Semester - 1

INTRODUCTION TO MECHANICAL AND CIVIL ENGINEERING

Course Code	Teaching hours per week				Self Study hours	Credits	Exam hours	Course type	CIE Marks	ESE Marks
	L	T	P	R	SS					
26NNCES106	4	0	0	0	3	4	2 Hrs. 30 Min.	Theory	40	60

1. **Preamble:**

This is a two - part course.

Part 1: Mechanical Engineering: This part serves to introduce the fundamentals and latest technologies in mechanical engineering for students in both mechanical and civil engineering disciplines. This course also encompasses the basic principles of mechanical engineering which include topics ranging from thermodynamics, hydraulic systems, power transmission to various conventional and advanced manufacturing techniques.

Part 2: Civil Engineering: It familiarizes students with major civil engineering disciplines, basic building concepts, construction materials, and regulatory frameworks. Emphasis is placed on understanding buildings, materials, and construction practices in relation to codes and sustainability. The course provides a foundational platform for advanced studies in structural, geotechnical, transportation, environmental, and water resources engineering.

2. **Pre requisites: Nil**

Module Number	Syllabus Description	Contact Hours
1	General introduction to Mechanical Engineering: First law of thermodynamics for a process and cycle, Thermodynamic cycles -Carnot Cycle - Derivation of efficiency - Otto, Diesel cycles. IC Engines: CI & SI Engines, working of 2-Stroke & 4-Stroke engines. Listing the parts of IC Engines. Concept of CRDI, MPFI and hybrid engines. Refrigeration: Unit of refrigeration, reversed Carnot cycle, COP, vapour compression cycle; Definitions of dry, wet & dew point temperatures, specific humidity and relative humidity, Psychrometric chart, Cooling and dehumidification, Layout of central air conditioning systems.	9

2	Classification of pumps, Description about working with sketches of: Reciprocating pump, Centrifugal pump. Classification of Hydraulic Turbines. Different type of gears and its applications (spur, helical, bevel, worm and worm wheel), List types of clutches and their use, Bearings and their classification (Journal bearing and ball bearing) Manufacturing Process: Sand Casting, Forging, Rolling, Extrusion. Metal Joining Processes: List types of welding, Description with sketches of Arc Welding, SMAW, Soldering and Brazing and their applications. Machining processes: Description and operations performed on Lathe, Drilling machine, Milling machine, CNC machine, 3D printing.	9
3	**General Introduction to Civil Engineering:** Relevance of Civil Engineering in the overall infrastructural development of the country. Responsibility of an engineer in ensuring the safety of the built environment. Brief introduction to major disciplines of Civil Engineering like Structural Engineering, Geo-technical Engineering, Transportation Engineering, Water Resources Engineering and Environmental Engineering. **Introduction to buildings:** 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. Selection of site for a residential building. **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	9
4	**Conventional construction materials**: Brick, Coarse Aggregate, Fine Aggregate, Cement and Timber- Classifications, Qualities, Tests and Uses of construction materials. **Cement concrete**: Constituent materials, properties and types. **Tests on fresh and hardened concrete** - slump test, cube compressive strength as per IS Codes. **Steel**: Structural steel sections and steel reinforcements – types and uses. **Modern construction materials**: Architectural glass, ceramics, composite materials, thermal and acoustic insulating materials **Green Buildings** (Concept only)	9
	Total hours	**36**

3. Course Outcomes

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

Course Outcomes		Blooms Taxonomy Level
CO1	Illustrate the scope and various disciplines of mechanical engineering in engineering applications.	**K3**
CO2	Explain the applications of thermodynamics in IC engines and refrigeration systems.	**K2**
CO3	Describe the various manufacturing processes and select suitable manufacturing processes for mechanical engineering applications.	**K3**
CO4	Explain the relevance of civil engineering and its various disciplines.	**K2**
CO5	Describe the relevance of various building codes and types of buildings as per NBC	**K2**
CO6	Describe the various building components and the properties of commonly used building materials.	**K2**

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

4. Mapping of Course Outcomes with Program Outcomes

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

Course Assessment Method

(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Micro project	Internal Examination- 1	Internal Examination- 2	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

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

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3=24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9=36marks)**	**60**

5. **Text Books**

Sl No	Title of Book	Name of Author/s	Publisher	Edition and Year
1	Basic Mechanical Engineering	Pravin Kumar	Pearson Education	1st Edition, 2013
2	A Textbook of Basic Mechanical Engineering	R.K. Rajput	Laxmi Publications	3rd Edition, 2017
3	Elements of Mechanical Engineering	K.P. Roy, S.K. Hajra Choudhury, A.K. Hajra Choudhury	Media Promoters & Publishers Pvt. Ltd.	Revised Edition, 2012
4	Fundamentals of Mechanical Engineering	G.S. Sawhney	PHI Learning Pvt. Ltd	1st Edition, 2013
5	Essentials of Civil Engineering	Dalal K R	Charotar Publishing house	1st Edition 2012
6	Engineering Materials (Material Science)	Rangwala S C	Charotar Publishing House Pvt Limited	43rd Edition 2019
7	Building Materials	Duggal S K	New Age International	6th Edition (Two-Colour Edition), 2025

6. **Reference Books**

Sl No	Title of Book	Name of Author/s	Publisher	Edition and Year

1	Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives	Chris Mi and M. Abul Masrur	John Wiley & Sons	2nd Edition, 2017
2	Automotive Engineering Fundamentals	Richard Stone and Jeffrey K. Ball	SAE International	1st Edition, 2004
3	Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing	Ian Gibson, David W. Rosen, and Brent Stucker	Springer	2nd Edition, 2015
4	Materials for Civil and Construction Engineering	Mamlouk, M.S., and Zaniewski, J.P	Pearson Publishers	4th Edition, 2017
5	Building Construction	Rangwala, S.C and Dalal, KB	Charotar Publishing house	34th Edition 2022
6	Construction Technology Vol. I to IV	Chudley, R	Longman group, England Course	2nd Edition 1987
7	Building Construction Volumes 1 to 4	Mckay, W.B. and Mckay, J.K	Pearson India Education Services	5th Edition 2013/2014
8	Engineering Geology	Duggal S. K., Pandey, H.K. and Rawat N	Mcgraw Hill Education, New Delhi	1st Edition 2017
9	Latest Building codes and related rules and regulations			

7. **Video Links or any other Reference Materials**

Sl No	Weblink, Publication Details	Module
1	https://nptel.ac.in/courses/112/105/112105123/ https://nptel.ac.in/courses/112/106/112106133/ https://nptel.ac.in/courses/112/105/112105129/	1
2	https://nptel.ac.in/courses/112/105/112105171/2 https://nptel.ac.in/courses/112/105/112105268/ https://archive.nptel.ac.in/courses/112/107/112107145	2
3	https://youtube.com/playlist?list=PLyqSpQzTE6M_SM0Lrnzk2dJFwElh0Ebhu&si=3JWde99nfgYd7jBM	3
4	https://youtube.com/playlist?list=PLRqv9w8h3CrS464mCUQgnTocX0R9IiBYK&si=WNG9oPgXxe08MxD9	3
5	https://lsgkerala.gov.in/htm/kmbr.asp	3
6	https://youtube.com/playlist?list=PLyqSpQzTE6M_RfjEQMK7_L-UvxAMhplUT&si=ivwlDenhAZoAn3St	4
7	https://youtu.be/cx5gPKp9QEc?si=Kj0pvcRxyM10G9xk	4

MODEL QUESTION PAPER

FEDERAL INSTITUTE OF SCIENCE AND TECHNOLOGY(FISAT)
(Autonomous)
FIRST SEMESTER B. TECH DEGREE EXAMINATION (2026 Scheme), <Month & Year>

Course Code: 26NNCES106

Course Name: Introduction to Mechanical and Civil Engineering

Max. Marks: 60		Duration: 2 Hours 30 Minutes

- ***Use separate answer sheets for Part 1 and Part 2***
- ***No separate minimum marks required for pass***

PART 1- MECHANICAL ENGINEERING (30 Marks)

PART 1-A
Module 1 & 2

		Answer all questions. Each question carries 3 marks	**CO**	**Marks**
1		A petrol engine operating on Otto cycle shows poor thermal efficiency. Analyze how compression ratio affects the efficiency of the cycle with the help of P-V and T-S diagrams.	1	(3)
2		An air-conditioning system is unable to maintain comfort during humid weather conditions. Explain the significance of COP, dew point temperature, and specific humidity in such situations.	2	(3)
3		Select suitable welding processes for joining (i) thin sheet metal, (ii) railway tracks, and (iii) stainless steel pipes, with justification.	3	(3)
4		Compare impulse and reaction turbines based on working principle, construction, and applications. Suggest suitable applications for each type.	2	(3)

PART 1- B
Module 1 & 2

Answer any one full question from each module. Each question carries 9 marks

Module 1

5	a)	Analyze the effect of source and sink temperatures on the efficiency of a Carnot engine and explain the processes involved in the cycle using suitable diagrams.	1	(5)
	b)	A Carnot's engine is between 500ºC and 95ºC. Find out the efficiency of the engine. Also calculate the work developed, if it takes 1200 kJ of heat from the high temperature reservoir.	1	(4)
6	a)	Illustrate the sequence of operations in a 2-stroke diesel engine using suitable sketches and explain how scavenging takes place in the engine.	2	(9)

Module 2

7	a)	A centrifugal pump installed in a building fails to deliver water	2	(6)

		efficiently. Explain the working principle of the pump and analyze the factors affecting its performance.		
	b)	Analyze the role of priming in centrifugal pump operation and discuss the consequences of improper priming.	2	(3)
8	a)	Select a suitable manufacturing process for producing large and complex metal components and justify why. Explain the major steps involved in the process.	3	(9)
PART 2- CIVIL ENGINEERING (30 Marks)				
PART 2-A Module 3 & 4				
		Answer all questions. Each question carries 3 marks	**CO**	**Marks**
1		List the major disciplines of Civil Engineering.	4	(3)
2		Differentiate between built-up area, plinth area, floor area, carpet area, and floor area ratio (FAR) as per KBR.	5	(3)
3		List the various uses of cement.	6	(3)
4		Write a short note on modern construction materials.	6	(3)
PART 2-B Module 3 & 4				
Answer any one full question from each module. Each question carries 9 marks				
Module 3				
5	a)	List the types of buildings as per occupancy according to Kerala Building rules. Explain any four.	5	(9)
6	a)	Explain the classification of buildings based on occupancy as per NBC	5	(9)
Module 4				
7	a)	Explain any five tests for proper quality control of bricks.	6	(9)
8	a)	Explain any 4 market forms of steel sections with neat sketches	6	(9)
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