MITS Kochi
Muthoot Institute of Technology and Science
(Autonomous)

B. TECH
CIVIL ENGINEERING
CURRICULUM & SYLLABUS

2025 REGULATION

B.Tech

CIVIL ENGINEERING

2025 REGULATION

CURRICULUM & SYLLABUS

CONTENTS

SEMESTER 1

CURRICULUM

SLOT	COURSE CATEGORY	COURSE CODE	COURSE NAME	L	T	J	P	S	C
A	BST	B250902/MA100A	Mathematics for Physical Science-1	3	1	0	0	2	3
B	BSE	B250902/PH110B	Physics for Physical Science	3	0	0	2	3	4
C	EST	B250902/CE100C	Engineering Mechanics	2	1	0	0	3	3
D	EST	B250902/CN100D	Introduction to Mechanical Engineering and Civil Engineering	4	0	0	0	4	4
E	ESE	B250903/CN110E	Programming in Python	2	1	0	2	3	4
K	HMT	B250908/LS900K	Life Skills and Professional Communication	1	1	0	0	0	1
U	ESL	B250902/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**	**25/0**	**Credits**	**3**
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work)							

Course Code	**Course Name**	**Course Category**
B250902/MA100A	**MATHEMATICS FOR PHYSICAL SCIENCE-1**	**BST**
Pre-requisite		
The basic knowledge in matrices and calculus.		

COURSE OBJECTIVES	
1	To equip students with the knowledge and skills to analyze and solve linear systems of equations using matrix methods, understand the concepts of linear independence and matrix rank, and apply eigenvalue and eigenvector techniques for matrix diagonalization in mathematical and engineering applications.
2	To equip students with analytical techniques for solving ordinary differential equations (ODEs), including both homogeneous and non-homogeneous equations using methods like undetermined coefficients and variation of parameters.
3	To explain the concept of Laplace Transform and its use in solving differential equations arise in engineering problems.
4	To develop the ability to represent functions as series using Taylor and Fourier methods, and to apply these expansions for analyzing and solving problems in science and engineering.

COMPETENCY STATEMENT (CC)	
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.

COURSE OUTCOMES (CO)

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

CO	CO Statement	CC Mapping	Cognitive (C)	Psychomotor (P)	Affective (A)
CO1	**Solve** linear systems of equations by applying the properties of matrices and vectors.	CC 1	A		Rs
CO2	**Solve** linear differential equations with constant coefficients by using various methods.	CC 1	U		Rs
CO3	**Apply** Laplace transform to find the solution of Initial value problem.	CC 1	A		Rs
CO4	**Determine** series expansion of the given functions using Taylor and Fourier series.	CC 1	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*

CO	Program Outcomes (PO) & Program Specific Outcomes (PSO) Correlation Matrix													
	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	2	2									1	1		
2	2	2									1	1		
3	2	2									1	1		
4	2	2									1	1		
Correlation [3 – High, 2 -Medium, 1 – Low]														

TEACHING AND ASSESSMENT SCHEME									
Teaching Scheme / Week					Credit	Hours / Semester	Examination Scheme		
							Theory		
L	T	J	P	S	C		CIA	ESE	Total
3	1	0	0	2	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	Linear Algebra	Linear systems of equations, Row echelon form and rank of a matrix, 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). **(Relevant topics from sections 2.1, 2.2, 2.7, 2.10,3.1,3.2,3.3)**	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)**	10
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

SELF-LEARNING / TEAM WORK		
Sl. No	Self-learning / Team Work Description	Hrs

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).**	9
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).**	9
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 modeled using a linear differential equation with constant coefficient, and solve it using Laplace Transform methods and using python **(2 hours)**.	9
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)**.	8

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=hWcuSXdZilZs5ZCs

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

Module	Topic	Mode of Delivery	CO	Learning Domain			Hrs
				C	P	A	
1	Linear systems of equations	L	CO1	U			1
	Row echelon form and rank of a matrix	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
	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			1
	Properties of eigenvalues of Symmetric matrix, Skew-symmetric matrix, Orthogonal Matrix	S	CO1	U			1
	Diagonalization of matrices	L	CO1	A			2
	Tutorial Problems	T	CO1	A		Rs	1
2	Solving non-homogeneous ODE using direct integration method	S	CO2	U			1
	Solving non-homogeneous ODE using variable separable method	S	CO2	U			1
	Solution of Homogeneous linear ODEs of second order with constant coefficients	L	CO2	U			2
	Tutorial Problems	T	CO2	U		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	U			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	U			2
	Tutorial Problems	T	CO2	U		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	U			2
	Tutorial Problems	T	CO2	U		Rs	1
3	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
	Dira 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	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	U			2
	Tutorial Problems	T	CO4	U		Rs	1
	Fourier series of 2l periodic functions	L	CO4	U			2
	Tutorial Problems	T	CO4	U		Rs	1
	Half range sine series expansion	L	CO4	U			1
	Half range cosine series expansion	L	CO4	U			2
	Tutorial Problems	T	CO4	U		Rs	1

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

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 Method	**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:	**B250902/ MA100A**		
Course Name:	**MATHEMATICS FOR PHYSICAL SCIENCE-1**		
Max. Marks	**60**	**Duration**:	2 hours 30 minutes
Common to CE & ME			

PART A

(Answer all questions. Each question carries 3 marks)

No.	*Question*	*CO*	*Marks*
1	Determine the row echelon form of the matrix $\begin{bmatrix}1 & 2 & 3\\2 & 4 & 6\\1 & 1 & 1\end{bmatrix}$ and hence evaluate its rank.	CO 1	(3)
2	If 2 is an eigen value of the matrix $\begin{bmatrix}3 & -1 & 1\\-1 & 5 & -1\\1 & -1 & 3\end{bmatrix}$, 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	Form an ordinary differential equation from the given basis: $x,\ xlnx$.	CO 2	(3)
5	Determine the inverse Laplace transform of the function $\frac{s+1}{s^2+2s+5}$.	CO 3	(3)
6	Find the Laplace transform of the function $f(t) = t^2e^{3t}$.	CO 3	(3)
7	Construct the half-range cosine series for $f(x) = e^x$ in $(0,1)$.	CO 4	(3)
8	Obtain the Fourier series representation of $f(x) = x^2 - 2$ for –2 < x < 2.	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)	Find the values of λ and μ so that the given system of equations $x + y + z = 6, x + 2y + 3z = 10, x + 2y + \lambda z = \mu$ has (i) No solution. (ii) Infinite solutions. (iii) Unique solution.	CO 1	(5)
	b)	Determine the eigenvalues and corresponding eigenvectors of the matrix $A = \begin{bmatrix}-2 & 2 & -3\\2 & 1 & -6\\-1 & -2 & 0\end{bmatrix}$.	CO 1	(4)
OR				

10	a)	Diagonalize the matrix $A = \begin{bmatrix} -1 & 2 & -2 \\ 2 & 4 & 1 \\ 2 & 1 & 4 \end{bmatrix}$.	CO 1	(5)
	b)	Test for consistency and solve the following system of equations using 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)	Find the general solution of $y'' + 4y = 8x^2$.	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)	Use variation of parameters to obtain the solution of the linear ordinary differential equation $y'' - 2y' + y = e^x lnx$.	CO 2	(4)
		MODULE III		
13	a)	Using Laplace transform, solve the differential equation $y'' + 5y' + 6y = e^{-t}, y(0) = 0, y'(0) = 1.$	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)	Using the convolution theorem, determine the inverse Laplace transform of the function $\frac{\omega}{s^2(s^2-\omega^2)}$.	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 $f(x) = \begin{cases} x\ ; 0 < x < 1 \\ 1-x\,; 1 < x < 2 \end{cases}$.	CO 4	(5)
	b)	The periodic function $f(x) = \|x\|$, 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 $f(x) = \begin{cases} -\pi\,; -\pi < x < 0 \\ x\,; 0 < x < \pi \end{cases}$ with period 2π. Find the Fourier series expansion of $f(x)$.	CO 4	(5)
	b)	Construct the half-range sine series for $f(x) = \sin(\frac{\pi x}{l})$ 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**	**25/0**	**Credits**	**4**
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work)							

Course Code	Course Name	Course Category
B250902/PH110B	**PHYSICS FOR PHYSICAL SCIENCE**	**BSE**
Pre-requisite		
Basics of optics, basics of dual nature of matter and radiation, basics of oscillations & waves.		

COURSE OBJECTIVES	
1	To develop a strong foundation in fundamentals of physics employed in physical science disciplines.
2	To equip students with practical knowledge that complements their theoretical studies and develop their ability to create practical applications and solutions in engineering based on their understanding of physics.

COMPETENCY	
CC1	Demonstrate ability to apply the principles of optics, lasers and fiber optics to solve basic problems in photonics and communication systems.
CC2	Demonstrate ability to apply the principles of waves, acoustics and quantum mechanics to solve basic problems in ultrasonics and atomic structure.

COURSE OUTCOMES

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

CO	CO Statement	CC Mapping	Cognitive (C)	Psychomotor (P)	Affective (A)
CO1	Apply the principles of lasers and optical fibers in an optical communication system.	CC1	A	M	Rs
CO2	Apply interference and diffraction phenomena in natural optical processes and optical instruments.	CC1	A	M	Rs
CO3	Apply the Schrodinger equation to a one-dimensional quantum mechanical system for finding energy levels in such systems.	CC2	A		
CO4	Apply principles of wave motion in acoustics of buildings and ultrasonic diffractometer	CC2	A	M	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*

CO	Program Outcomes & Program Specific Outcomes Correlation Matrix	
	PO	**PSO**

	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	2	2			1		2	2	2		2	1		
2	2	2			1		2	2	2		2	1		
3	2	2			1		2	2	2		2	1		
4	2	2			1		2	2	2		2	1		
Correlation [3 – High, 2 -Medium, 1 – Low]														

TEACHING AND ASSESSMENT SCHEME

Teaching Scheme / Week					Credit	Hours / Semester	Examination Scheme						
							Theory			Practical			Total
L	T	J	P	S	C		CIA	ESE	Total	CIA	ESE	Total	
3	0	0	2	3	4	120	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 & Fiber optics	Principle of laser - conditions for sustained lasing – Population, Ruby laser and CO2 laser, Construction and working semiconductor 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	9
2	Interference and Diffraction	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	9
3	Quantum mechanics	Introduction, Concept of Uncertainty and conjugate observables-Uncertainty principle, Application of Uncertainty principle - 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 tunneling	9
4	Waves & Acoustics	Waves- transverse and longitudinal waves, Transverse vibrations in a stretched string- derivation of velocity and frequency - laws of transverse vibration. Acoustics- Reverberation and echo Sabine's Formula, Factors affecting acoustics of a building- Ultrasonics- Piezoelectric oscillator, Ultrasonic diffractometer, SONAR, NDT-Pulse echo method, medical Application-Ultrasound scanning	9

SELF-LEARNING / TEAM WORK

Sl. No	Self-learning / Team Work Description	Hrs
1	Emission and absorption in atomic system (Self-learning 1) - Fiber optics principles (Self-learning 2)- Laser applications (Self-learning 3) - Fiber optics communication (Self-learning 4) – Fiber sensors (Self-learning 5)	10
2	Interference (Self-learning 6) - Thin film reflection (Self-learning 7) – Diffraction (Self-learning 8)	6
3	de Broglie waves (Self-learning 9) - Uncertainty principle (Self-learning 10)- Quantum computers (Self-learning 11)	6
4	Oscillations and waves (Self-learning 12)- Wave characteristics (Self-learning 13) - Acoustics (Self-learning 14)- Ultrasonics (Self-learning 15)- Applications of Ultrasonics (Self-learning 16)	10
5	Prelab assignment 1-10	20
6	Practice problems 1-6	12

SUGGESTED LEARNING RESOURCES

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

Reference			
Sl. No.	Title of Book	Author	Publication
1	Advanced Engineering Physics	Premlet B	Phasor Books 10th Edition, 2017
2	A Text Book of Engineering Physics	I. Dominic and. A. Nahari	Owl Books Revised Edition, 2016
3	Concept of Engineering Physics	G Sreekanth and M Suresh Babu	Orbit Publishers,2024

Web Resource	
1	https://nptel.ac.in/courses/113104012
2	https://nptel.ac.in/courses/108108122
3	https://nptel.ac.in/courses/112104212
4	https://nptel.ac.in/courses/124105004

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

Module	Major Topic & Sub Topic	Mode of Delivery	CO	Learning Domain			Hrs
				C	P	A	
1	Optical processes – Absorption-Spontaneous emission and stimulated emission	L	CO1	A	M	Rs	1
	Principle of laser – conditions for sustained lasing – Population inversion- Pumping- Metastable states	L	CO1	A	M	Rs	1
	Basic components of laser - Active medium - Optical resonant cavity	L	CO1	A	M	Rs	1
	Prelab assignment 1	S	CO1	A			
	Self-Learning 1, Self-Learning 2	S	CO1	A			
	Construction and working of Ruby laser and CO2 laser	L	CO1	A	M	Rs	1
	Construction and working of Semiconductor laser (qualitative), Properties of laser, Applications of laser	L	CO1	A	M	Rs	1
	Practice problems 1	S	CO1	A			
	Optic fibre Principle of propagation of light, Types of fibres	L	CO1	A	M	Rs	1
	Prelab assignment 2	S	CO1	A			
	Self-Learning 3, Self-Learning 4	S	CO1	A			
	Step index and Graded index fibres - Multimode and single mode fibers	L	CO1	A	M	Rs	1
	Acceptance angle, Numerical aperture – Derivation	L	CO1	A	M	Rs	1
	Applications of optical fibres - Fibre optic communication system (block diagram)	L	CO1	A	M	Rs	1
	Self-Learning 5	S	CO1	A			

	Practice problems 2	S	CO1	A			
2	Prelab assignment 3	S	CO2	A			
	Self-Learning 6	S	CO2	A			
	Introduction, Principle of super position, Constructive and destructive interference	L	CO2	A	M	Rs	1
	Optical path, Phase difference and path difference	L	CO2	A	M	Rs	1
	Cosine law- reflected system- Condition for constructive and destructive interference, Colours in thin films	L	CO2	A	M	Rs	1
	Newton's Rings-Determination of refractive index of transparent liquids and wavelength	L	CO2	A	M	Rs	1
	Practice problems 3	S	CO2	A			
	Prelab assignment 4	S	CO2	A			
	Self-Learning 7	S	CO2	A			
	Air wedge-Measurement of thickness of thin sheets	L	CO2	A	M	Rs	1
	Diffraction-types of diffraction	L	CO2	A	M	Rs	1
	Diffraction due to a single slit	L	CO2	A	M	Rs	1
	Prelab assignment 5	S	CO2	A			
	Self-Learning 8	S	CO2	A			
	Diffraction Grating – Construction - Grating equation	L	CO2	A	M	Rs	1
	Dispersive and Resolving Power	L	CO2	A	M	Rs	1
	Practice problems 4	S	CO2	A			
3	Prelab assignment 6	S	CO3	A			
	Self-Learning 9	S	CO3	A			
	Uncertainity principle, conjugate observables	L	CO3	A	M	Rs	1
	Application of uncertainity principle- Absence of electron inside nucleus, Natural line broadening	L	CO3	A	M	Rs	1
	Wave function, properties, physical interpretation	L	CO3	A	M	Rs	1
	Prelab assignment 7	S	CO3	A			
	Self-Learning 10	S	CO3	A			
	Formulation of time dependent Schrodinger equation	L	CO3	A	M	Rs	1
	Time dependent Schrodinger equation	L	CO3	A	M	Rs	1
	Time independent Schrodinger equation	L	CO3	A	M	Rs	1
	Prelab assignment 8	S	CO3	A			
	Self-Learning 11	S	CO3	A			
	Particle in a one-Dimensional potential well	L	CO3	A	M	Rs	1
	Derivation of eigen values and normalized wave function	L	CO3	A	M	Rs	1
	Quantum mechanical tunnelling	L	CO3	A	M	Rs	1
	Practice problems 5	S	CO3	A			
4	Prelab assignment 9	S	CO4	A			
	Self-Learning 12, Self-Learning 13	S	CO4	A			
	Waves- transverse and longitudinal waves.	L	CO4	A	M	Rs	1
	Concept of frequency, wavelength and time period	L	CO4	A	M	Rs	1
	Transverse vibrations in a stretched string- derivation of velocity and frequency - laws of transverse vibration.	L	CO4	A	M	Rs	1

	Prelab assignment 10	S	CO4	A			
	Self-Learning 14	S	CO4	A			
	Acoustics- Reverberation and echo,	L	CO4	A	M	Rs	1
	Reverberation time and its significance	L	CO4	A	M	Rs	1
	Sabine's Formula, Factors affecting acoustics of a building.	L	CO4	A	M	Rs	1
	Self-Learning 15	S	CO4	A			
	Ultrasonics- Piezoelectric oscillator	L	CO4	A	M	Rs	1
	Ultrasonic diffractometer, SONAR	L	CO4	A	M	Rs	1
	NDT-Pulse echo method, medical Application-Ultrasound	L	CO4	A	M	Rs	1
	Practice problems 6	S	CO4	A			
	Self-Learning 16	S	CO4	A			

PRACTICAL SYLLABUS

Topic	Objective	CO	Learning Domain			Hrs
			C	P	A	
Numerical aperture	To determine numerical aperture of an optical fibre	CO1	A	M	Rs	2
LED	To determine the characteristics of LED	CO1	A	M	Rs	2
Particle size	To determine the particle size using laser	CO2	A	M	Rs	2
Newton's ring	To determine the wavelength of monochromatic light	CO2	A	M	Rs	2
Air wedge	To determine the thickness of the given wire	CO2	A	M	Rs	2
Diffraction grating	To determine the wavelength of the given laser	CO2	A	M	Rs	2
Solar cell	To study the characteristics of solar cell	CO2	A	M	Rs	2
LCR Circuit	To determine frequency response of series LCR circuit	CO4	A	M	Rs	2
Melde's string	To determine the frequency of tuning fork	CO4	A	M	Rs	2
Cathode Ray Oscilloscope	To determine voltage and frequency of an electronic signal from function generator	CO4	A	M	Rs	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	Laser & Fibre optics	√	√	√				15
2	Interference & Diffraction	√	√	√				15
3	Quantum mechanics	√	√	√				15
4	Wave & 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	**40**
1. Internal Examination	**20**
2. Continuous Lab Evaluation	**10**
3. Learning Activity	
4. Regularity	**5**
5. Course Project	
6. Internal Examination (Lab)	**5**
End Semester Examination	**60**
Total	**100**

MODEL QUESTION PAPER

FIRST SEMESTER B. TECH DEGREE (REGULAR) EXAMINATION, DECEMBER 2025 (2025 SCHEME)			
Course Code:	**B250902/PH110B**		
Course Name:	**Physics for physical science**		
Max. Marks	**60**	**Duration**:	2 hours 30 minutes
Common to CE & ME			
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. Explain the pumping scheme and population inversion mechanism in a ruby laser.	CO1	3
2	With the help of a block diagram, briefly describe the working of fiber optic communication system.	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	Give physical meaning of wave function in quantum mechanics.	CO3	3
7	Distinguish between transverse and longitudinal waves.	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)	With help of a neat diagram explain the construction and working of a carbon dioxide laser.	CO1	6
9 b)	Calculate the wavelength of light emitted from a diode laser with a band gap of 2 eV.	CO1	3
OR			
10 a)	Define numerical aperture of an optical fiber. Derive an expression for numerical aperture of step index fiber.	CO1	6
10 b)	What is the numerical aperture of an optical fiber with core refractive index of 1.546 and cladding refractive index 1.378?	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 mth dark ring.	CO2	6
11 b)	A monochromatic light of wavelength 5893 Å is incident normally on a soap film of μ = 1.42. What is the least thickness of the film that will appear dark by reflection?	CO2	3
OR			
12 a)	What is a transmission grating? Derive grating equation with the help of a neat diagram.	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**	**25/0**	**Credits**	**3**
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work)							

Course Code	Course Name	Course Category
B250902/CE100C	**ENGINEERING MECHANICS**	**EST**
Pre-requisite		
NIL		

COURSE OBJECTIVES	
1	To develop a comprehensive understanding of static and dynamic principles governing mechanical systems.
2	To cultivate advanced problem-solving skills through the application of mathematical modelling, vector analysis, and computational techniques.

COMPETENCY STATEMENT (CC)	
CC1	Apply the fundamental principles of mechanics to analyse Engineering Systems.

COURSE OUTCOMES (CO)

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

CO	CO Statement	CC Mapping	Cognitive (C)	Psychomotor (P)	Affective (A)
CO1	**Analyse** static systems involving concurrent and non-concurrent forces in 2D and 3D.	CC1	A		
CO2	**Apply** the laws of friction to analyse structural systems.	CC1	A		
CO3	**Determine** the Centre of Gravity and Moment of Inertia of plane and solid system components.	CC1	A		
CO4	**Apply** kinematic and kinetic principles to rectilinear motion of particles, rigid bodies and connected systems.	CC1	A		
CO5	**Apply** principles of curvilinear motion and rotation to problems involving combined static and dynamic systems.	CC1	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*

CO	Program Outcomes (PO) & Program Specific Outcomes (PSO) Correlation Matrix													
	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	3	3		2						2	1		
2	3	2			2		2				1	1		
3	3	2	2								1	1		
4	3	3	2		2	2					1	1		

5	**3**	**3**	**2**		**3**			**2**			**2**	1			
Correlation [3 – High, 2 -Medium, 1 – Low]															

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		✓	✓				15
3	Centroid & Moment of inertia		✓	✓				15
4	Kinetics and Kinematics		✓	✓				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**

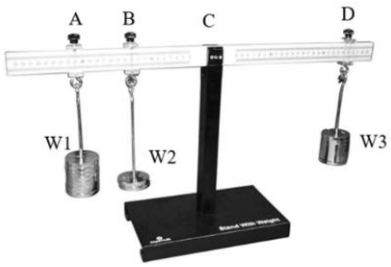
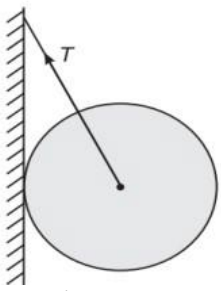
MODEL QUESTION PAPER

(

FIRST SEMESTER B. TECH DEGREE (REGULAR) EXAMINATION, DECEMBER 2025 (2025 SCHEME)			
Course Code:	**B250902/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

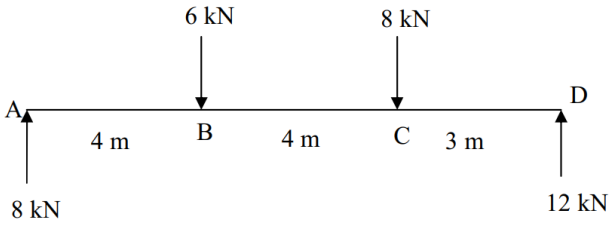
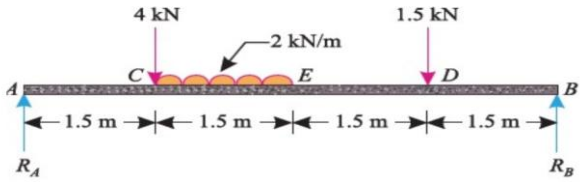
(Answer all questions. Each question carries 3 marks)

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: <table><tr><th>A</th><th>B</th></tr><tr><td>1. Static friction</td><td>a. Opposes sliding</td></tr><tr><td>2. Kinetic friction</td><td>b. Measured in metres</td></tr></table>	CO2	(3)

	3. Rolling friction	c. Prevents start of motion		
	4. Limiting friction	d. Opposes rolling		
	5. Angle of repose	e. Same magnitude for static & kinetic friction		
	6. Coefficient of friction	f. μ = limiting friction / normal reaction		
		g. Equals mass × acceleration		
		h. Inclination where sliding begins		
		i. Causes energy creation		
		j. Maximum static value		
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	CO1	(9)

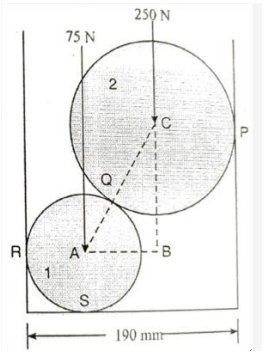
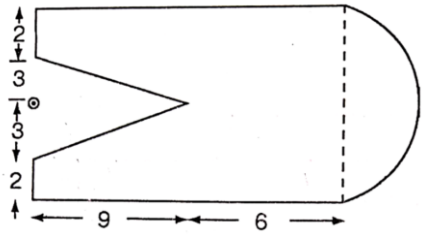
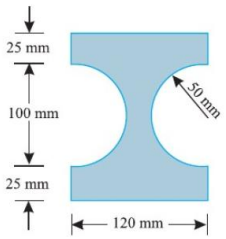
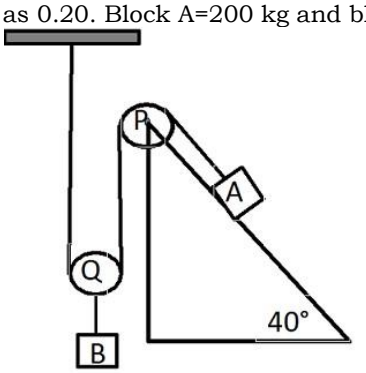
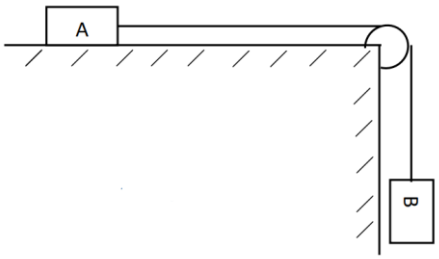


Figure 5

		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.  Figure 6	CO3	(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 ii. Time required for the speed to reach 80 revolutions per minute.	CO5	(4)
	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**	**25/0**	**Credits**	**4**
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work)							

Course Code	**Course Name**	**Course Category**
B250902/CN100D	**INTRODUCTION TO MECHANICAL AND CIVIL ENGINEERING**	**EST**
Pre-requisite: NIL		

COURSE OBJECTIVES	
1	Understand thermodynamic cycles and working of IC engines
2	Understand the refrigeration cycles and psychrometric concepts
3	Explain the working of pumps, turbines, and power transmission elements
4	Understand basic manufacturing, metal joining, machining, and advanced processes
5	To introduce the relevance of civil engineering and its various disciplines
6	To create awareness of building construction and the concepts of intelligent and green buildings

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

COURSE OUTCOMES (CO)					
Course Outcomes (CO): At the end of this course, learners will be able to:					
CO	**CO Statement**	**CC Mapping**	**Cognitive (C)**	**Psychomotor (P)**	**Affective (A)**
CO1	Comprehend thermodynamic cycles and the working of IC Engines.	CC1	U		
CO2	Distinguish the various systems of refrigeration and air conditioning.	CC1	U		
CO3	Illustrate the working of hydraulic machines and various power transmission elements.	CC1	U		
CO4	Summarize the basic manufacturing, metal joining, machining and advanced processes.	CC1	U		
CO5	Comprehend the relevance of Civil Engineering and building regulations as per NBC, KBR and CRZ	CC2	U		

CO6	Describe different types of conventional building materials	CC2	U		
CO7	Perceive the concepts of intelligent and green buildings	CC2	U		

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*

CO	Program Outcomes (PO) & Program Specific Outcomes (PSO) Correlation Matrix													
	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	2							1	1		1	1		
2	2							1	1		1	1		
3	2							1	1		1	1		
4	2							1	1		1	1		
5	2					1					1	1		
6	2					1					1	1		
7	2					1					1	1		
Correlation [3 – High, 2 -Medium, 1 – Low]														

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)	12

		Green building - Energy systems, water and waste water management systems in residential buildings (Elementary concepts)	

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:	**B250902/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)

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COURSE DESCRIPTION							
Regulation	**2025**	**L-T-J-P-S**	**2-1-0-2-3**	**Version**	**1**	**Credits**	**4**
(L- Lecture, T-Tutorial, J-Project, P-Practical, S-Self-learning & Team Work)							
Course Code	**Course Name**						**Course Category**
B250903/CN110E	**PROGRAMMING IN PYTHON**						**ESE**
Pre-requisite if any							
NIL							

COURSE OBJECTIVES	
1	To provide students with a thorough understanding of algorithmic thinking and its practical applications in solving real-world problems.
2	To explore various algorithmic paradigms, including brute force, divide-and-conquer, dynamic programming, and heuristics, in addressing and solving complex problems

COMPETENCY STATEMENT (CC)	
CC1	Apply the basic engineering concepts to solve near to real-life engineering problems
CC2	Demonstrates proficiency in the Python programming language

CO	**Program Outcomes & Program Specific Outcomes Correlation Matrix**													
	PO											**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
1	3	3	3		2		2		2	2	3	1		
2	3	3	3		2		2		2	2	3	1		
3	3	3	3		2		2		2	2	3	1		
4	3	3	3		2		2		2	2	3	1		

Correlation [3 – High, 2 -Medium, 1 – Low]

COURSE OUTCOMES (CO)					
Course Outcomes (CO): At the end of this course, learners will be able to:					
CO	**CO Statement**	**CC Mapping**	**Cognitive (C)**	**Psychomotor (P)**	**Affective (A)**
CO1	Interpret problem-solving strategies by using computing as a model for addressing near real-world problems.	1	U	M	Rs
CO2	Develop clear and accurate models, such as algorithms, pseudocode, and flowcharts, to represent the problem by articulating it before attempting to solve it.	1	A	M	Rs
CO3	Apply the essential python programming skills, to translate the algorithmic model into executable program.	2	A	M	Rs

CO4	Identify systematic approaches and problem-solving strategies for computational problems.	1	A	M	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*

TEACHING AND ASSESSMENT SCHEME

Teaching Scheme / Week					Credit	Hours / Semester	Examination Scheme						
							Theory			Practical			Total
L	T	J	P	S	C		CIA	ESE	Total	CIA	ESE	Total	
2	1	0	2	2	4	120	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	7
2	Algorithm Design with Pseudocode and Flowcharts	Pseudocode, Flowcharts	9
3	Modular Problem-Solving with Python: Control Structures to Recursion	Selection and Iteration, Decomposition and Modularization, Recursion	10
4	Fundamental Computational Approaches to Problem-Solving	Divide-and-Conquer Approach, Dynamic Programming Approach, Greedy Algorithm Approach	10

SELF-LEARNING / TEAM WORK

Sl. No	Self-learning / Team Work Description	Hrs
1	Pre-Lab Practical Learning	19
2	Case study: Pick simple problems (e.g., finding prime numbers) document steps: understanding, model, algorithm, coding, testing.	12
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.	12
4	Compare recursive vs iterative solutions for factorial & Fibonacci. Trace recursion using call-stack diagrams.	10
5	Study simple brute-force problems: padlock, password guessing. Write small brute-force code (e.g., linear search).	10

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

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

Module	Title	Major Topic & Sub 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	CO1	U	M	Rs	2
		The problem-solving process – computer as a model of computation, understanding the problem, formulating a model, developing an algorithm, writing the program, testing & evaluating the solution	L	CO1	U	M	Rs	3
		Essentials of Python programming – variables, numeric and string data types, math module, Python Standard Library, I/O (print, input), operators & precedence	L	CO1	U	M	Rs	2
		Case study: Pick simple problems (e.g., prime numbers) and document steps (understanding, model, algorithm, coding, testing)	S	CO1	U	M	Rs	12
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	CO2	A	M	Rs	3
		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	CO2	A	M	Rs	3

		Flowcharts – symbols: start/end, arithmetic operation, I/O, decision, module call, loop (hexagon), flow-lines, connectors (on-page & off-page)	L	CO2	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	T	CO2	A	M	Rs	1
		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	CO2	A	M	Rs	12
3	Modular Problem-Solving with Python: Control Structures to Recursion	**Selection and iteration using Python** – if-else, elif, for loop, range, while loop	L	CO3	A	M	Rs	2
		Sequence data types in Python – list, tuple, set, strings, dictionary	L	CO3	A	M	Rs	2
		Creating and using arrays in Python (using NumPy library)	L	CO3	A	M	Rs	1
		Decomposition and modularization – problem decomposition as a strategy for solving complex problems, modularization, motivation for modularization	L	CO3	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	CO3	A	M	Rs	1
		Recursion – definition, reasons for using recursion, the call stack, recursion and the stack, avoiding circularity in recursion	T	CO3	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	CO3	A	M	Rs	1
		Self-learning: Compare recursive vs iterative solutions for factorial & Fibonacci; trace recursion using call-stack diagrams	S	CO3	A	M	Rs	10
4	Fundamental Computational Approaches to	**Brute-force Approach** – Introductory diagrammatic/algorithmic explanation (analysis not	L	CO4	A	M	Rs	2

	Problem-Solving	required). Example: Padlock, Password guessing						
		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	CO4	A	M	Rs	2
		Dynamic Programming Approach – introductory diagrammatic/algorithmic explanation (analysis not required). Example: Fibonacci series. Recursion vs Dynamic Programming	L	CO4	A	M	Rs	2
		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	CO4	A	M	Rs	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	CO4	A	M	Rs	2
		Self-learning – Study simple brute-force problems: padlock, password guessing. Write small brute-force code (e.g., linear search).	S	CO4	A	M	Rs	11

PRACTICAL SYLLABUS						
Module	Objective	CO	Learning Domain			Hrs
			C	P	A	
1	To practice basic syntax, input/output, and simple execution in Python	3	A	M	Rs	1
1	To understand and apply different primitive data types in Python	3	A	M	Rs	1
1	To practice arithmetic operators and precedence in Python	3	A	M	Rs	1
1	To familiarize string operations and indexing	3	A	M	Rs	1

1	To understand built-in libraries and formatting	3	U	M	Rs	1
1	To apply data structures and library usage	3	A	M	Rs	1
3	To apply selection control structure	3	A	M	Rs	1
1	To apply formulas and I/O	3	A	M	Rs	1
3	To practice nested iteration and control flow	3	A	P	Rs	1
3	To apply iteration and conditions with efficiency	3	A	P	Rs	1
3	To apply recursion for mathematical problems	3	A	P	Rs	1
3	To practice recursion basics	3	A	P	Rs	1
3	To strengthen recursive algorithm design	3	A	P	Rs	1
3	To apply recursion for number theory problems	3	A	P	Rs	1
3	To apply modularization and conditionals	3	A	Ar	V	1
3	To understand modular programming and reuse	3	A	Ar	V	1
3	To apply modularization by selective import of functions	3	A	Ar	V	2
3	To apply string validation logic	4	A	P	Rs	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	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	**Mark**
Continuous Internal Assessment	40
1. Internal Examination	20
2. Continuous Lab Evaluation	5
3. Learning Activity	
4. Regularity	5
5. Course Project	
6. Lab Examination	10
End Semester Examination	60
Total	**100**

MODEL QUESTION PAPER

FIRST SEMESTER B. TECH DEGREE (REGULAR) EXAMINATION, DECEMBER 2025 (2025 SCHEME)			
Course Code:	**B250903/CN110E**		
Course Name:	**PROGRAMMING IN PYTHON**		
Max. Marks	**60**	**Duration**:	2 hours 30 minutes
Common to CE, ME & EEE			

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.	CO 1	(3)
2	List the operator precedence rules supported in Python.	CO 1	(3)
3	Draw a flowchart to find and display the factorial of a given number.	CO 2	(3)
4	Develop the algorithm, flowchart, and pseudocode to find the sum of 'n' numbers entered by the user.	CO 2	(3)
5	Compare and contrast pre-test and post-test looping constructs in Python with examples.	CO 3	(3)
6	Write a Python program to read two matrices and display its sum.	CO 3	(3)
7	Compare and contrast the greedy approach and dynamic programming approach.	CO 4	(3)
8	Write an algorithm to calculate the nth Fibonacci number using the dynamic programming approach.	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)	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.	CO 1	(6)
	b)	Let A =127, B = 63 Predict the output of the expressions: A & B, A | B and A >> 3.	CO 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.	CO 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.	CO 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.	CO 2	(6)
	b)	Illustrate how a switch-case statement can be represented in pseudocode.	CO 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.	CO 2	(6)
	b)	Illustrate how a loop or repetition can be represented in a flowchart.	CO 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.	CO 3	(6)
	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.	CO 3	(3)
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.	CO 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.	CO 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].	CO 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.	CO 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.	CO 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.	CO 4	(4)

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

Course Code	**Course Name**	**Course Category**
B250908/LS900K	**LIFE SKILLS AND PROFESSIONAL COMMUNICATION**	**HMT**
Pre-requisite		
NIL		

COURSE OBJECTIVES	
1	To foster self-awareness and personal growth, promote effective participation in groups and teams, develop critical thinking, problem solving and decision-making skills and cultivate the ability to exercise emotional intelligence.
2	To enhance students' overall communication skills, enabling them to comprehend, interpret and express ideas clearly in diverse academic and professional settings.
3	To equip students to build their profile in line with the professional requirements and standards.

COMPETENCY STATEMENT (CC)	
CC1	Learners demonstrate essential life skills and professional communication skills, enabling them to adapt confidently to personal, academic, and professional challenges and contribute meaningfully to society.

COURSE OUTCOMES (CO)					
Course Outcomes (CO): At the end of this course, learners will be able to:					
CO	**CO Statement**	**CC Mapping**	**Cognitive (C)**	**Psychomotor (P)**	**Affective (A)**
CO1	Evaluate self-awareness to set effective goals and plans	CC 1	A		V
CO2	Evaluate the ability to focus on strengthening the fundamentals of emotional quotient	CC 1	A		V
CO3	Apply techniques to enhance Critical Thinking, Problem-solving and Decision-making skills	CC 1	A		V
CO4	Apply strategies to improve comprehension and communication skills	CC 1	A		Rs
CO5	Present ideas using modern technological platforms	CC 1	A		V
CO6	Establish a professional network using networking platforms	CC 1	An		O
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*

CO	Program Outcomes (PO) & Program Specific Outcomes (PSO) Correlation Matrix													
	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1					2	2	2	2	3	1	1	1		
2							2	1	2		1	1		
3	1	2	1	2		2	1	3	2	2	1	1		
4						1		2	3	1	2	1		
5					1			2	3		2	1		
6						2		3	3		2	1		
Correlation [3 – High, 2 -Medium, 1 – Low]														

TEACHING AND ASSESSMENT SCHEME									
Teaching Scheme / Week					Credit	Hours / Semester	Examination Scheme		
							Theory		
L	T	J	P	S	C		CIA	ESE	Total
1	1	0	0	0	1	30	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	Personal Growth & Self-management	1.Group formation and self-introduction 2. Preparation of Gantt chart 3. Online personality development test 4.Role-storming exercise	5
2	Workplace & Interpersonal Skills	1.Presentation on instances of empathy 2.Networking with professionals to develop workplace skills 3. Role- Play 4. Report writing	7
3	Problem-Solving & Creative thinking	1.Identifying real-life problem that requires a technical solution 2. Six thinking hat exercises 3. Group Discussion 4.Video presentation on diversity aspects	9
4	English Language communication & Professional Development	1.Online Interview skills development session. 2. Listening test 3.Activities to improve English vocabulary of students 4.Video content for podcasts on technological interventions/research work tried out in Kerala context	9

SELF-LEARNING / TEAM WORK		
Sl. No	Self-learning / Team Work Description	Hrs
1	Take an online personality development test, self-reflect and report	1
2	Prepare a mind map based on the role-storming exercise	1
3	Students indulge in self-reflection and identify their own goal and prepare for their undergraduate journey	1

SUGGESTED LEARNING RESOURCES

Text Book

Sl. No.	Title of Book	Author	Publication
1	Life Skills & Personality Development	Maithry Shinde et.al.	Cambridge University Press
2	Emotional Intelligence: Why it can matter more than IQ	Daniel Goleman	Bloomsbury Publishing PLC
3	Think Faster, Talk Smarter: How to speak successfully when you are put on the spot	Matt Abrahams	Macmillan Business
4	Deep Work: Rules for focused success in a distracted world	Cal Newport	PIATKUS
5	Effective Technical Communication	Ashraf Rizvi	McGraw Hill Education

Reference			
Sl. No.	Title of Book	Author	Publication
1	Life Skills for Engineers	Remesh S., Vishnu R.G	Ridhima Publication
2	Soft Skills & Employability Skills	Sabina Pillai andAgna Fernandez	Cambridge University Press
3	Guide to writing as an Engineer	David F. Beer and David McMurrey	John Willey. New York
4	LinkedIn Profile Optimization	Donna Serdula	

Web Resource	
1	www.mindtools.com
2	TED Talks on Life Skills
3	www.linkedin.com/learning

DETAILED SYLLABUS *(Self-learning if any to be marked)*									
Sl. No	Activity	Mode of Delivery	Group/ Individual (G/I)	Mark	COs	Learning Domain			Hrs
						C	P	A	
1.1	Group formation and self-introduction among the group members	L	G			R		Re	2
1.2	Familiarizing the activities and preparation of the time plan for the activities	L	G			R		Re	
1.3	Preparation of Gantt chart based on the time plan	L, T	G	5	CO1	A		Re	
2.1	Take an online personality development test	L, T	I	2	CO1	U		V	3
2.2	Role-storming exercise 1: Students assume 2 different roles given below and write about their; ●Strengths ●Areas for improvement ●Concerns ●Areas in which he/she hesitates to take advice ●Goals/Expectations from the point of view of the following assumed roles: i) parent/guardian/mentor ii) friend/sibling/cousin	L, T	I	2	CO1	U		Rs	

2.3	Role-storming exercise 2: Students assume the role of their teacher and write about ●Skills required as a B.Tech graduate ●Attitudes, habits, approaches required and activities to be practiced during their B.Tech years, in order to achieve the set goals	L, T	I	2	CO1	U		Rs	
2.4	Discuss the skills identified through role storming exercise by each one within their own group and improvise the list of skills	L, T	G	2	CO1	R		Re	
2.5	Exhibit/present the mind map prepared based on the role-storming exercise in the class	L, T	G	2	CO1	U		Re	
3	Prepare a presentation on instances of empathy the students have observed in their own life or in other's life	L, T	I	5	CO2	U		V	3
4.1	Each student connects and networks with a minimum of 3 professionals from industry/ public sector organizations/ other agencies/NGOs /academia (at least 1 through LinkedIn)	L, T	I	2	CO2	U		Rs	
4.2	Interact with them to understand their workplace details including ●workplace skills required ●their work experience ●activities they have done to enhance their employability during their B.Tech years ●suggestions on the different activities to be done during B.Tech years Prepare a documentation of this	L, T	I	4	CO2	U		Rs	
4.3	Discuss the different workplace details & work readiness activities assimilated by each through the interactions within their group and compile the inputs collected by the individuals Prepare the Minutes of the discussions	L, T	G	2	CO2	U		Rs	
4.4	Report preparation based on the discussions	L, T	G	3	CO4	R			
4.5	Perform a role-play based on the workplace dynamics assimilated through interactions and group discussions	L, T	G	4	CO3	U		Rs	
4.6	Students prepare an action plan for their undergraduate journey	L, T	I	2	CO1	R		Rs	
5.1	Select a real-life problem that requires a technical solution and list the study materials needed	L, T	G	2	CO3	A		Rs	3

5.2	Listen to TED talks & video lectures from renowned Universities related to the problem and prepare a one-page summary (Each group member should select a different resource)	L, T	I	2	CO4	U			
5.3	Use any online tech forum to gather ideas for solving the problem chosen	L, T	G	2	CO5	A		Rs	
5.4	Arrive at a possible solution using six thinking hat exercise	L, T	G	5	CO3	An		V	
5.5	Prepare a report based on the problem- solving experience	L, T	G	2	CO4	A			
6.1	LinkedIn profile creation	L, T	I	2	CO6	U			
6.2	Resume preparation	L, T	I	5	CO6	A			2
6.3	Self-introduction video	L, T	I	3	CO6	A		V	
7	Prepare a presentation on instances of demonstration of emotional intelligence	L, T	I	2	CO2	A		V	3
8	Prepare a short video presentation on diversity aspects observed in our society (3 to 5 minutes)	L, T	G	5	CO2 CO5	A		V	3
9	Take online Interview skills development sessions like robotic interviews; self-reflect and report	L, T	I	2	CO6	U		V	1
10	Take an online listening test, self-reflect and report	L, T	I	2	CO6	U		Rs	1
11.1	Activities to improve English vocabulary of students	L, T	I/G	4	CO4	U		Re	
11.2	Activities to help students identify errors in English language usage	L, T	I/G	2	CO4	U		Re	
11.3	Activity to help students identify commonly misspelled words, commonly mispronounced words and confusing words	L, T	I/G	2	CO4	U		Re	
11.4	Write a self-reflection report on the improvement in English language communication through this course	L, T	I	2	CO4	A		V	4
11.5	Presentation by groups on the experience of using online collaboration tools in various group activities and time management experience as per the Gantt chart prepared	L, T	G	5	CO4 CO5	A		V	
12.1	Each group prepares video content for podcasts on innovative technological interventions/research work tried out in Kerala context by academicians/professionals/Govt. agencies/research institutions/private agencies/NGOs/other agencies	L, T	G	10	CO2 CO4 CO5	A		V	
12.2	Upload the video content to podcasting platforms or YouTube	T	G	2	CO5	U			1
12.3	Add the link of the podcast in their LinkedIn profile	T	G	2	CO5	U			

ASSESSMENT PATTERN	
Assessment	**Marks**
Continuous Internal Assessment	**100**
Internal Examination	
Learning Activity	**100**
Attendance	
Course Project	
End Semester Examination	
Total	**100**

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

Course Code	**Course Name**	**Course Category**
250902/CN130U	**ENGINEERING WORKSHOP**	**ESL**
Pre-requisite		
NIL		

COURSE OBJECTIVES	
1	To identify and manage the tools, materials and methods required to execute an engineering project.
2	To develop the necessary skills for planning, preparing and executing an engineering project.

COMPETENCY STATEMENT (CC)	
CC1	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**	**CC Mapping**	**Cognitive (C)**	**Psychomotor (P)**	**Affective (A)**
CO1	Identify workshop operations and instruments in accordance with the material and object.	CC1	A		Re
CO2	Use appropriate tools to make simple models.	CC1	U	I	Rs
CO3	Conduct the assembly and disassembly of various machine components.	CC1	U	I	Rs
CO4	Identify the different machines tools in shop floor and their applications.	CC1	U		Rs
CO5	Understand the field tests to assess the qualities of bricks and cement	CC1	U	M	Rs

CO6	Practice the construction of a wall specimen in English and Flemish bond	CC1	A	M	Rs
CO7	Demonstrate the setting out a residential building using thread, tape and water tube levelling	CC1	U	M	Rs
CO8	Identify the market rates of conventional construction materials.	CC1	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*

CO	**Program Outcomes & Program Specific Outcomes Correlation Matrix**													
	PO											**PSO**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
1	2							1	2		1	1		
2	2							1	2		1	1		
3	2							1	2		1	1		
4	2							1	2		1	1		
5	2							1	2		1	1		
6	2							1	2		1	1		
7	2							1	2		1	1		
8	2							1	2		1	1		
Correlation [3 – High, 2 -Medium, 1 – Low]														

TEACHING AND ASSESSMENT SCHEME									
Teaching Scheme / Week					**Credit**	**Hours / Semester**	**Examination Scheme**		
							Practical		
L	**T**	**J**	**P**	**S**	**C**		**CIA**	**ESE**	**Total**
0	0	0	2	0	1	30	50	50	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)	
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, O-rings, circlips, keys etc.(c)Vernier Calipers, Height Gauge, Depth Gauge, Micrometers, Bevel Protractor etc	2
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-Manufacturing Processes	S K Hajra Choudhury A K Hajra Choudhury Nirjhar Roy	MPP Media Promoters and Publishers
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	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		**50**
1	Continuous Lab Evaluation	45
2	Internal Examination	-
3	Regularity	5
4	Course Project	-
End Semester Examination		**50**
Total		**100**