using Pandas. b) Write a Python script to create a scatter plot of two variables from a CSV file and customize the plot by adding labels, title, and legend using Matplotlib.
20	NumPy: a) Implement a program to generate random data arrays using NumPy and save them to a text file. Then, read the data back from the file and visualize it using Matplotlib. b) Write a Python program to read data from a CSV file using NumPy and perform basic statistical analysis (mean, median, standard deviation, etc.) on the data. c) Implement Matrix multiplication
21	Pandas: a) Create a Python program to read data from an Excel file using Pandas and perform data manipulation operations like filtering, sorting, and grouping. b) Implement a program to merge data from multiple CSV files using Pandas and save the merged data to a new CSV file. Then, visualize the merged data using Matplotlib.

Reference Books

1. Kenneth A Lambert., Fundamentals of Python: First Programs, 2/e, Cengage Publishing, 2016
2. Y. DAniel Liang,Introduction to Python Programming and Data Structures,3^rd Edition, Pearson, 2024
3. Wes McKinney, Python for Data Analysis, 2/e, Shroff / O'Reilly Publishers, 2017
4. Flask: Building Python web services, Jack Stouffer, Shalabh Aggarwal, Gareth Dwyer, PACKT Publishing Limited, 2018
5. Zed A Shaw, Learn Python 3 The Hard Way, Addison-Wesley, 2017
6. Kennedy Behrman, Foundational python for data science,Pearson,2024
7. Allen B. Downey, Think Python: How to Think Like a Computer Scientist, 2/e, Schroff, 2016
8. Michael Urban and Joel Murach, Python Programming, Shroff/Murach, 2016
9. Charles Severance. Python for Informatics: Exploring Information

B24CS1L02	OBJECT ORIENTED PROGRAMMING LAB	L	T	P	S	CREDIT	YEAR OF INTRODUCTION
		0	0	3	3	2	2024

Preamble

The aim of the course is to provide hands-on experience to the learners on various object oriented concepts in Java Programming. This course helps the learners to enhance the capability to design and implement various Java applications for real world problems.

Prerequisite

Nil

Course Outcomes

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

CO 1	Implement the Object Oriented concepts - constructors, inheritance, method overloading and overriding and polymorphism in Java (Cognitive Knowledge Level: Apply)
CO 2	Implement programs in Java which use datatypes, operators, control statements, built in packages and interfaces, Input/Output streams and Files (Cognitive Knowledge Level: Apply)
CO 3	Implement robust application programs in Java using exception handling (Cognitive Knowledge Level: Apply)
CO 4	Implement application programs in Java using multithreading and database connectivity (Cognitive Knowledge Level: Apply)
CO 5	Implement Graphical User Interface based application programs by utilizing event handling features and Swing in Java (Cognitive Knowledge Level: Apply)

Mapping of Course Outcomes With Program Outcomes

Mark Distribution

Continuous Internal Evaluation Pattern

	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	2	1			1		1		2
CO 2	2	2	2	2	1			1		1		2
CO 3	2	1	2	1	1			1		1		1
CO 4	2	1	2	1	1			1		1		1
CO 5	3	1	3	1	2			1		1		1

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

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	Write a Java program to check whether a given number is prime or not.
2	Write a Java program to find the second smallest element in an array.
3	Write a Java program that checks whether a given string is a palindrome or not. Ex: MALAYALAM is a palindrome.
4	Write a Java Program to find the frequency of a given character in a string.
5	Write a Java program to multiply two given matrices.
6	Write a Java program which creates a class named 'Employee' having the following members: Name, Age, Phone number, Address, Salary. It also has a method named 'print- Salary( )' which prints the salary of the Employee. Two classes 'Officer' and 'Manager' inherits the 'Employee' class. The 'Officer' and 'Manager' classes have data members 'specialization' and 'department' respectively. Now, assign name, age, phone number, address and salary to an officer and a manager by making an object of both of these classes and print the same. (Exercise to understand inheritance)

7	Write a java program to create an abstract class named Shape that contains an empty method named numberOfSides( ). Provide three classes named Rectangle, Triangle and Hexagon such that each one of the classes extends the class Shape. Each one of the classes contains only the method numberOfSides( ) that shows the number of sides in the given geometrical structures. (Exercise to understand polymorphism).
8	Write a Java program using reader/writer class that displays the number of characters, lines and words in a text file.
9	Write a Java program that reads from a file and writes to a file by handling all file related exceptions. (Using FileInputStream and FileOutputStream classes)
10	Write a Java program that reads a line of integers, and then displays each integer, and the sum of all the integers (Use String Tokenizer class of java.util)
11	Write a Java program that shows the usage of try, catch, throws and finally.
12	Write a Java program that implements a multi-threaded program which has three threads. First thread generates a random integer every 1 second. If the value is even, second thread computes the square of the number and prints. If the value is odd the third thread will print the value of cube of the number.
13	Write a Java program that shows thread synchronization.
14	Write a Java program that works as a simple calculator. Arrange Buttons for digits and the + - * % operations properly. Add a text field to display the result. Handle any possible exceptions like divide by zero. Use Java Swing.
15	Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green. When a radio button is selected, the light is turned on, and only one light can be on at a time. No light is on when the program starts.
16	Write a Java program to display all records from a table using Java Database Connectivity (JDBC).

Reference Books

1. Herbert Schildt, Java: The Complete Reference, 8/e, Tata McGraw Hill, 2011.
2. Paul Deitel, Harvey Deitel, Java How to Program, Early Objects 11th Edition, Pearson, 2018.
3. Y. Daniel Liang, Introduction to Java Programming and Data Structures, 12/e, Pearson, 2024.
4. Nageswararao R., Core Java: An Integrated Approach, Dreamtech Press, 2008.
5. Flanagan D., Java in A Nutshell, 5/e, O'Reilly, 2005.
6. Barclay K., J. Savage, Object Oriented Design with UML and Java, Elsevier, 2004.
7. Sierra K., Head First Java, 2/e, O'Reilly, 2005.
8. Balagurusamy E., Programming JAVA a Primer, 5/e, McGraw Hill, 2014.

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", 2^{nd} Edition, McGraw Hill Education, 2017.

2. Meenakshi Raman and Sangeetha Sharma, "Technical Communication: Principles and Practice", 2^{nd} Edition, Oxford University Press, 2011

3. M Govindarajan, S Natarajan and V S Senthil Kumar, Engineering Ethics, PHI Learning Private Ltd, New Delhi,2012.

4. R S Naagarazan, A text book on professional ethics and human values, New age international (P) limited, New Delhi,2006.

Reference Books

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

6. Training in Interpersonal Skills: Tips for Managing People at Work, Pearson Education, India, 6^{th} edition, 2015.

7. Mike W Martin and Roland Schinzinger, Ethics in Engineering,4^{th} edition, Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi,2014.

8. Charles D Fleddermann, Engineering Ethics, Pearson Education/ Prentice Hall of India, New Jersey,2004.

9. 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)

(b) Help your friend by suggesting and explaining methods to improve his/her reading skills.. (8)

OR

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

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

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

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

OR

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

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

B24MC1L02	IDEA LAB	L	T	P	S	CREDIT	YEAR OF INTRODUCTION
		0	0	2	2	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 Micro controller 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. AICTE's Prescribed Textbook: Workshop / Manufacturing Practices (with Lab Manual), Khanna Book Publishing.
2. 3D Printing and Design, Dr. SabrieSoloman, ISBN: 978-9386173768, Khanna Book Publishing Company, New Delhi.
3. The Big Book of Maker Skills: Tools and Techniques for Building Great Tech Projects. Chris Hackett. Weldon Owen; 2018. ISBN-13: 978-1681884325.
4. The Total Inventors Manual (Popular Science): Transform Your Idea into a Top Selling Product. Sean Michael Ragan(Author).Weldon Owen;2017.ISBN-13:978-1681881584.
5. Make: Tools: How They Work and How to Use Them. Platt, Charles. Shroff/Maker Media. 2018. ISBN-13: 978- 352137374 .
6. The Art of Electronics. 3rd edition. Paul Horowitz and Winfield Hill. Cambridge University Press. ISBN: 9780521809269 .
7. Practical Electronics for Inventors. 4th edition. Paul Sherz and Simon Monk. McGraw Hill. ISBN-13: 978-1259587542 .
8. Encyclopedia of Electronic Components (Volume 1, 2 and 3). Charles Platt. Shroff Publishers. ISBN-13: 978-9352131945, 978-9352131952, 9789352133703.
9. Building Scientific Apparatus. 4th edition. John H. Moore, Christopher C. Davis, Michael A. Coplan and Sandra C. Greer. Cambridge University Press. ISBN-13: 978-0521878586.
10. Programming Arduino: Getting Started with Sketches. 2nd edition. Simon Monk. McGraw Hill. ISBN-13: 978-1259641633 .
11. Make Your Own PCBs with EAGLE: From Schematic Designs to Finished Boards. Simon Monk and Duncan Amos. McGraw Hill Education. ISBN-13: 978-1260019193.
12. Pro GIT. 2nd edition. Scott Chacon and Ben Straub. A press. ISBN-13: 9781484200773.
13. Venuvinod, PK., MA. W., Rapid Prototyping – Laser Based and Other Technologies, Kluwer.
14. Ian Gibson, David W Rosen, 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 Edition, 2002.