MITS Kochi
Muthoot Institute of Technology and Science (Autonomous)

B. TECH

MECHANICAL ENGINEERING

CURRICULUM & SYLLABUS

2025 REGULATION (R1)

B.Tech in MECHANICAL ENGINEERING

CURRICULUM & SYLLABUS

SEMESTER 1

2025 REGULATION

(Version R1)

CONTENTS

SEMESTER 1

CURRICULUM

SLOT	COURSE CATEGORY	COURSE CODE	COURSE NAME	L	T	J	P	S	C
A	BST	B251902/MA100A	Mathematics for Physical Science-1	3	1	0	0	2	3
B	BST	B251902/PH910B	Physics for Physical Science	3	0	0	2	3	4
C	EST	B251902/CE100C	Engineering Mechanics	2	1	0	0	3	3
D	EST	B251902/CN100D	Introduction to Mechanical Engineering and Civil Engineering	4	0	0	0	4	4
E	ESE	B251904/CN110E	Programming in Python	2	1	0	2	3	4
K	HMT	B251909/CN910K	Health & Wellness	1	1	0	0	0	1
U	ESL	B251902/CN130U	Engineering Workshop	0	0	0	2	0	1
I	Skill Enhancement Course: NASSCOM or equivalent								1
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work, C- Credit)									

COURSE DESCRIPTION							
Regulation	**2025**	**L-T-J-P-S**	**3-1-0-0-2**	**Version**	**25/1**	**Credits**	**3**
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work)							

COURSE CODE	COURSE NAME	COURSE CATEGORY
B251902/MA100A	**MATHEMATICS FOR PHYSICAL SCIENCE-1**	**BST**
PRE-REQUISITE		
The basic knowledge in matrices and calculus.		

PREAMBLE

This course explores fundamental mathematical techniques essential to engineering analysis and design. It begins with linear algebra, covering systems of linear equations, matrix rank, and Gauss elimination, along with eigenvalues, eigenvectors, and diagonalization of matrices. The course then develops methods for solving homogeneous and non-homogeneous ordinary differential equations of second and higher order, using techniques such as undetermined coefficients and variation of parameters. It further introduces the Laplace transform as an operational tool for solving initial value problems, including those involving discontinuous and impulsive inputs. Finally, the course covers Fourier series, enabling the representation of periodic functions and signals as sums of sinusoidal components.

RATIONALE

- Develops the ability to model, analyse, and solve structural systems and matrix-based engineering problems using linear algebra.
- Enhances understanding of dynamic mechanical and structural systems such as vibrating beams, spring-mass systems, and structural oscillations through the study of linear ordinary differential equations.
- Provides an operational approach, through the Laplace transform, for solving structural and mechanical system differential equations efficiently, including systems with sudden loading and impact forces.
- Enables the representation and analysis of periodic loading, vibrations, and signals using Fourier series methods.
- Enhances analytical thinking and supports systematic problem-solving in civil and mechanical engineering applications.

COMPETENCY STATEMENT/s	
CC1	Demonstrate the ability to apply the concepts of linear algebra, differential equations, Laplace Transforms and series expansions to construct mathematical models and obtain effective solutions to practical problems.

CO	CO Statement	Cognitive (C)	Psychomotor (P)	Affective (A)
CO1	**Solve** linear systems of equations by applying the properties of matrices and vectors.	Applying		Responding
CO2	**Employ** appropriate methods for solving linear differential equations with constant coefficients arising in engineering applications.	Applying		Responding
CO3	**Apply** Laplace transform to find the solution of Initial value problem.	Applying		Responding
CO4	**Apply** Taylor and Fourier series methods to obtain series explanation of given functions.	Applying		Responding

TEACHING AND ASSESSMENT SCHEME													
Teaching Scheme / Week					**Hours / Semester**	**Credit**	**Examination Scheme**						
							Theory			**Practical**			**Total**
L	**T**	**J**	**P**	**S**	**90**	**C**	**CIA**	**ESE**	**Total**	**CIA**	**ESE**	**Total**	

3	1	0	0	2		3	40	60	100	-	-	-	100

***L**: Lecture (One unit is of one-hour duration), **T**: Tutorial (One unit is of one-hour duration), **P**: Practical (One unit is of one-hour duration), **J**: Project (One unit is of one-hour duration), **S**: Self-Learning & Team Work (One unit is of one-hour duration), **CIA**: Continuous Internal Assessment, **ESE**: End Semester Examination*

SYLLABUS (Major Topics)			
Module	Title	Major Topics	Hrs
1	**Linear Algebra**	Linear systems of equations, Row echelon form and rank of a matrix, Linear Independence, Solution by Gauss elimination, Eigenvalues and Eigenvectors of matrices, Diagonalization of matrices. **(Text 1- Relevant topics from sections 7.3, 7.4, 7.5, 8.1, 8.4)**	10
2	**Ordinary Differential Equation**	Homogeneous linear ODEs of second order, non-homogeneous linear ODEs of second order (with constant coefficients) – General solution by the method of undetermined coefficients, Solution of Non - homogeneous second order linear ODE (with constant coefficients)- by the method of variation of parameters. Solution of Homogeneous linear ODEs of higher order with constant coefficients, Solution of Non-Homogeneous linear ODEs of higher order with constant coefficients by the method of undetermined coefficients (particular solutions for the functions ke^x, kx^n, $k \cos \omega x$, $k \sin \omega x$ and their linear combinations). **(Text 1: Relevant topics from sections 2.1, 2.2, 2.7, 2.10)**	10
3	**Laplace Transform**	Laplace transform, Inverse Laplace transform, Linearity property, First shifting theorem, Transform of derivatives, solution of initial value problems by Laplace transform (Second order linear ODE with constant coefficients with initial conditions at t=0 only), Unit step function, Second shifting theorem, Dirac delta function and its transform (Initial value problems involving unit step function and Dirac delta function are excluded) , Convolution theorem (without proof) and its application to finding Laplace transform of products of functions. **((Text 1: Relevant topics from sections 6.1, 6.2, 6.3, 6.4, 6.5)**	12
4	**Fourier Series**	Taylor series representation (without proof, assuming the possibility of power series expansion in appropriate domains), Maclaurin series representation, Fourier series, Euler formulas, Convergence of Fourier series (Dirichlet's conditions), Fourier series of periodic functions, Fourier series of 2l periodic functions, Half range sine series expansion, Half range cosine series expansion. **(Text 1: Relevant topics from sections 11.1, 11.2 Text 2: Relevant topics from section 10.8)**	10

Sl. No	Self-learning / Team Work Description
1	Symmetric matrix, Skew-symmetric matrix, Orthogonal Matrix, Properties of eigenvalues of Symmetric matrix, Skew-symmetric matrix, Orthogonal Matrix **(1 hour)** Practice problems on solving systems of linear equations using Gauss elimination **(2 hours)**, finding eigenvalues and eigenvectors **(2 hours)**, diagonalization **(2 hour)** **Team Work -** Apply Kirchhoff's Voltage Law (KVL) and Kirchhoff's Current Law (KCL) in a simple electrical circuit to form a system of linear equations in matrix form. Then solve the system of equations using Gauss Elimination method and using python. **(2 hours).**

2	Solving non-homogeneous ODE using direct integration method **(1 hour**), Solving non-homogeneous ODE using variable separable method **(1 hour)**. Practice problems on solving non-homogeneous ODE with constant coefficients by the method of undetermined coefficients **(3 hours)**, variation of parameters **(2 hours)**. **Team Work -** Develop a mathematical model for a mass-spring-damper system subjected to an external time-dependent force, and perform its dynamic analysis using Python-based simulation **(2 hours).**
3	Practice problems on Solving initial value problem using Laplace transform **(3 hours)**, unit step function, second shifting theorem (**2 hours)** Finding inverse Laplace transform using convolution theorem **(2 hours)** **Team work** -Identify and explain a real-world engineering problem that can be modelled using a linear differential equation with constant coefficient, and solve it using Laplace Transform methods and using python **(2 hours)**.
4	Practice problems on Fourier series expansion of functions **(2 hours)**, Half range sine series expansion of functions **(2 hours)** and Half range cosine series expansion of functions **(2 hours)**. **Team work-** Develop Fourier series expansions of real-world signals like square wave and triangular wave also plot the Fourier approximation using python **(2 hours)**.

SUGGESTED LEARNING RESOURCES

Text Book			
Sl. No.	Title of Book	Author	Publication
1	Advanced Engineering Mathematics	Erwin Kreyszig	John Wiley & Sons 10th edition, 2016
2	Calculus	H Anton, I Biven, S Davis	12th edition, Wiley, 2024

Reference			
Sl. No.	Title of Book	Author	Publication
1	Thomas Calculus	Maurice D. Weir, Joel Hass, Christopher Heil, Przemyslaw Bogacki	15th edition, Pearson, 2023
2	Essential Calculus	J. Stewart	2nd edition, Cengage, 2017
3	Elementary Linear Algebra	Howard Anton, Chris Rorres	11th edition, Wiley, 2019
4	Bird's Higher Engineering Mathematics	John Bird	9th edition, Taylor & amp; Francis, 2021
5	Higher Engineering Mathematics	B. V. Ramana	39th edition, McGraw-Hill Education, 2023.
6	Signals and systems	Simon Haykin, Barry Van Veen	2nd edition, Wiley, 2002

Web Resource	
1	https://nptel.ac.in/courses/111101115
2	Ordinary and Partial Differential Equations and Applications - Course
3	Mod-01 Lec-01 General Introduction
4	https://youtube.com/playlist?list=PLyqSpQzTE6M8gnapvdLN92hs_4F75OSuH&si=hWcuSXdZilZs5Z Cs

DETAILED SYLLABUS

Module	**Title**	**Topic**	**Mode of Delivery**	**CO**	**Learnig Domain**			**Hrs**
					C	P	A	
	Linear	Linear systems of equations	L	CO1	U			1
		Row echelon form and rank of a matrix, Linear Independence	L	CO1	U			2
		Tutorial Problems	T	CO1	U			1
		Solution by Gauss elimination	L	CO1	A			2
		Tutorial Problems	T	CO1	A		Rs	1

1	**Algebra**	Eigenvalues and Eigenvectors of matrices	L	CO1	A			3
		Tutorial Problems	T	CO1	A		Rs	1
		Symmetric matrix, Skew-symmetric matrix, Orthogonal Matrix	S	CO1	U			
		Properties of eigenvalues of Symmetric matrix, Skew-symmetric matrix, Orthogonal Matrix	S	CO1	U			
		Diagonalization of matrices	L	CO1	A			2
		Tutorial Problems	T	CO1	A		Rs	1
2	**Ordinary Differential Equation**	Solving non-homogeneous ODE using direct integration method	S	CO2	U			
		Solving non-homogeneous ODE using variable separable method	S	CO2	A			
		Solution of Homogeneous linear ODEs of second order with constant coefficients	L	CO2	A			2
		Tutorial Problems	T	CO2	A		Rs	1
		Existence and uniqueness of solutions (without proof), Linear dependence and independence of solutions using Wronskian	L	CO2	U			1
		Non-homogeneous linear ODEs of second order (with constant coefficients) – General solution by the method of undetermined coefficients	L	CO2	A			2
		Tutorial Problems	T	CO2	U		Rs	1
		Solution of non - homogeneous second order linear ODE (with constant coefficients)- by the method of variation of parameters.	L	CO2	A			2
		Tutorial Problems	T	CO2	A		Rs	1
		Solution of Homogeneous linear ODEs of higher order with constant coefficients.	L	CO2	U			1
		Solution of non- homogeneous linear ODEs of higher order with constant coefficients by the method of undetermined coefficients	L	CO2	A			2
		Tutorial Problems	T	CO2	A		Rs	1
3	**Laplace Transform**	Laplace Transform and its inverse	L	CO3	U			2
		Linearity. First shifting theorem(s-shifting)	L	CO3	U			1
		Tutorial Problems	T	CO3	U		Rs	1
		Transform of Derivatives	L	CO3	U			1
		Solution of differential equation using Laplace transform	L	CO3	A			2
		Tutorial Problems	T	CO3	A		Rs	1
		Unit step function, Second shifting theorem	L	CO3	U			2
		Dirac delta function and its transform	L	CO3	U			1
		Tutorial Problems	T	CO3	U		Rs	1
		Convolution theorem in finding inverse Laplace transform of products of functions	L	CO3	U			1
		Tutorial Problems	T	CO3	U		Rs	1
4	**Fourier Series**	Taylor series representation	L	CO4	U			1
		Maclaurin series representation	L	CO4	U			1
		Tutorial Problems	T	CO4	U		Rs	1
		Fourier series, Euler formulas, Convergence of Fourier series (Dirichlet's conditions)	L	CO4	U			1
		Fourier series of 2π periodic functions	L	CO4	A			2
		Tutorial Problems	T	CO4	A		Rs	1
		Fourier series of 2l periodic functions	L	CO4	A			2
		Tutorial Problems	T	CO4	A		Rs	1

		Half range sine series expansion	L	CO4	A			1
		Half range cosine series expansion	L	CO4	A			2
		Tutorial Problems	T	CO4	A		Rs	1

TABLE OF SPECIFICATIONS (ToS) (ESE Question Paper Design) (Use √)

Module	Module Title	Distribution of Marks (RBL)						Total Marks
		R	U	A	An	E	C	
1	Linear Algebra	√	√	√				15
2	Ordinary Differential Equation	√	√	√				15
3	Laplace Transforms	√	√	√				15
4	Fourier Series	√	√	√				15

This ToS shall be treated as a general guideline for students and teachers for distribution of marks

ASSESSMENT PATTERN	
Assessment	**Marks**
Continuous Internal Assessment	40
1. Internal Examination	20
2. Learning Activity	15
3. Regularity	5
End Semester Examination - Theory	60
Total	**100**

MITS Kochi Muthoot Institute of Technology and Science (Autonomous)

MODEL QUESTION PAPER

			Total Pages: .....
Register No.:	.....	Name:	.....

FIRST SEMESTER B. TECH DEGREE (REGULAR) EXAMINATION, DECEMBER 2025 (2025 SCHEME)			
Course Code:	**B251902/ MA100A**		
Course Name:	**MATHEMATICS FOR PHYSICAL SCIENCE-1**		
Max. Marks	**60**	**Duration**:	2 hours 30 minutes
Common to ME & CE			

PART A

(Answer all questions. Each question carries 3 marks)

No.	***Question***	***CO***	***Marks***
1	Choose the number p(if possible) so that the ranks of $A = [6\ 4\ 2\ -3\ -2\ -1\ 9\ 6\ p\ ]$ are : (a) 1, (b) 2, (c) 3.	CO 1	(3)
2	If 2 is an eigenvalue of the matrix A=$\begin{bmatrix}1 & 2 & 3\\ 2 & 4 & 6\\ 1 & 1 & 1\end{bmatrix}$, without using its characteristic equation find the other eigen values and also find the eigen values of A^3, A^T, A^{-1} and $6A$.	CO 1	(3)
3	Obtain the general solution of the ordinary differential equation y'' – 5y' + 6y = 0.	CO 2	(3)
4	If $y_1 = sinhax, y_2 = coshax$, show the linear independence by using quotients.	CO 2	(3)
5	Determine the inverse Laplace transform of the function $\frac{s+1}{s^2+2s+5}$.	CO 3	(3)
6	A control unit in an electrical system receives the time-domain signal $f(t) = t^2e^{3t}$ representing an input waveform. Find the Laplace transform of the function $f(t)$.	CO 3	(3)
7	In heat distribution along a thin insulated rod of length 1 m, the temperature profile is modeled by the function $f(x) = e^x$ in (0,1). Construct the half-range cosine series for the function in $0 < x < 1$.	CO 4	(3)
8	A periodic electrical signal in a communication circuit is modeled by the function $f(x) = x^2 - 2$ for –2 < x < 2. Obtain the Fourier series representation of the function.	CO 4	(3)

PART B

(Answer any one full question from each module, each question carries 9 marks)

No.		***Question***	***CO***	***Marks***
		MODULE I		
9	a)	A statically indeterminate truss joint is in equilibrium under three internal member forces x, y, and z(in kN), governed by the force-balance equations: $x + y + z = 6x + 2y + 3z = 10x + 2y + az = b$ where a is a structural stiffness parameter of the third member and b is the applied external load (kN) at that joint. Determine the values of a and b for which the truss system has: (i) No solution (ii) Infinitely many solutions (iii) A unique solution.	CO 1	(5)
	b)	A three-storey building frame, idealized as a lumped-mass shear structure, has its dynamic behaviour governed by the matrix $A = [8\ -4\ 0\ -4\ 8\ -4\ 0\ -4\ 4\ ]$ Determine the eigenvalues and eigenvectors of A.	CO 1	(4)

		OR		
10	a)	A structural engineer is studying the coupled dynamic behaviour of three interconnected floors in a multi-storey building frame. To simplify the vibration analysis and decouple the interactions between the floors, the system's stiffness-mass interaction matrix has been found to be: $A = [6\ -2\ 0\ -2\ 6\ -2\ 0\ -2\ 6]$ By diagonalizing this matrix, the engineer can transform the coupled system of storey displacements into an equivalent set of independent single-degree-of-freedom modal equations, making it far easier to analyze the building's natural frequencies and design it for seismic safety. Diagonalize the matrix A.	CO 1	(5)
	b)	In an electrical network, the unknown branch currents satisfy the following system of linear equations. Test the consistency of the system and solve it using the Gauss elimination method. $2x + 3y - z = 3, x - y + 2z = 2,\ 3x + 2y + z = 5.$	CO 1	(4)
		MODULE II		
11	a)	The current $i(t)$ in an electrical circuit satisfies $i'' - 3i' + 2i = e^{2t}$. Find the complete solution for $i(t)$ using the method of undetermined coefficients.	CO 2	(5)
	b)	Use variation of parameters to obtain the solution of the linear ordinary differential equation $y'' - 2y' + y = e^x lnx$.	CO 2	(4)
		OR		
12	a)	Obtain the general solution of the ordinary differential equation $(3D^2 + 27I)y = 3cosx + cos\ 3x$.	CO 2	(5)
	b)	In a series RLC circuit, $L = 1H, R = 3\Omega, C = \frac{1}{2}F$ and the applied voltage is $E(t) = 5t$. The governing differential equation for charge $q(t)$ is $q'' + 3q' + 2q = 5t$. Find the general solution for $q(t)$.	CO 2	(4)
		MODULE III		
13	a)	In a second-order electrical or mechanical system, the response is governed by the differential equation $y'' + 5y' + 6y = e^{-t}$ with initial conditions $y(0) = 0, y'(0) = 1$. Using Laplace transform, solve the differential equation.	CO 3	(5)
	b)	Find the inverse Laplace transform of the function $\frac{s^2+2}{s(s^2+9)}$.	CO 3	(4)
		OR		
14	a)	In signal processing, the output response of a linear time-invariant system is represented in Laplace domain by the function $\frac{\omega}{s^2(s^2-\omega^2)}$. Using the convolution theorem, determine the inverse Laplace transform of the function.	CO 3	(5)
	b)	Express in terms of unit step function and hence find the Laplace transform of $f(t) = \begin{cases} t-1\,;1<t<2 \\ 3-t\,;2<t<3 \end{cases}$.	CO 3	(4)
		MODULE IV		
15	a)	Find the Fourier series expansion of the periodic function $f(t) = \begin{cases} t-1\,;1<t<2 \\ 3-t\,;2<t<3 \end{cases}$.	CO 4	(5)
	b)	The periodic function $f(x) = \lvert x \rvert$, defined on (–π, π) is used to model a triangular waveform. Determine the Fourier coefficients a_n and b_n.	CO 4	(4)
		OR		
16	a)	The periodic square wave signal is defined by $f(t) = \begin{cases} t-1\,;1<t<2 \\ 3-t\,;2<t<3 \end{cases}$ with period 2π. Find the Fourier series expansion of $f(x)$.	CO 4	(5)

	b)	In vibration or signal analysis, a function defined on a finite interval is extended as an odd periodic function to model a waveform. Construct the half-range sine series for the function $f(x) = sin\left(\frac{\pi x}{l}\right)$ in $(0, l)$.	CO 4	(4)

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COURSE DESCRIPTION							
REGULATION	**2025**	**L-T-J-P-S**	**3-0-0-2-3**	**VERSION**	**25/1**	**CREDITS**	**4**
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work)							

COURSE CODE	COURSE NAME	COURSE CATEGORY
B251902/PH910B	**Physics For Physical Science**	**BST**
PRE-REQUISITE		
Basics of laser, basics of dual nature of matter and radiation, basics of optics and basics of mechanical waves and acoustics.		

PREAMBLE

Physics deals with fundamentals and the laws of physics are applicable from the largest of entities of this universe to the smallest of particles known.
Physical science spans theory and application and it requires thinking bot in abstract terms and concrete terms.

RATIONALE

The course enables students to apply subatomic level physics and laser and fibre optics theory in analysing the working of ultrasonic oscillators and optoelectronic devices which has applications in physical and life science.

COMPETENCY STATEMENT/s

CC1: Demonstrate ability to apply the principles of optics, lasers, fibre optics, waves, acoustics and ultrasonic to solve basic problems in photonics and ultrasonics.

CO	CO Statement	Cognitive (C)	Psychomotor (P)	Affective (A)
1	Apply the principles of lasers and optical fibers in an optical communication system.	A	Rs	M
2	Apply interference and diffraction phenomena in natural optical processes and optical instruments.	A	Rs	M
3	Apply the Schrodinger equation to a one-dimensional quantum mechanical system for finding energy levels in such systems	A	Rs	M
4	Apply principles of wave motion in acoustics of buildings and ultrasonic diffractometer	A	Rs	M

TEACHING AND ASSESSMENT SCHEME

Teaching Scheme / Week					Hours / Semester	Credit	Examination Scheme						
							Theory			Practical			Total
L	T	J	P	S		C	CIA	ESE	Total	CIA	ESE	Total	
3	0	0	2	3	120	4	25	60	85	15	0	15	100

***L**: Lecture (One unit is of one-hour duration), **T**: Tutorial (One unit is of one-hour duration), **P**: Practical (One unit is of one-hour duration), **J**: Project (One unit is of one-hour duration), **S**: Self-Learning & Team Work (One unit is of one-hour duration), **CIA**: Continuous Internal Assessment, **ESE**: End Semester Examination*

SYLLABUS (Major Topics)

Module	Title	Major Topics	Hrs
1	**Laser & Fibre Optics**	Optical processes – Absorption-Spontaneous emission and stimulated emission, Principle of laser - conditions for sustained lasing – Population inversion- Pumping- Metastable states, Basic components of laser -Active medium - Optical resonant cavity, Construction and working of Ruby laser and CO2 laser, Construction and working Semiconductor laser (qualitative), Properties of laser, Applications of laser. Optic fibre-Principle of propagation of light, Types of fibres-Step index and Graded index fibres - Multimode and single mode fibers, Acceptance angle, Numerical aperture –Derivation, Applications of optical fibres -Fibre optic communication system (block diagram)	9

2	**Interference and Diffraction**	Introduction, Principle of super position, Constructive and destructive interference, Optical path, Phase difference and path difference, Cosine law- reflected system- Condition for constructive and destructive interference, Colours in thin films, Newton's Rings-Determination of refractive index of transparent liquids and wavelength, Air wedge-Measurement of thickness of thin sheets. Diffraction-types of diffraction, Diffraction due to a single slit, Diffraction grating – Construction - grating equation, Dispersive and Resolving Power (qualitative).	9
3	**Quantum Mechanics**	Introduction, Concept of uncertainty and conjugate observables (qualitative), Uncertainty principle (statement only), Application of uncertainty principle- Absence of electron inside nucleus - Natural line broadening, Wave function – properties - physical interpretation, Formulation of time dependent and time independent Schrodinger equations, Particle in a one- dimensional box - Derivation of energy eigen values and normalized wave function, Quantum Mechanical Tunnelling(qualitative)	9
4	**Waves And Acoustics**	Waves- transverse and longitudinal waves, Concept of frequency, wavelength and time period (no derivation), Transverse vibrations in a stretched string- derivation of velocity and frequency - laws of transverse vibration. Acoustics- Reverberation and echo, Reverberation time and its significance - Sabine's Formula, Factors affecting acoustics of a building. Ultrasonics- Piezoelectric oscillator, Ultrasonic diffractometer, SONAR, NDT-Pulse echo method, medical application-Ultrasound scanning (qualitative).	9

Sl. No	**Self-learning / Team Work Description**
1	Fundamentals of emission and absorption in atomic system, fundamentals of fibre optics principles, Basics of fiber sensors.
2	Fundamentals of Interference, Fundamentals of Diffraction.
3	Basics of de Broglie waves, Basics of quantum computers, Uncertainty principle.
4	Basics of Oscillations and waves, Fundamentals of Acoustics, Basics of ultrasonics.
5	Prelab assignment.
6	Practice Problems.

SUGGESTED LEARNING RESOURCES

Text Book			
Sl. No.	Title of Book	Author	Publication
1	A Textbook of Engineering Physics	MN Avadhanulu, P G Kshirsagar, TVS Arun Murthy,	S.Chand 11th Edition, 2018.
2	Engineering Physics	H K Malik, A.K. Singh	McGraw Hill Education 2nd Edition, 2017

Reference			
Sl. No.	Title of Book	Author	Publication
1	Engineering Physics,2nd Edition	Aruldhas G.	PHI Pvt. Ltd,2015
2	Engineering Physics	G Sreekanth & M Suresh Babu	Orbit Publishers
3	Advanced Engineering Physics	Premlet B	Phasor Books
4	Concepts of Modern Physics, 6th Edition,	Beiser Arthur	Tata McGraw Hill Publications,2003

Web Resource / Virtual Lab
https://nptel.ac.in/courses/115102124
https://nptel.ac.in/courses/104104085
https://nptel.ac.in/courses/115105537
https://nptel.ac.in/courses/115102023
https://nptel.ac.in/courses/115101107
https://nptel.ac.in/courses/112104212
Virtual Lab - https://ep-iitb.vlabs.ac.in/exp/newtons-ring-experiment

	https://ep-iitb.vlabs.ac.in/exp/diffraction-grating/procedure.html

DETAILED SYLLABUS

Module	Title	Topic	Mode of Delivery	CO	Learning Domain			Hrs
					C	P	A	
1	Laser	Optical Processes-Absorption and emission of radiation, spontaneous and stimulated emission.	L	1	A	Rs	M	1
		Principle of Laser, Conditions for sustained lasing-Population inversion,Pumping, Metastable states.	L	1	A	Rs	M	1
		Basic components of laser, Active medium, Pumping mechanism, Optical resonating cavity	L	1	A	Rs	M	1
		Construction and working of Ruby laser and CO_2 laser.	L	1	A	Rs	M	1
		Construction and working of semiconductor laser. Properties of Laser. Applications of laser.	L	1	A	Rs	M	1
		Optic fibre-Principle of propagation of light, Types of fibres-Step index and Graded index fibres,	L	1	A	Rs	M	1
		Multimode and single mode fibres	L	1	A	Rs	M	1
		Acceptance Angle, Numerical aperture–Derivation	L	1	A	Rs	M	1
		Fibre optic communication system, applications	L	1	A	Rs	M	1
2	Interference and Diffraction	Introduction to wave optics superposition principle, Constructive and destructive interference	L	2	A	Rs	M	1
		Cosine law (Reflected system) Derivation of the conditions of constructive and destructive Interference. Colours in thin films	L	2	A	Rs	M	1
		Interference due to wedge shaped films –Determination of thickness of thin sheets	L,P	2	A	Rs	M	1
		Newton's rings Measurement of wavelength and refractive index	L	2	A	Rs	M	1
		Measurement of wavelength and refractive index.	L	2	A	Rs	M	1
		Diffraction of light, Fresnel and Fraunhofer classes of diffraction	L	2	A	Rs	M	1
		Diffraction due to single slit Diffraction grating-	L,P	2	A	Rs	M	1
		Construction-Grating equation	L	2	A	Rs	M	1
		Resolving and Dispersive power of a grating with expression	L	2	A	Rs	M	1
3	Quantum Mechanics	Introduction to Quantum mechanics – Concept of uncertainty and conjugate observables, Uncertainty principle,	L	3	A	Rs	M	1
		Applications of UP Absence of electrons inside a nucleus	L	3	A	Rs	M	1
		Natural line broadening	L	3	A	Rs	M	1

		Mechanism						
		Wave function – Properties- Physical interpretation	L	3	A	Rs	M	1
		Formulation of time dependent Schrodinger equation	L	3	A	Rs	M	1
		Time-independent Schrodinger wave equations-	L	3	A	Rs	M	1
		Particle in a one dimensional box	L	3	A	Rs	M	1
		Derivation for normalised wave function and energy eigen values	L	3	A	Rs	M	1
		Quantum Mechanical Tunnelling(qualitative)	L	3	A	Rs	M	1
4	**Waves & Acoustics**	Wave motion with various examples, Transverse and longitudinal waves with examples	L	4	A	Rs	M	1
		Concept of frequency wavelength and time period	L	4	A	Rs	M	1
		Transverse vibration in a stretched string - Laws of vibration of stretched string	L,P	4	A	Rs	M	1
		Acoustics-Reverberation and Echo- reverberation time	L	4	A	Rs	M	1
		Significance of reverberation Time Sabine formula	L	4	A	Rs	M	1
		Factors affecting acoustics of buildings	L	4	A	Rs	M	1
		Ultrasonic, Piezoelectric oscillator	L	4	A	Rs	M	1
		Ultrasonic Diffractometer	L	4	A	Rs	M	1
		SONAR, NDT-Pulse Echo Method, Medical Applications – Ultrasound Scanning (qualitative)	L	4	A	Rs	M	1

LAB COMPONENT DESIGN				
Objective	**CO**	**Learning Domain**		
		C	P	A
Determination of wavelength of Laser using Diffraction Grating	2	A	Rs	M
CRO basics-Measurement of frequency and amplitude of wave forms.	4	A	Rs	M
Solar Cell- I V and Intensity Characteristics	1	A	Rs	M
Characteristics of LED	1	A	Rs	M
Determination of diameter of wire or thickness of thin sheet using Air wedge method.	2	A	Rs	M
Meld's experiment- Frequency calculation in Transverse and Longitudinal Mode.	4	A	Rs	M
Optical fiber characteristics- Measurement of Numerical aperture.	1	A	Rs	M
To determine the particle size using laser	2	A	Rs	M

TABLE OF SPECIFICATIONS (ToS) (ESE Question Paper Design) (Use √)								
Module	Module Title	Distribution of Marks (RBL)						Total Marks
		R	U	A	An	E	C	
1	Laser and Fibre Optics	√	√	√				15
2	Interference and Diffraction	√	√	√				15
3	Quantum Mechanics	√	√	√				15

4	Waves & Acoustics	√	√	√				15
This ToS shall be treated as a general guideline for students and teachers for distribution of marks.								

ASSESSMENT PATTERN		
Assessment		**Marks**
Continuous Internal Assessment		
1	Internal Examination	20
2	Continuous Lab Assessment	15
3	Regularity	5
End Semester Examination - Theory		60
Total		**100**

MODEL QUESTION PAPER

			Total Pages: …….
Register No.:	……	Name:	……

(AN AUTONOMOUS COLLEGE AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANATHAPURAM)

FIRST SEMESTER B. TECH DEGREE (REGULAR) EXAMINATION, DECEMBER 2025 (2025 SCHEME)			
Course Code:	**B251902/PH910B**		
Course Name:	**Physics for physical science**		
Max. Marks	**60**	**Duration**:	2 hours 30 minutes
Common to Civil Engineering and Mechanical Engineering			
Use of Calculators are permitted.			

PART A

(Answer all questions. Each question carries 3 marks)

No.	*Question*	*CO*	*Marks*
1	Ruby laser is a three level system. Illustrate how optical pumping achieves population inversion and enables laser action.	CO1	3
2	Relate the function of each block in a fiber optic communication system using a suitable block diagram	CO1	3
3	Two independent light sources are never coherent. Give reason.	CO2	3
4	Distinguish between Fresnel and Fraunhofer diffraction.	CO2	3
5	Using Heisenberg's principle show that electron is absent in a nucleus.	CO3	3
6	The performance of quantum devices depends on accurately predicting the behaviour of electrons using the wave function rather than classical particle trajectories. Interpret the physical meaning of the wave function and justify how it enables the prediction of the probability of finding a particle in a given region of space.	CO3	3
7	Differentiate between transverse and longitudinal waves by comparing their particle motion, propagation characteristics, and engineering applications.	CO4	3
8	Distinguish between reverberation and echo.	CO4	3

PART B

(Answer any one full question from each module, each question carries 9 marks)

No.		*Question*	*CO*	*Marks*
MODULE I				
9	a)	An automotive manufacturing plant intends to replace conventional cutting techniques with laser-based machining to improve efficiency and reduce material wastage. As part of the design review, the engineering team must evaluate the laser source used in the system. With the help of a neat diagram, explain the construction and working of a CO_2 laser. Evaluate how its energy transfer mechanism makes it suitable for precision machining applications.	CO1	6
	b)	Calculate the wavelength of light emitted from a diode laser with a band gap of 2 eV.	CO1	3
OR				
10	a)	Derive the expression for the numerical aperture of a step-index fiber and justify its importance in selecting an appropriate optical fiber for the communication system.	CO1	6
	b)	What is the numerical aperture of an optical fiber with core refractive index of 1.54 and cladding refractive index 1.37?	CO1	3
MODULE II				
11	a)	Draw experimental setup for Newton's rings. Write condition for maxima and minima, and derive an expression for diameter of m^{th} dark ring.	CO2	6
	b)	A monochromatic light of wavelength 5893 Å is incident normally on a soap film of $\mu = 1.42$. What is the least thickness of the film that will appear dark by reflection?	CO2	3
OR				
12	a)	Derive the grating equation using a neat diagram and explain how the equation is applied in wavelength analysis using a spectrometer.	CO2	6
	b)	What is the highest spectral order that can be seen if a grating with 6000 lines/cm is illuminated by a source of 650 nm wavelength.	CO2	3
MODULE III				

13	a)	Write the Schrodinger's equation for a particle in a one dimensional potential well and obtain the expression for normalized wave function and energy eigen values.	CO3	6
	b)	Calculate the separation between the two lowest energy levels of an electron in a one dimensional box of width 4 Å in Joules.	CO3	3
OR				
14	a)	Using separation of variable method, solve time-dependent Schrodinger equation and obtain the time-independent Schrodinger equation.	CO3	6
	b)	Calculate the uncertainty in velocity of an electron which is confined in a 10 Å box.	CO3	3
MODULE IV				
15	a)	With help of a diagram derive an expression for fundamental frequency for transverse vibrations in a stretched string.	CO4	6
	b)	A sitar wire is under tension of 40 N, and length of the bridge is 80 cm. A 10 m sample of that wire has mass 1.2 g. Find the speed and fundamental frequency of the transverse wave on the wire.	CO4	3
OR				
16	a)	Give an account of various factors affecting the architectural acoustics of a building and their remedies.	CO4	6
	b)	A theatre has a volume of 12000 m^3. It is required to have a reverberation time of 2 seconds. What should be the total absorption of the hall.	CO4	3

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COURSE DESCRIPTION							
Regulation	**2025**	**L-T-J-P-S**	**2-1-0-0-3**	**Version**	**25/1**	**Credits**	**3**
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work)							

Course Code	Course Name	Course Category
B251902/CE100C	**ENGINEERING MECHANICS**	**EST**
Pre-requisite		
NIL		

COMPETENCY STATEMENT/s
Apply the fundamental principles of mechanics to analyse Engineering Systems.
PREAMBLE
This course introduces the fundamental concepts of engineering mechanics, focusing on the analysis of forces, equilibrium, friction, centroids, moments of inertia, and the motion of particles and rigid bodies. Students develop the ability to model engineering systems using free-body diagrams, analyse static and dynamic behaviour, and solve practical problems involving translational and rotational motion. The course provides a strong foundation for structural analysis, machine design, transportation, and other engineering disciplines by integrating theoretical concepts with engineering applications.

RATIONALE
• Develops the fundamental principles of engineering mechanics required to analyse forces, equilibrium, motion, friction, and structural behaviour, forming the basis for advanced engineering courses. • Enables students to apply analytical methods to solve practical engineering problems involving static and dynamic systems encountered in civil and multidisciplinary engineering applications.

COURSE OUTCOMES (CO)

Course Outcomes (CO): At the end of this course, learners will be able to:

CO	CO Statement	Cognitive (C)	Psychomotor (P)	Affective (A)
CO1	**Analyse** static systems involving concurrent and non-concurrent forces in 2D and 3D.	A		
CO2	**Apply** the laws of friction to analyse structural systems.	A		
CO3	**Determine** the Centre of Gravity and Moment of Inertia of plane and solid system components.	A		
CO4	**Apply** kinematic and kinetic principles to rectilinear motion of particles, rigid bodies and connected systems.	A		
CO5	**Apply** principles of curvilinear motion and rotation to problems involving combined static and dynamic systems.	A		

Cognitive (Revised blooms Level): *-* ***R****: Remember;* ***U****: Understand;* ***A****: Apply;* ***An****: Analyse;* ***E****: Evaluate;* ***C****: Create*
Psychomotor Domain (Dave's): *-* ***I****-Imitation,* ***M****-Manipulation,* ***P****-Precision,* ***Ar****-Articulation,* ***N****-Naturalisation*
Affective (Krathwohl)*: -* ***Re****-Receiving,* ***Rs****-Responding,* ***V****-Valuing,* ***O****-Organization,* ***Ch****-Characterization*

TEACHING AND ASSESSMENT SCHEME

Teaching Scheme / Week					Credit	Hours / Semester	Examination Scheme		
							Theory		
L	**T**	**J**	**P**	**S**	**C**		**CIA**	**ESE**	**Total**
2	1`	0	0	3	3	90	40	60	100

L*: Lecture (One unit is of one-hour duration),* ***T****: Tutorial (One unit is of one-hour duration),* ***P****: Practical (One unit is of one-hour duration),* ***J****: Project (One unit is of one-hour duration),* ***S****: Self-Learning & Team Work (One unit is of one-hour duration),* ***CIA****: Continuous Internal Assessment,* ***ESE****: End Semester Examination*

SYLLABUS (Major Topics)			
Module	Title	Major Topics	Hrs

1	Introduction to Mechanics	**Introduction to statics**: Branches of mechanics, Concept of rigid body scalars and vectors, vector operations. **Force systems**: Coplanar, concurrent, Collinear and Parellel Forces, Rectangular components in 2D and 3D, moment and couple, resultants. **Equilibrium**: System isolation and the free-body diagram, equilibrium conditions 2D and 3D.	14
2	Friction, Centroid & Moment of inertia	**Support reactions of beams** (point load and UDL only) **Friction**: -laws of friction – analysis of blocks. **Centroid of composite areas**- – moment of inertia- parallel axis and perpendicular axis theorems. **Polar moment of inertia, radius of gyration, mass moment of inertia** (Concept only)	14
3	Kinetics and Kinematics	**Rectilinear translation** - equations of motion in kinematics and kinetics – **D'Alembert's principle**. –motion on horizontal and inclined surfaces, motion of connected bodies	9
4	Curvilinear Translation and Rotation	**Curvilinear translation** - equations of kinematics projectile motion (solution starting from differential equations) **Rotation** – kinematics of rotation- equation of motion for a rigid body rotating about a fixed axis	8

SELF-LEARNING / TEAM WORK		
Sl. No	Self-learning / Team Work Description	Hrs
1	Visualize the animation/video on idealization and prepare a reflection.	3
2	Solve 10 problems on resolution & resultant of forces. Draw Free Body Diagrams (FBDs) for at least 8 real-life objects (ladder, trolley, bridge pier, chair, crane, table, wall beam, cycle)	5
3	Solve 8 equilibrium problems (concurrent & non-concurrent force systems).	5
4	Identify and document (photos/sketches) 6 real-life supports (roller, hinge, fixed, suspension, continuous, cantilever).	3
5	Apply parallel & perpendicular axis theorems in at least 3 examples.	2
6	Calculate centroid of 5 cardboard shapes; verify experimentally by balancing.	5
7	Solve projectile motion problems using differential equations; compare with observed trajectories.	4
8	Presentation on mass moment of inertia, radius of gyration & engineering applications	2
9	Build a simple lever/see-saw model and demonstrate conditions of equilibrium.	8
10	Demonstrate laws of friction using block, pulley & weights; present observations.	8

SUGGESTED LEARNING RESOURCES

Text Book			
Sl. No.	Title of Book	Author	Publication
1	Engineering Mechanics - Statics and Dynamics	Shames, I. H.	Prentice Hall of India.
2	Engineering Mechanics, Vol. I statics, Vol II Dynamics	R. C. Hibbeler and Ashok Gupta	Pearson Education.
Reference			
Sl. No.	Title of Book	Author	Publication
1	Engineering Mechanics	Timoshenko S P &Young	M c Graw Hill
2	Engineering Mechanics	Rajasekharan S&Sankara Subramanian G	Vikas Publishing House
3	Engineering Mechanics - Statics & Dynamics	Tayal A. K.	Umesh Publications.
4	Engineering Mechanics	Bhavikatti S. S.	Pearson Prentice Hall.
5	Engineering Mechanics	Bansal R. K.	Laxmi Publications Pvt. Ltd.
6	Engineering Mechanics	Benjamin J.	Pentex Book Publishers and Distributors.

Web Resource	
1	https://nptel.ac.in/courses/122104015
2	https://unacademy.com/lesson/overview-of-the-course/Y363O9AC

DETAILED SYLLABUS *(Self-learning if any to be marked)*							
Module	Topic	Mode of Delivery	COs	Learning Domain			Hrs
				C	P	A	
1	Introduction to Statics – Branches of mechanics, concept of rigid body, scalars & vectors, vector operations	L, S	CO1	U			2
	Force Systems – Coplanar, concurrent, collinear, parallel forces	L, T	CO1	A			2
	Rectangular components in 2D & 3D	T	CO1	A			2
	Moment & Couple, Resultants	L, T	CO1	A			2
	Equilibrium – System isolation, Free-body diagram, Equilibrium conditions (2D & 3D)	L, T, S	CO1	A			4
2	Support Reactions of Beams – Simply supported beams (point load, UDL)	L, T, S	CO1	A			2
	Friction – Laws of friction, analysis of blocks on horizontal/inclined planes	L, T, S	CO2	A			3
	Centroid – Composite areas	L, S	CO3	A			2
	Moment of Inertia – Parallel & Perpendicular axis theorems	L, T, S	CO3	A			2
	Polar MoI, radius of gyration, mass moment of inertia (*Self-learning*)	L	CO3	U			3
3	Equations of motion in kinematics & kinetics	L	CO4	A			2
	D'Alembert's principle	L, T	CO4	A			1
	Motion on horizontal & inclined surfaces	T	CO4	A			3
	Motion of connected bodies	T	CO4	A			2
4	Curvilinear Translation – Equations of kinematics	L	CO5	U			3
	Projectile motion (solution from differential equations)	L, T, S	CO5	A			2
	Rotation – Kinematics of rotation, equations of motion of rigid body about fixed axis	L, T	CO5	A			3

TABLE OF SPECIFICATIONS (ToS) (ESE Question Paper Design)								
Module	Module Title	Distribution of Marks (RBL)						Total Marks
		R	U	A	An	E	C	
1	Introduction to Mechanics		✓	✓				15
2	Friction, Centroid & Moment of inertia		✓	✓				15
3	Kinetics and Kinematics		✓	✓				15
4	Curvilinear Translation and Rotation		✓	✓				15
This ToS shall be treated as a general guideline for students and teachers for distribution of marks.								

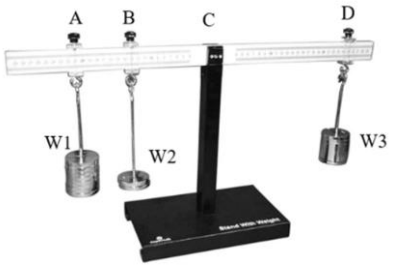
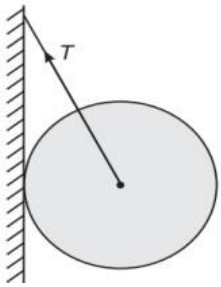
ASSESSMENT PATTERN	
Assessment	**Marks**
Continuous Internal Assessment	**40**
1. Internal Examination	**20**
2. Learning Activity	**15**
3. Regularity	**5**
4. Course Project	
End Semester Examination	**60**
Total	**100**

MODEL QUESTION PAPER

FIRST SEMESTER B. TECH DEGREE (REGULAR) EXAMINATION, DECEMBER 2025 (2025 SCHEME)			
Course Code:	**B251902/CE100C**		
Course Name:	**ENGINEERING MECHANICS**		
Max. Marks	**60**	**Duration**:	2 hours 30 minutes
COMMON to CE & ME Branches			
Use of Data Book / IS codes, etc. to be specified by the question paper setter			

PART A

(Answer all questions. Each question carries 3 marks)

No.	*Question*	*CO*	*Marks*
1	Determine the weight W2 for the top beam to be perfectly horizontal for the system shown in Figure 1. Point C is a hinge, and the distances are AB=5 cm, BC=10 cm, and CD=18 cm. The magnitudes of weights are: W1=5 N, W3=5 N.  Figure 1	CO1	(3)
2	Describe a free body diagram, and sketch the free body diagram of a spherical ball of weight W supported by a string and resting against a wall as shown in Figure 2.  Figure 2	CO1	(3)
3	Match the following: A: 1. Static friction; 2. Kinetic friction; 3. Rolling friction; 4. Limiting friction; 5. Angle of repose; 6. Coefficient of friction B: a. Opposes sliding; b. Measured in metres; c. Prevents start of motion; d. Opposes rolling; e. Same magnitude for static & kinetic friction; f. μ = limiting friction / normal reaction; g. Equals mass × acceleration; h. Inclination where sliding begins; i. Causes energy creation; j. Maximum static value	CO2	(3)
4	Differentiate between mass moment of inertia and area moment of inertia.	CO3	(3)
5	State D'Alembert's principle and explain its significance in dynamics.	CO4	(3)
6	A block of mass 20 kg rests on a horizontal surface. If it is subjected to a horizontal force of 50 N and the coefficient of friction is 0.3, determine whether the block will move or not. Take g=9.81 m/s^2	CO4	(3)

7	Describe projectile motion and state the assumptions made in its kinematic analysis.	CO5	(3)
8	A flywheel starts from rest and rotates with a uniform angular acceleration of 3 rad/s^2. Compute its angular velocity and the angle it has rotated after 5 seconds.	CO5	(3)

PART B

(Answer any one full question from each module, each question carries 9 marks)

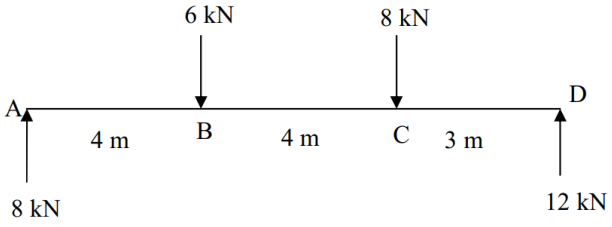
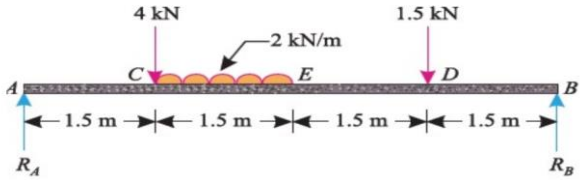
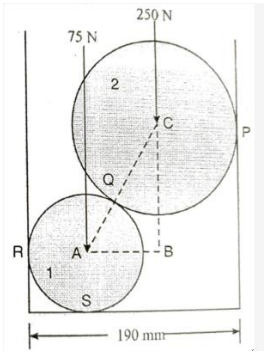
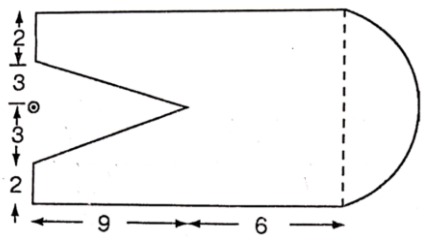
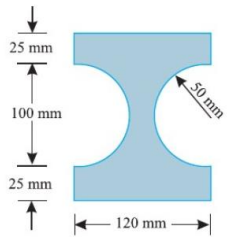
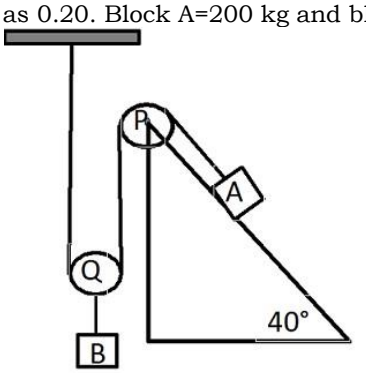
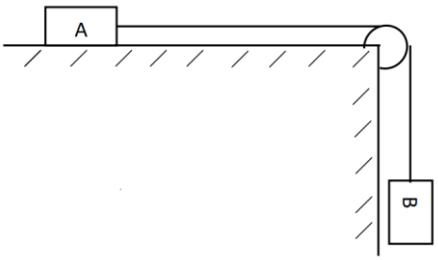
No.		Question	CO	Marks
		MODULE I		
9	a)	A rigid bar AD is acted upon by forces as shown in Figure 3. Reduce the force system to a single force and locate the point of application of that force.  Figure 3	CO1	(3)
	b)	A simply supported beam AB of span 6m is loaded as shown in Figure 4. Determine the reactions at A and B.  Figure 4	CO1	(6)
		OR		
10	a)	Two homogeneous spherical balls rest between two vertical walls as shown in Figure 5. The radius of the smaller ball is 40mm and weight is 75N. The radius of the larger ball is 60 mm and the weight is 250 N. The distance between the walls is 190 mm. Assuming the contact surface to be smooth, draw the free body diagram of the balls and determine the reactions at P, Q, R and S  Figure 5	CO1	(9)
		MODULE II		
11	a)	A block of weight 1000N is placed on a rough horizontal plane. If a horizontal force of 300N just causes the body to slide over the plane, calculate the coefficient of friction between the block and the plane.	CO2	(3)
	b)	Locate the centroid of the given lamina as shown in Figure 6. All dimensions are in cm.  	CO3	(6)

		Figure 6		
		OR		
12	a)	State the laws of friction.	CO2	(3)
	b)	The cross section of a cast iron beam is shown in Figure 7. Determine the moments of inertia of the section about the horizontal and vertical axes passing through the centroid.  Figure 7	CO3	(6)
		MODULE III		
13	a)	Determine the tension in the inextensible string and the acceleration of the masses as shown in Figure 8. Consider the pulley as massless and the coefficient of friction as 0.20. Block A=200 kg and block B=100kg.  Figure 8	CO4	(9)
		OR		
14	a)	Two blocks of 100N (A) and 50N (B) are connected by a flexible but inextensible string as shown in the Figure 9. Assuming coefficient of friction between block 100N and horizontal surface is 0.25, find the acceleration of masses and tension in the string.  Figure 9	CO4	(7)
	b)	A car moving with a velocity of 20 m/s is uniformly retarded at 2 m/s^2. Find the distance it travels before coming to rest and the time taken for it.	CO4	(2)
		MODULE IV		
15	a)	A flywheel rotates with a constant retardation due to breaking. In the first 10 seconds, it made 300 revolutions. At t = 7.5 sec, its angular velocity was 40π rad/s. Determine i. **The value of constant retardation** ii. **The total time taken to come to rest.** iii. **The total revolutions made till it comes to rest**	CO5	(6)
	b)	Explain how velocity and acceleration are expressed in terms of their rectangular components in 3D motion. Why is this representation useful in engineering analysis?	CO5	(3)
		OR		
16	a)	A wheel, rotating about a fixed axis at 30 r.p.m. is uniformly accelerated for 50 seconds, during which time it makes 40 revolutions. Determine i. Angular velocity at the end of this interval	CO5	(4)

		ii. Time required for the speed to reach 80 revolutions per minute.		
	b)	A stone is projected from the top of a building 40 m high with an initial velocity of 20 m/s at an angle of 30° with the horizontal. Determine i. The time taken for the stone to hit the ground. ii. The horizontal distance from the base of the building where it strikes. (Take g=9.8 m/s^2)	CO5	(5)

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COURSE DESCRIPTION							
Regulation	**2025**	**L-T-J-P-S**	**4-0-0-0-4**	**Version**	**25/1**	**Credits**	**4**
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work)							

Course Code	Course Name	Course Category
B251902/CN100D	**INTRODUCTION TO MECHANICAL ENGINEERING AND CIVIL ENGINEERING**	**EST**
Pre-requisite: NIL		

PREAMBLE
This course introduces students from non-civil engineering disciplines to the fundamental concepts of thermal systems, manufacturing processes, and civil engineering. It provides an overview of building materials, building planning, and sustainable construction practices, enabling learners to appreciate the role of civil engineering in infrastructure development and multidisciplinary engineering applications.

RATIONALE
• To provide students with a foundational understanding of mechanical and civil engineering principles, including thermal systems, manufacturing processes, building planning, and construction materials, essential for multidisciplinary engineering practice. • To familiarize students with modern concepts such as intelligent and green buildings, promoting awareness of sustainable infrastructure development and environmentally responsible engineering solutions.

COMPETENCY STATEMENT (CC)	
CC1	Students will be able to demonstrate an understanding of the fundamental concepts of thermodynamics, hydraulic machines, power transmission systems and manufacturing processes.
CC2	Able to interpret the fundamental concepts of building construction

CO	CO Statement	Cognitive (C)	Psychomotor (P)	Affective (A)
CO1	Comprehend thermodynamic cycles and the working of IC Engines.	U		
CO2	Distinguish the various systems of refrigeration and air conditioning.	U		
CO3	Illustrate the working of hydraulic machines and various power transmission elements.	U		
CO4	Summarize the basic manufacturing, metal joining, machining and advanced processes.	U		
CO5	Comprehend the relevance of Civil Engineering and building regulations as per NBC, KBR and CRZ	U		
CO6	Describe different types of conventional building materials	U		
CO7	Perceive the concepts of intelligent and green buildings	U		

TEACHING AND ASSESSMENT SCHEME									
Teaching Scheme / Week					**Credit**	**Hours / Semester**	**Examination Scheme**		
							Theory		
L	**T**	**J**	**P**	**S**	**C**		**CIA**	**ESE**	**Total**
4	0	0	0	4	4	120	40	60	100

***L**: Lecture (One unit is of one-hour duration), **T**: Tutorial (One unit is of one-hour duration), **P**: Practical (One unit is of one-hour duration), **J**: Project (One unit is of one-hour duration), **S**: Self-Learning & Team Work (One unit is of one-hour duration), **CIA**: Continuous Internal Assessment, **ESE**: End Semester Examination*

SYLLABUS (Major Topics)			
Module	Title	Major Topics	Hrs
1	Thermodynamics and Thermal Systems	Thermodynamic cycles, IC Engines, Refrigeration, Psychrometry	15
2	Fluid Machines and Manufacturing Processes	Pumps, Hydraulic turbines, Power transmission elements, Manufacturing processes, Metal joining, Machining processes	15
3	Introduction to Civil Engineering and Buildings	General Introduction to Civil Engineering: Relevance of Civil Engineering in the overall infrastructural development of the country. Brief introduction to major disciplines of Civil Engineering. Introduction to buildings: Building Area Definitions: Built up area, Plinth area, Floor area, Carpet area and Floor Area Ratio of a building as per KBR. Building rules and regulations: Relevance of NBC, KBR & CRZ norms (brief discussion of relevance only). Types of buildings according to character of occupancy as per NBC, Load bearing and non-load bearing building structures, components of a residential building and their functions (concept only). Selection of site for a residential building.	18
4	Building materials and Concepts of Intelligent and green buildings	Conventional construction materials: Brick, stone, aggregate and cement - Classifications, and Uses. Cement concrete: Constituent materials, properties and types. Steel: Structural steel sections and steel reinforcements – types and uses. Intelligent building-Core components (Elementary concepts) Green building - Energy systems, water and waste water management systems in residential buildings (Elementary concepts)	12

SELF-LEARNING / TEAM WORK		
Sl. No	Self-learning / Team Work Description	Hrs
1	Prepare a report about the various thermodynamic cycles like Carnot, Otto, Diesel and Reversed Carnot cycle by referring NPTEL videos.	6
2	Workshop familiarization with machining processes and CNC.	6
3	Study the working of single plate friction clutch, Different bearings used in joints.	6
4	Prepare a report on the latest advancements in metal joining technology by referring NPTEL videos.	6
5	Develop a working model of gear trains.	6
6	Significance of various disciplines in a construction activity (Group work)	5
7	Calculation of plinth area, carpet area and FAR for a given plan (Group work)	5
8	Recent innovative construction in civil engineering (Presentation -5 slides max)	10
9	Study of modern building materials (a) Glass (b) Ceramics (c) Composite materials (d) Plastics (One Material each group)	10

SUGGESTED LEARNING RESOURCES

Text Book			
Sl. No.	Title of Book	Author	Publication
1	Fundamentals of Mechanical Engineering	G.S. Sawhney	PHI Learning Pvt. Ltd.
2	A Textbook of Basic Mechanical Engineering	R.K. Rajput	Laxmi Publications
3	Essentials of Civil Engineering	Dalal K R	Charotar Publishing House Pvt Limited
4	Engineering Materials (Material Science)	Rangwala S C	Charotar Publishing House Pvt Limited

Reference			
Sl. No.	Title of Book	Author	Publication
1	Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives	Chris Mi and M. Abul Masrur	John Wiley & Sons

2	Heating, Ventilating, and Air Conditioning Analysis and Design	Faye C. McQuiston, Jerald D. Parker, and Jeffrey D. Spitler	John Wiley & Sons
3	Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing	Ian Gibson, David W. Rosen, and Brent Stucker	Springer
4	Materials for Civil and Construction Engineering	Mamlouk, M.S.,and Zaniewski, J.P	Pearson Publishers
5	Building Construction	Rangwala S C	Charotar Publishing House Pvt Limited

Web Resource	
1	https://nptel.ac.in/courses/112/105/112105129/ https://nptel.ac.in/courses/112/106/112106133/ https://nptel.ac.in/courses/112/105/112105129/
2	https://nptel.ac.in/courses/112/105/112105171/ https://nptel.ac.in/courses/112/105/112105268/ https://archive.nptel.ac.in/courses/112/107/112107145
3	https://archive.nptel.ac.in/courses/105/106/105106201/
4	https://archive.nptel.ac.in/courses/105/106/105106206/
5	https://archive.nptel.ac.in/courses/105/106/105106201
6	https://onlinecourses.nptel.ac.in/noc21_ce10
7	https://onlinecourses.nptel.ac.in/noc25_ce41

DETAILED SYLLABUS *(Self-learning if any to be marked)*

Module	Topic	Mode of Delivery	CO	Learning Domain			Hrs
				C	P	A	
1	Introduction to thermodynamics, systems & cycles – Carnot cycle, efficiency derivation & problems	L, S	CO1	U			3
	Otto cycle & Diesel cycle – p–v and T–s diagrams, comparison	L, S	CO1	U			2
	IC Engines – SI & CI engines (2-stroke & 4-stroke working)	L	CO1	U			2
	Engine components & developments: CRDI, MPFI, hybrid engines (series, parallel, series – parallel)	L	CO1	U			3
	Refrigeration – unit of refrigeration, COP, reversed Carnot cycle, vapour compression refrigeration cycle	L, S	CO2	U			3
	Psychrometry – properties, psychrometric chart, cooling & dehumidification, central AC system layout	L, S	CO2	U			2
2	Pumps – classification, working of reciprocating and centrifugal pumps	L	CO3	U			2
	Hydraulic turbines – classification and applications	L	CO3	U			3
	Power transmission: gears (spur, helical, bevel, worm), clutches, bearings (journal, ball)	L	CO3	U			1
	Manufacturing processes – Sand casting, forging, rolling, extrusion	L	CO4	U			3
	Metal joining – Arc welding, SMAW, soldering, brazing (concepts & applications)	L, S	CO4	U			2
	Machining processes – lathe, drilling, milling (basic operations)	L	CO4	U			2
	Advanced processes – CNC, 3D printing: principles & applications	L	CO4	U			1
3	Relevance of Civil Engineering in the overall infrastructural development of the country	L	CO5	U			2
	Brief introduction to major disciplines of Civil Engineering.	L	CO5	U			2

	Building Area Definitions Built up area, Plinth area, Floor area, Carpet area	L, S	CO5	U			2
	Floor Area Ratio of a building as per KBR	L, S	CO5	U			2
	Building rules and regulations: Relevance of NBC, KBR & CRZ norms	L	CO5	U			2
	Types of buildings according to character of occupancy as per NBC	L	CO5	U			2
	Load-bearing and non-load bearing building structures	L	CO5	U			1
	components of a residential building and their functions	L	CO5	U			3
	Selection of site for a residential building	L	CO5	U			2
4	Conventional construction materials: Brick, stone, aggregate and cement - Classifications, and Uses	L	CO6	U			3
	Cement concrete: Constituent materials, properties and types.	L	CO6	U			3
	Steel: Structural steel sections and steel reinforcements – types and uses.	L	CO6	2			2
	Intelligent building-Core components	L	CO7	2			2
	Green building - Energy systems, water and waste water management systems in residential buildings	L	CO7	2			2

TABLE OF SPECIFICATIONS (ToS) (ESE Question Paper Design)								
Module	Module Title	Distribution of Marks (RBL)						Total Marks
		R	U	A	An	E	C	
1	Thermodynamics and Thermal Systems	✓	✓					15
2	Fluid Machines and Manufacturing Processes	✓	✓					15
3	Introduction to Civil Engineering and Buildings	✓	✓					15
4	Building materials and Concepts of Intelligent and green buildings	✓	✓					15
This ToS shall be treated as a general guideline for students and teachers for distribution of marks.								

ASSESSMENT PATTERN	
Assessment	**Marks**
Continuous Internal Assessment	**40**
1. Internal Examination	**20**
2. Learning Activity	**15**
3. Regularity	**5**
4. Course Project	**-**
End Semester Examination	**60**
Total	**100**

MODEL QUESTION PAPER

FIRST SEMESTER B. TECH DEGREE (REGULAR) EXAMINATION, DECEMBER 2025 (2025 SCHEME)			
Course Code:	**B251902/CN100D**		
Course Name:	**INTRODUCTION TO MECHANICAL ENGINEERING & CIVIL ENGINEERING**		
Max. Marks	**60**	**Duration**:	2 hours 30 minutes
Common to CE & ME			

- ***Students should write answers to Questions of Part 1 between the pages 1 and 15 and answers to Questions of Part 2 between pages 16 and 30 of the answer booklet. No additional answer books / sheets will be provided.***
- ***No separate minimum marks are required to pass.***

PART 1- MECHANICAL ENGINEERING (30 MARKS)

PART 1- A

MODULE 1 &2

(Answer all questions. Each question carries 3 marks)

No.	*Question*	*CO*	*Marks*
1	Illustrate the different components of a CRDI system with the help of a diagram.	CO1	(3)
2	Draw the layout of central AC system.	CO2	(3)
3	Compare helical and bevel gears.	CO3	(3)
4	Differentiate between up milling and down milling.	CO4	(3)

PART 1- B

MODULE 1 &2

(Answer any one full question from each module, each question carries 9 marks)

No.		*Question*	*CO*	*Marks*
MODULE I				
5	a)	A thermodynamic consultant must select an ideal heat engine for a power plant operating between specified temperatures. What theoretical cycle, operating reversibly between these two thermal reservoirs, should the consultant choose as the ultimate benchmark for maximum possible efficiency. Draw the PV and TS diagram of the same?	CO1	(3)
	b)	Derive an equation for the efficiency of Carnot cycle.	CO1	(6)
OR				
6	a)	Distinguish between 2 stroke and 4 stroke SI engines.	CO1	(5)
	b)	Outline the various processes and working of the theoretical thermodynamic cycle on which a domestic refrigerator works.	CO2	(4)
MODULE II				
7	a)	List any 3 classifications of hydraulic turbines along with the basis of the classification.	CO3	(3)
	b)	Discuss the working of reciprocating pump with the help of a diagram.	CO3	(6)
OR				
8	a)	Give a comparison between brazing and soldering.	CO4	(4)
	b)	Briefly explain about any 5 lathe operations.	CO4	(5)

PART 2 - CIVIL ENGINEERING (30 MARKS)

PART 2 - A

MODULE 3 & 4

(Answer all questions. Each question carries 3 marks)

No.	*Question*	*CO*	*Marks*
1	Describe any three relevance of Civil Engineering in the overall infrastructural development of the country.	CO5	(3)
2	Identify the constituent materials of cement concrete and explain their basic functions.	CO6	(3)
3	Enumerate the uses of any two types of cement in construction work.	CO6	(3)
4	Explain the concept of a green building.	CO7	(3)

PART 2- B

MODULE 3 & 4

(Answer any one full question from each module, each question carries 9 marks)

No.		*Question*	*CO*	*Marks*
MODULE III				
5	a)	A plot in a Municipal area is to be used for a residential building construction. Which building bye-laws to be followed and also explain its relevance.	CO5	(4)

	b)	Discuss the major disciplines of Civil Engineering and their contributions.	CO5	(5)
OR				
6	a)	"The decision to demolish the flats in Maradu was influenced by the laws pertaining to the Coastal Regulation Zone (CRZ)". Discuss this statement.	CO5	(4)
	b)	Enumerate the key considerations in selecting a site for a residential building.	CO5	(5)
MODULE IV				
7	a)	Describe the first-class bricks and explain their uses.	CO6	(3)
	b)	How do the core components contribute to the overall performance of intelligent building?	CO7	(6)
OR				
8	a)	Select any two structural steel sections suitable for use as beams in a building and explain their other applications in construction.	CO6	(3)
	b)	Discuss the wastewater management systems in residential green buildings.	CO7	(6)

****

COURSE DESCRIPTION							
REGULATION	**2025**	**L-T-J-P-S**	**2-1-0-2-3**	**VERSION**	**25/1**	**CREDITS**	**4**
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work)							

COURSE CODE	COURSE NAME	COURSE CATEGORY
B251904/CN110E	**PROGRAMMING IN PYTHON**	**ESE**
PRE-REQUISITE		
Nil		

PREAMBLE

This course introduces students to the fundamentals of computational thinking and problem-solving using Python programming. It emphasizes the systematic development of algorithms through pseudocode and flowcharts before translating them into Python programs. Students gain proficiency in Python programming constructs, functions, recursion, modular programming, and data structures while developing the ability to design, implement, test, and debug programs. The course also provides an introductory understanding of major algorithm design paradigms, enabling students to build efficient and structured solutions to real-world computational problems.

RATIONALE

- Develop computational thinking and problem-solving skills through algorithm design and structured programming.
- Equip students with the ability to design solutions using pseudocode, flowcharts, and Python programming.
- Build proficiency in Python programming concepts, including functions, recursion, modular programming, and data structures.
- Introduce fundamental algorithm design paradigms for solving computational problems efficiently.
- Prepare students for advanced computing courses and real-world software development applications.

COMPETENCY STATEMENT/s

CC1: Apply the basic engineering concepts to solve near to real-life engineering problems
CC2: Demonstrates proficiency in the Python programming language

CO	CO Statement	Cognitive (C)	Psychomotor (P)	Affective (A)
1	**Interpret** problem-solving strategies by using computing as a model for addressing near real-world problems.	U	M	Rs
2	**Develop** clear and accurate models, such as algorithms, pseudocode, and flowcharts, to represent the problem by articulating it before attempting to solve it.	A	M	Rs
3	**Apply** the essential python programming skills, to translate the algorithmic model into executable program.	A	M	Rs
4	**Identify** systematic approaches and problem-solving strategies for computational problems.	A	M	Rs

TEACHING AND ASSESSMENT SCHEME

Teaching Scheme / Week					Hours / Semester	Credit	Examination Scheme						
							Theory			Practical			Total
L	**T**	**J**	**P**	**S**	**120**	**C**	**CIA**	**ESE**	**Total**	**CIA**	**ESE**	**Total**	
2	1	0	2	3		4	25	60	85	15	0	15	100

***L**: Lecture (One unit is of one-hour duration), **T**: Tutorial (One unit is of one-hour duration), **P**: Practical (One unit is of one-hour duration), **J**: Project (One unit is of one-hour duration), **S**: Self-Learning & Team Work (One unit is of one-hour duration), **CIA**: Continuous Internal Assessment, **ESE**: End Semester Examination*

SYLLABUS (Major Topics)			
Module	Title	Major Topics	Hrs
1	Foundations of Problem-Solving and Python Basics	Problem-Solving Strategies, The Problem-Solving Process, Essentials of Python Programming	10
2	Algorithm Design with Pseudocode and Flowcharts	Pseudocode, Flowcharts	10
3	Modular Problem-Solving with Python: Control Structures to Recursion	Selection and Iteration, Decomposition and Modularization, Recursion	13
4	Fundamental Computational Approaches to Problem-Solving	Divide-and-Conquer Approach, Dynamic Programming Approach, Greedy Algorithm Approach	12

Sl. No	**Self-learning / Team Work Description**
1	Pre-Lab Practical Learning
2	Case study: Pick simple problems (e.g., finding prime numbers) document steps: understanding, model, algorithm, coding, testing.
3	Group activity: Each team takes a real-world scenario (e.g., ATM withdrawal process, online shopping checkout) and develops pseudocode with sequencing, selection, and repetition.
4	Compare recursive vs iterative solutions for factorial & Fibonacci. Trace recursion using call-stack diagrams.
5	Study simple brute-force problems: padlock, password guessing. Write small brute-force code (e.g., linear search).

SUGGESTED LEARNING RESOURCES

Text Book			
Sl. No.	Title of Book	Author	Publication
1.	Problem solving & programming concepts	Maureen Sprankle, Jim Hubbard	Pearson
2.	How to Solve It: A New Aspect of Mathematical Method	George Pólya	Princeton University Press

Reference			
Sl. No.	Title of Book	Author	Publication
1	Creative Problem Solving: An Introduction	Donald Treffinger., Scott Isaksen, Brian Stead-Doval	Prufrock Press
2	Psychology (Sec. Problem Solving.)	Spielman, R. M., Dumper, K., Jenkins, W., Lacombe, A., Lovett, M., & Perlmutter, M	H5P Edition
3	Computational Thinking: A Primer for Programmers and Data Scientists	G Venkatesh Madhavan Mukund	Mylspot Education Services Pvt Ltd
4	Computer Arithmetic Algorithms	Koren, Israel	AK Peters/CRC Press

Web Resource / Virtual Lab	
1.	https://opentextbc.ca/h5ppsychology/chapter/problem-solving/
2.	https://onlinecourses.nptel.ac.in/noc21_cs32/preview

DETAILED SYLLABUS								
Module	**Title**	**Topic**	**Mode of Delivery**	**CO**	**Learning Domain**			**Hrs**
					C	**P**	**A**	
1	Foundations of Problem-Solving and Python Basics	**Problem-solving strategies** – definition, importance, trial & error, heuristics, means-ends analysis, backtracking (working backward)	L	1	U	M	Rs	2
		The problem-solving process – computer as a model of computation, understanding the	L,T	1	U	M	Rs	3,2

		problem, formulating a model, developing an algorithm, writing the program, testing & evaluating the solution						
		Essentials of Python programming – variables, numeric and string data types, math module, Python Standard Library, I/O (print, input), operators & precedence	L,T	1	U	M	Rs	2,1
		Case study: Pick simple problems (e.g., prime numbers) and document steps (understanding, model, algorithm, coding, testing)	S	1	U	M	Rs	15
2	Algorithm Design with Pseudocode and Flowcharts	**Pseudocode Representation** – meaning & definition, reasons for using pseudocode, constructs of pseudocode (sequencing, selection – if-else, case structure; repetition – for, while, repeat-until loops)	L	2	A	M	Rs	1
		Sample problems using pseudocode – evaluate expression (d=a+b*c), simple interest, larger of two numbers, smallest of three numbers, grade computation (KTU scale), numbers 1–50 in descending order, sum of n numbers (all loop types), factorial, largest of n numbers (more may be added)	L,T	2	A	M	Rs	2,2
		Flowcharts – symbols: start/end, arithmetic operation, I/O, decision, module call, loop (hexagon), flow-lines, connectors (on-page & off-page)	L	2	A	M	Rs	2
		Flowcharts for sample problems – construct diagrams for problems listed earlier (expression evaluation, interest, factorial, largest number, etc.); use of tools like RAPTOR suggested	L,T	2	A	M	Rs	1,2
		Self-learning – Group activity: Each team takes a real-world scenario (e.g., ATM withdrawal process, online shopping checkout) and develops pseudocode with sequencing, selection, and repetition	S	2	A	M	Rs	10
3	Modular Problem-Solving with Python: Control Structures to Recursion	**Selection and iteration using Python** – if-else, elif, for loop, range, while loop	L	3	A	M	Rs	2
		Sequence data types in Python – list, tuple, set, strings, dictionary	L	3	A	M	Rs	1
		Creating and using arrays in Python (using NumPy library)	L	3	A	M	Rs	1
		Decomposition and modularization – problem decomposition as a strategy for solving complex problems, modularization, motivation for modularization	L	3	A	M	Rs	2

		Functions in Python – defining & using functions, functions with multiple return values. The idea should be demonstrated using Merge Sort and the problem of returning the top three integers from a list of n ≥ 3 integers (examples). (Not limited to these exercises; more can be worked out if time permits).	L,T	3	A	M	Rs	1,2
		Recursion – definition, reasons for using recursion, the call stack, recursion and the stack, avoiding circularity in recursion	L	3	A	M	Rs	1
		Sample recursive problems – finding nth Fibonacci number, GCD of two integers, factorial of a positive integer, adding two positive integers, sum of digits of a positive number (Not limited to these exercises; more can be worked out if time permits).	L,T	3	A	M	Rs	1,2
		Self-learning: Compare recursive vs iterative solutions for factorial & Fibonacci; trace recursion using call-stack diagrams	S	3	A	M	Rs	10
4	Fundamental Computational Approaches to Problem-Solving	**Brute-force Approach** – Introductory diagrammatic/algorithmic explanation (analysis not required). Example: Padlock, Password guessing	L	4	A	M	Rs	2
		Divide-and-Conquer Approach– Introductory diagrammatic/ algorithmic explanation (analysis not required). Example: The Merge Sort Algorithm. Advantages of Divide and Conquer Approach. Disadvantages of Divide and Conquer Approach	L	4	A	M	Rs	2
		Dynamic Programming Approach – introductory diagrammatic/algorithmic explanation (analysis not required). Example: Fibonacci series. Recursion vs Dynamic Programming	L,T	4	A	M	Rs	1,1
		Greedy Algorithm Approach – Introductory diagrammatic /algorithmic explanation (analysis not required). Example: Given an array of positive integers each indicating the completion time for a task, find the maximum number of tasks that can be completed in the limited amount of time you have. Motivations for the Greedy Approach. Characteristics of the Greedy Algorithm. Greedy Algorithms vs Dynamic Programming	L,T	4	A	M	Rs	2,2

		Randomized Approach – Introductory diagrammatic/ algorithmic explanation (analysis not required). Example: Coupon Collector Problem – A company selling jeans gives a coupon for each pair of jeans. There are n different coupons. Collecting n different coupons gives you a free pair. How many jeans do you expect to buy before getting a free one?	L,T	4	A	M	Rs	1,1
		Self-learning – Study simple brute-force problems: padlock, password guessing. Write small brute-force code (e.g., linear search).	S	4	A	M	Rs	10

LAB COMPONENT DESIGN					
	Objectives	**CO**	**Learning Domain**		
			C	P	A
1	To practice basic syntax, input/output, and simple execution in Python	3	A	M	Rs
2	To understand and apply different primitive data types in Python	3	A	M	Rs
3	To practice arithmetic operators and precedence in Python	3	A	M	Rs
4	To familiarize string operations and indexing	3	A	M	Rs
5	To understand built-in libraries and formatting	3	U	M	Rs
6	To apply data structures and library usage	3	A	M	Rs
7	To apply selection control structure	3	A	M	Rs
8	To apply formulas and I/O	3	A	M	Rs
9	To practice nested iteration and control flow	3	A	P	Rs
10	To apply iteration and conditions with efficiency	3	A	P	Rs
11	To apply recursion for mathematical problems	3	A	P	Rs
12	To practice recursion basics	3	A	P	Rs
13	To strengthen recursive algorithm design	3	A	P	Rs
14	To apply recursion for number theory problems	3	A	P	Rs
15	To apply modularization and conditionals	3	A	Ar	V
16	To understand modular programming and reuse	3	A	Ar	V
17	To apply modularization by selective import of functions	3	A	Ar	V
18	To apply string validation logic	4	A	P	Rs

TABLE OF SPECIFICATIONS (ToS) (ESE Question Paper Design) (Use √)								
Module	Module Title	Distribution of Marks (RBL)						Total Marks
		R	U	A	An	E	C	
1	Foundations of Problem-Solving and Python Basics	-	✓	-	-	-	-	15
2	Algorithm Design with Pseudocode and Flowcharts	-	✓	✓	-	-	-	15
3	Modular Problem-Solving with Python: Control Structures to Recursion	-	✓	✓	-	-	-	15
4	Fundamental Computational Approaches to Problem-Solving	-	✓	✓	-	-	-	15
This ToS shall be treated as a general guideline for students and teachers for distribution of marks.								

ASSESSMENT PATTERN		
Assessment		**Marks**
Continuous Internal Assessment		40
1	Internal Examination	20
2	Continuous Lab Assessment	5

3	Learning Activity	
4	Regularity	5
5	Course Project	
6	Lab Examination	10
End Semester Examination		60
Total		**100**

MODEL QUESTION PAPER

			Total Pages: .....
Register No.:	.....	Name:	.....

(AN AUTONOMOUS COLLEGE AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANATHAPURAM)

FIRST SEMESTER B. TECH DEGREE (REGULAR) EXAMINATION, DECEMBER 2026 (2025 SCHEME)			
Course Code:	B251904/CN110E		
Course Name:	PROGRAMMING IN PYTHON		
Max. Marks	**60**	**Duration:**	**2 hours 30 minutes**
CE, ME, EEE, VLSI			
Use of Data Book / IS codes, etc to be specified by the question paper setter			

PART A

(Answer all questions. Each question carries 3 marks)

No.	***Question***	***CO***	***Marks***
1	With the help of a suitable example, explain the membership operator in Python.	1	3
2	List the operator precedence rules supported in Python.	1	3
3	Draw a flowchart to find and display the factorial of a given number.	2	3
4	Develop the algorithm, flowchart, and pseudocode to find the sum of 'n' numbers entered by the user.	2	3
5	Compare and contrast pre-test and post-test looping constructs in Python with examples.	3	3
6	Write a Python program to read two matrices and display its sum.	3	3
7	Compare and contrast the greedy approach and dynamic programming approach.	4	3
8	Write an algorithm to calculate the nth Fibonacci number using the dynamic programming approach.	4	3

PART B

(Answer any one full question from each module, each question carries 9 marks)

No.		***Question***	***CO***	***Marks***
MODULE I				
9	a)	Develop a program that finds all prime numbers up to a given integer n. Elaborate the steps involved in computer-based problem-solving process to solve this problem.	1	6
	b)	Let A =127, B = 63 Predict the output of the expressions: A & B, A | B and A >> 3.	1	3
OR				
10	a)	A delivery driver in a new city does not know all the streets but chooses routes based on experience, such as avoiding busy roads and taking familiar turns. Which problem-solving strategy is the driver using? Discuss how this strategy helps in making quick decisions and where it might lead to errors.	1	6
	b)	You are given the area of a circle. Write a Python program using the math module to calculate the radius of the circle.	1	3
MODULE II				
11	a)	Develop the algorithm, flowchart, and pseudocode to find the reverse of a number and to check if it is palindrome or not.	2	6
	b)	Illustrate how a switch-case statement can be represented in pseudocode.	2	3
OR				
12	a)	You visit a shop to buy a new mobile. During the festive season, the shop offers a 10% discount on all mobiles. Additionally, customers can exchange their old mobiles for a flat price of ₹1000. Draw a flowchart to input the original price of the mobile and print its selling price. Note that all customers may not have an old mobile for exchange. Also prepare algorithm and pseudocode for the given problem.	2	6
	b)	Illustrate how a loop or repetition can be represented in a flowchart.	2	3
MODULE III				

13	a)	Create a telephone directory using a dictionary, where the name of the individual is the key and the telephone number is the value. Write a Python program that allows the user to perform the following operations: 1. Add a contact – add a new name and phone number. 2. Update a contact – modify the phone number of an existing contact. 3. Delete a contact – remove an existing contact. 4. Search for a contact – retrieve the phone number by name. 5. Display all contacts. 6. Exit the program. Use a menu-driven approach.	3	5
	b)	Write a program that accepts the lengths of three sides of a triangle as inputs. The program should output whether or not the triangle is a right-angled triangle (recall the Pythagorean theorem). Implement the solution using functions.	3	4
		OR		
14	a)	A person deposits a fixed amount every year into a retirement account that earns compound interest. Given the initial deposit, annual contribution, interest rate, and number of years, write a recursive program to calculate the total savings at retirement. Do not use loops or built-in financial functions.	3	5
	b)	Sarah is a data analyst working for a marketing agency. She is given a list of customer ages from a recent survey conducted by her company. The list contains a mix of integers representing ages and some strings due to data entry errors. Sarah needs to clean the data by removing erroneous entries (non-integer values) and then analyze the data to find: 1. The youngest and oldest customers. 2. The average age of the customers. 3. The most common age in the list.	3	4
		MODULE IV		
15	a)	With the help of a neat diagram, demonstrate the merge sort algorithm to sort the following set of numbers: [20, 30, 10, 7, 23, 17, 100, 2].	4	5
	b)	You are organizing a security system for your office where each employee has a 4-digit PIN code for access. Due to a system malfunction, you forgot the correct PIN but know that it is a 4-digit number (0000–9999). Write an algorithm to determine the correct PIN using a brute-force approach. Explain the logic behind trying all possible combinations.	4	4
		OR		
16	a)	A company selling coffee gives a sticker with every cup purchased. There are '*n*' different stickers in total. Collecting all '*n*' different stickers earns you a free cup of coffee. Using a randomized approach, design an algorithm to estimate how many cups of coffee you need to buy on average to collect all '*n*' stickers.	4	5
	b)	You want to watch as many movies as possible at a film festival. Each movie has a start and end time, and you can only watch one at a time. Given an array of movies with their start and end times, write an algorithm to find the maximum number of movies you can watch in full.	4	4

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COURSE DESCRIPTION							
REGULATION	**2025**	**L-T-J-P-S**	**1-0-0-1-0**	**VERSION**	**25/1**	**CREDITS**	**1**
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work)							

COURSE CODE	COURSE NAME	COURSE CATEGORY
B251909/CN910K	HEALTH & WELLNESS	HMT
PRE-REQUISITE		
NIL		

PREAMBLE

This course aims to develop awareness and practice of holistic well-being among engineering students. It emphasizes the importance of physical activity, mental health, stress management, nutrition, and lifestyle choices in enhancing personal and professional effectiveness. Through practical strategies and wellness activities, students will learn to manage academic and life stress, maintain physical fitness, and build emotional resilience. The course nurtures habits that support lifelong health, enabling students to perform optimally in demanding engineering environments while promoting a balanced and sustainable lifestyle.

RATIONALE

Engineering education is intellectually demanding and often associated with high levels of academic stress, sedentary routines, and irregular lifestyles, which can negatively impact students' physical and mental well-being. This course addresses these challenges by promoting awareness and adoption of healthy lifestyle practices through physical activity, stress management, emotional regulation, and balanced nutrition. By integrating wellness into the engineering curriculum, the course aims to enhance students' personal resilience, concentration, emotional stability, and overall quality of life. The knowledge and habits developed through this course support long-term professional effectiveness, reduce burnout, and foster a culture of well-being, which is essential for sustaining productivity and innovation in engineering practice

COMPETENCY STATEMENT/s

Demonstrate a commitment to a healthy lifestyle through regular physical activity and avoidance of addictive substances to promote holistic wellness.

CO	CO Statement	Cognitive (C)	Psychomotor (P)	Affective (A)
CO1	Explain the importance of physical activity in maintaining the human metabolic system	U		Re
CO2	Practice life style management strategies to improve mental health and wellness.	U	M	Rs
CO3	Practice healthy life style through regular physical activities and abstaining from addictive substances	U	M	Ch

TEACHING AND ASSESSMENT SCHEME

Teaching Scheme / Week					Hours / Semester	Credit	Examination Scheme						
							Theory			Practical			Total
L	T	J	P	S		C	CIA	ESE	Total	CIA	ESE	Total	
1			1		30	1	30		30	20		20	50

***L**: Lecture (One unit is of one-hour duration), **T**: Tutorial (One unit is of one-hour duration), **P**: Practical (One unit is of one-hour duration), **J**: Project (One unit is of one-hour duration), **S**: Self-Learning & Team Work (One unit is of one-hour duration), **CIA**: Continuous Internal Assessment, **ESE**: End Semester Examination*

SYLLABUS (Major Topics)

Module	Title	Major Topics	Hrs
1	Physical well-being and fitness.	Human Body Systems. Quantifying Physical Activity Energy Expenditure. FITT principle.	
2	Mental health awareness & balanced diet	Understanding mental health addiction and related issues resources for mental wellness.	
3	Health and wellness through	Manage common hypokinetic diseases and disorders. Meaning, Aims and objectives of yoga. Understanding on substance abuse and addiction.	

	lifestyle management		
4	First Aid Essentials	First aid and principles of first aid.	

Sl. No	**Self-learning / Team Work Description**
1	Team activities: Group presentations (Sample topics: Addiction /mental health awareness and suicide prevention,Nutrition concepts, Popular dietary trends, Nutritional needs at different life stages).

SUGGESTED LEARNING RESOURCES

Text Book			
Sl. No.	Title of Book	Author	Publication
1	Foundations of Nutrition	Bhavana Sabarwal	Commonwealth Publishers 1999
2	Anatomy and physiology in health and illness.	Ross and Wilson	Waugh, A., & Grant, A. 2022
3	The Mental Health Handbook A Cognitive Behavioural Approach	Trevor Powell	Routledge 2009

Reference			
Sl. No.	Title of Book	Author	Publication
1	Fit to be Well Essential Concept.	Thygerson, A.,Thyge son , S.M.,& Thygerson, J. S.	Jones & Bartlett Learning 2018
2	Introduction to physical education, fitness, and sports	Siedentop, D., & Van der Mars, H.	Human kinetics. 2022
3	Substance Use Disorders. Manual for Physicians.	Lal,R.,& Ambekar,A. (2005).	National drug Dependence Treatment Centre , New Delhi 2005
4	The exercise health connection-how to reduce your risk of disease and other illnesses by making exercise your medicine.	Nieman, D. C., & White, J. A	Public Health 1998
5	ACSM's resource manual for guidelines for exercise testing and prescription.	Lippincott Williams & Wilkins.	American College of Sports Medicine. 2012
6	Exercise Physiology: energy, nutrition and human performance.	Katch, F. I., Katch, V. L., & McArdle, W. D.	Lippincott Williams & Wilkins 2010
7	Positive Psychology for Improving Mental Health; Well-Being.	Dr.Geetika Patnaik	Notion Press 2019

Web Resource	
1	https://www.nutrition.gov/#:~:text=Nutrition.gov%20is%20powered%20by,you%20make%20healthful%20eating%20choices
2	https://www.ncbi.nlm.nih.gov/pmc/artic1es/PMC2879108/
3	https:/ /yoga.ayush.gov.in/
4	https:/ /www.mindful.org/

DETAILED SYLLABUS

Module	**Title**	**Topic**	**Mode of Delivery**	**CO**	**Learning Domain**			**Hrs**
					C	**P**	**A**	
1	Human Body system	Human Body Systems related to Physical activity and its functions: Respiratory System - Cardiovascular System. Musculoskeletal System and the Major Muscle groups of the Human Body.	L	CO1	U		Re	1

		Quantifying Physical Activity Energy Expenditure and Metabolic equivalent of task (MET). Exercise Continuum: Light- intensity physical activity, Moderate intensity physical activity, Vigorous -intensity physical activity.	L	CO1	U		Re	1
		Defining Physical Activity, Aerobic Physical Activity, Anaerobic Physical Activity,Exercise and Health-Related Physical Fitness. FITT principle to design an Exercise programme.	L	CO1	U		V	1
		Components of Health-related Physical Fitness: - Cardiorespiratory Fitness- Muscular strength- Muscular endurance- Flexibility-Body composition.	L	CO1	U		Re	1
2	Health & well ness	Concept of Health and Wellness: Health and wellness differentiation, Factors affecting health and wellness.Mental health and Factors affecting mental health Sports and Socialization : Sports and character building - Leadership through Physical Activity and Sports.	L	CO2	U		V	2
		Diet and nutrition: Exploring Micro and Macronutrients: Concept of Balanced diet Carbohydrate & the Glycemic Index Animal & Plant - based Proteins and their Effects on Human Health Dietary Fats & their Effects on Human Health Essential Vitamins and Minerals.	L	CO2	U		Rs	2
3	Modern Life styles & diseases	Life style management strategies to prevent manage common hypokinetic diseases and disorders-Obesity Cardiovascular diseases - Diabetes -Osteoporosis - Musculoskeletal disorders (e.g., osteoarthritis, Low back pain, Kyphosis,lordosis,flat-foot, Knock knee.	L	CO2	U		Re	2
		Meaning, Aims and objectives of yoga Classification and importance of Yogic Asanas (Sitting, Standing,lying) Pranayama and Its Types- Active Lifestyle and Stress Management LThrough Yoga.	L	CO2	U		O	1
		Understand on substance abuse and addiction psychoactive substance &its ill effects -alcohol opioids- cannabis -sedative - cocaine- other stimulants including caffeine - hallucinogens- tobacco - volatile solvents.	L	CO2	U		O	1
4	First Aid	First aid and principles of First Aid: Primary survey: ABC (Airway, Breathing, Circulation). Qualities of a Good First Aider First aid measures for:Cuts,scrapes,Bruises , Sprains,Strains,Fractures, Burns & Nosebleeds.	L	CO3	U		Rs	1

		First Aid Procedures: Cardiopulmonary Resuscitation (CPR) Heimlich Maneuver - Applying a sling Sports injuries: Classification (Soft Tissue Injuries -Abrasion, Contusion, Laceration, Incision, Sprain & Strain).	L	CO3	U		Rs	1

INTERNAL EVALUATION DETAILS

1. LEARNING ACTIVITY

Activity	**Criteria**	**Split up mark**		**Total**
Presentation	Content and quality of presentation (can be assessed on knowledge & clarity of information)	12	Excellent 11-12 Good 6 -10 Need to improve <5	20
	Communication & Interaction	6	Excellent 5-6 Good 3-4 Need to improve <2	
	Time management	2	On time -2 Exceeded Time- <1	

2. ACTIVITY EVALUATION

Activity - 1

Scoring for V Sit Reach Test for Males

Level	**Benchmark Score**	**Measurement**
1	1	<11
2	2	12-13
3	3	14-17
4	3.5	18-19
5	4	20-21
6	4.5	22
7	5	23

Scoring for V Sit Reach Test for Females

Level	**Benchmark Score**	**Measurement**
1	1	<14
2	2	15-16
3	3	17-19
4	3.5	20-21
5	4	22
6	4.5	23
7	5	>23

Activity - 2

Scoring for Partial Curl Up - 30 seconds Test for Males

Level	Benchmark Score	Numbers
1	1	<25
2	2	25-30
3	3	31-34
4	3.5	35-38
5	4	39-43
6	4.5	44-49
7	5	>50

Scoring for Partial Curl Up - 30 seconds Test for Females

level	Benchmark Score	Numbers
1	1	<18
2	2	18-24
3	3	25-28
4	3.5	29-32
5	4	33-36
6	4.5	37-43
7	5	>43

Activity - 3

Scoring for Push Ups for Male

level	Benchmark Score	Numbers
1	1	<4
2	2	4-10
3	3	11-18
4	3.5	19-24
5	4	25-30
6	4.5	31-36
7	5	>37

Scoring for Modified Push Ups for Female

level	Benchmark Score	Numbers
1	1	0-1
2	2	2-5
3	3	6-10
4	3.5	11-15
5	4	14-19
6	4.5	20-23
7	5	>24

Activity – 4

Scoring for 2Km Run/walk for Male

Level	Benchmark Score	Minutes: Seconds
1	1	>11:30-12:00
2	2	10:31-11:29
3	3	9:31-10:30
4	3.5	8:31-9:30
5	4	7:31-8;30
6	4.5	7:00-7:30
7	5	>6:59

Scoring for 2Km Run/walk for Female

Level	Benchmark Score	Minutes: Seconds
1	1	13:31-14:00
2	2	12:31-13:30
3	3	11;31-12:30
4	3.5	10:3-11:30
5	4	9:31=10:30
6	4.5	8:31-9:30
7	5	<8:30

ASSESSMENT PATTERN		
Assessment		**Marks**
Continuous Internal Assessment		50
1	Internal Examination	-
2	Learning Activity	20
3	Activity Evaluation	20
4	Regularity	10
End Semester Examination - Theory		
Total		**50**

COURSE DESCRIPTION							
Regulation	**2025**	**L-T-J-P-S**	**0-0-0-2-0**	**Version**	**25/1**	**Credits**	**1**
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work)							

Course Code	Course Name	Course Category
B251902/CN130U	**ENGINEERING WORKSHOP**	**ESL**
Pre-requisite		
NIL		

PREAMBLE

This laboratory course provides hands-on exposure to fundamental workshop practices and basic civil engineering construction activities. Students develop practical skills in carpentry, fitting, foundry, sheet metal work, assembly, masonry, surveying, and material assessment while emphasizing safety, precision, quality control, and professional work ethics.

RATIONALE

- To develop basic workshop and construction skills through hands-on practice in manufacturing, masonry, material testing, and surveying, enabling students to understand common engineering tools, processes, and quality practices.
- To cultivate safe working habits, teamwork, craftsmanship, and problem-solving abilities while introducing students to practical construction techniques, material selection, and field measurement essential for multidisciplinary engineering practice.

COMPETENCY STATEMENT/s

To develop practical skills in civil and mechanical engineering

COURSE OUTCOMES (CO)

Course Outcomes (CO): At the end of this course, learners will be able to:

CO	CO Statement	Cognitive (C)	Psychomotor (P)	Affective (A)
CO1	Identify workshop operations and instruments in accordance with the material and object.	A		Re
CO2	Use appropriate tools to make simple models.	U	I	Rs
CO3	Conduct the assembly and disassembly of various machine components.	U	I	Rs
CO4	Identify the different machines tools in shop floor and their applications.	U		Rs
CO5	Understand the field tests to assess the qualities of bricks and cement	U	M	Rs
CO6	Practice the construction of a wall specimen in English and Flemish bond and quantity estimation	A	M	Rs
CO7	Demonstrate the setting out and area calculation of a residential building using thread, tape and water tube levelling	U	M	Rs
CO8	Identify the market rates of conventional construction materials.	U		Rs

Cognitive (Revised blooms Level): *- **R**: Remember; **U**: Understand; **A**: Apply; **An**: Analyse; **E**: Evaluate; **C**: Create*
Psychomotor Domain (Dave's): *- **I**-Imitation, **M**-Manipulation, **P**-Precision, **Ar**-Articulation, **N**-Naturalisation*
***Affective (Krathwohl)**: - **Re**-Receiving, **Rs**-Responding, **V**-Valuing, **O**-Organization, **Ch**-Characterization*

SYLLABUS (Major Topics)	
Major Topics	Hrs
General: Introduction to workshop practice, Safety precautions, Shop floor ethics, and Basic First Aid knowledge. Study of mechanical and measurement tools, components and their applications: (a) Tools: screw drivers, spanners, Allen keys, cutting pliers etc. and accessories (b) bearings, seals,	2

O-rings, circlips, keys etc.(c)Vernier Calipers, Height Gauge, Depth Gauge, Micrometers, Bevel Protractor etc	
Carpentry: Understanding carpentry tools and knowledge of at least one model 1. Cross lap joint 2. T –Lap joint	2
Foundry: Understanding of foundry tools and knowledge of at least one model 1.Bench Moulding 2. Floor Moulding	2
Sheet Metal: Understanding sheet metal working tools and knowledge of at least one model 1. Prismatic shaped job from sheet metal 2. Conical shape	2
Fitting: Understanding the tools used for fitting and knowledge of at least one model 1. Square Joint 2. V- Joint	2
Assembly: Demonstration only Dissembling and assembling of 1. Tail stock assembly 2.Cylinder and piston assembly	2
On-site quality assessment of brick and cement	2
Construct a 1 and 1 1⁄2 thick brick wall with a height of 50 cm and a minimum length of 60 cm using English bond. Check the verticality of the wall	2
Construct a 1 and 1 1⁄2 thick brick wall with a height of 50 cm and a minimum length of 60 cm using Flemish bond. Check the verticality of the wall	2
Estimate the number of different types of building blocks needed to construct the walls of a room measuring 2m x 3m, accounting for standard-sized doors and windows.	2
Setting out of a two-roomed building using thread, tape, and water tube levelling.	2
Measuring the area of a plot with an irregular boundary using a chain and cross staff	2
Conduct a market study to understand the types, prices, and general specifications of at least three materials available in the market (such as bricks, cement, aggregates, steel, plumbing items, fixtures.	Self-study

SELF-LEARNING / TEAM WORK		
Sl. No	Self-learning / Team Work Description	Hrs
1	Calculate the plinth area, carpet area and Floor Area Ratio (FAR) for a given plan of a residential building.	3

2	Workshop in Everyday Life”
	Instructions for Students
	• Choose one area from Carpentry, Foundry, Sheet Metal, Fitting, or Assembly.
	• Observe and document at least 3 real-life applications of the selected process or model.
	Example: Carpentry (T-lap joint) → Seen in furniture (chairs, tables, wooden doors).
	Sheet Metal (Cylindrical shape) → Seen in water tanks, kitchen utensils.
	Fitting (Square joint) → Seen in frames, machine components.
	Assembly (Piston–Cylinder) → Seen in bike engines, pumps.
	• For each application, note down:
	  • Name of product / component
	  • Where it is used
	  • Why this joint/shape/process is chosen
	  • Possible modern alternatives (e.g., welding instead of carpentry joint).
	• Draw a neat sketch / take a photograph (if possible).
	• Prepare a 1–2-page handwritten report or a short PPT presentation.
	[Related to the syllabus topics – Carpentry, Sheet Metal, Fitting and Assembly]
		3

SUGGESTED LEARNING RESOURCES

Text Book			
Sl. No.	Title of Book	Author	Publication
1	Mechanical Workshop Practice	K C John	PHI Learning
2	Building Materials Engineering Materials	S K Duggal	New Age International
3	Indian Practical Civil Engineering Handbook	Khanna P.N	Engineers Publishers
4	Building Construction	Arora S.P and Bindra S.P	Dhanpat Rai Publications

Reference			
Sl. No.	Title of Book	Author	Publication
1	Elements of Workshop Technology Vol-1-	S K Hajra Choudhury A K Hajra Choudhury	MPP Media Promoters and Publishers

	Manufacturing Processes	Nirjhar Roy	
2	Engineering Materials	S C Rangwala	Charotar Publishing House Pvt Limited

Web Resource	
1	http://nptel.ac.in/video.php?subjectId=105104101
2	https://www.nptelprep.in/courses/105102088/materials

PRACTICAL SYLLABUS

Topic	Objective	COs	Learning Domain			Hrs
			C	P	A	
Study of mechanical and measurement tools, components and their applications	General: Introduction to workshop practice, Safety precautions, Shop floor ethics, and Basic First Aid knowledge. Study of mechanical and measurement tools, components and their applications: (a) Tools: screw drivers, spanners, Allen keys, cutting pliers etc. and accessories (b) bearings, seals, O-rings, circlips, keys etc.(c)Vernier Calipers, Height Gauge, Depth Gauge, Micrometers, Bevel Protractor etc	CO1	U	I	Re	2
Carpentry	Carpentry: Understanding carpentry tools and knowledge of at least one model 1. T –Lap joint 2. Cross lap joint	CO2	U	I	Rs	2
Foundry	Foundry: Understanding of foundry tools and knowledge of at least one model 1.Floor Moulding 2. Core making	CO2	U	I	Rs	2
Sheet Metal	Sheet Metal: Understanding sheet metal working tools and knowledge of at least one model 1. Cylindrical shape 2. Conical shape 3. Prismatic shaped job from sheet metal	CO2	U	I	Rs	2
Fitting	Fitting: Understanding the tools used for fitting and knowledge of at least one model 1. Square Joint 2. V- Joint 3. Male and female fitting	CO4	U	I	Rs	2
Assembly	Assembly: Demonstration only Dissembling and assembling of 1. Cylinder and piston assembly 2. Tail stock assembly	CO3	U	I	Rs	2
On-site quality assessment of brick and cement	To assess the quality of bricks and cement at field	CO5	U	I	Rs	1
Construct a 1 and 1 1⁄2 thick brick wall with a height of 50 cm and a minimum length of 60 cm using English bond. Check the verticality of the wall	To construct 1 and 1½ brick thick walls in English bond and verify their verticality.	CO6	U	I	Rs	2
Construct a 1 and 1 1⁄2 thick brick wall with a height of 50 cm and a minimum length of 60 cm using Flemish bond. Check the verticality of the wall	To construct 1 and 1½ brick thick walls in Flemish bond and check their verticality.	CO6	U	I	Rs	2
Estimate the number of different types of building blocks needed to construct the walls of a room measuring 2m x 3m, accounting for standard-sized doors and windows.	To estimate the quantities of wall blocks for a 2 m × 3 m room, accounting for standard door and window openings.	CO6	U	I	Rs	2

Setting out of a two-roomed building using thread, tape, and water tube levelling	To set out a two-room building plan on the ground using thread, tape, and water tube levelling.	CO7	U	I	Rs	2
Measuring the area of a plot with an irregular boundary using a chain and cross staff	To measure the area of an irregular plot using a chain and cross staff	CO7	U	I	Rs	2
Conduct a market study to understand the types, prices, and general specifications of at least three materials available in the market (such as bricks, cement, aggregates, steel, plumbing items, fixtures, welding rods,	To study and compare the types, prices, and specifications of selected construction materials available in the market.	CO8	U	I	Rs	*Self-Study*

ASSESSMENT PATTERN		
Assessment Method		**Marks**
Continuous Internal Assessment		**100**
1	Continuous Lab Evaluation	60
2	End Semester Internal Examination	30
3	Regularity	10
4	Course Project	-
End Semester Examination		**-**
Total		**100**