

| COURSE CODE | COURSE NAME | L | T | P | CREDIT | YEAR OF INTRODUCTION |
|----------------------|---|----------|----------|----------|---------------|-----------------------------|
| 101908/CO900D | BASICS OF CIVIL AND MECHANICAL ENGINEERING | 4 | 0 | 0 | 4 | 2021 |

1. Preamble

Objective of this course is to provide an insight and inculcate the essentials of Civil Engineering discipline to the students of all branches of Engineering and to provide the students an illustration of the significance of the Civil Engineering Profession in satisfying the societal needs.

To introduce the students to the basic principles of mechanical engineering

2. Prerequisite

Basics of Physics and Chemistry at the level of Higher Secondary Education

3. Syllabus

Section 2: Basics of Civil Engineering (Modules 1, 2 and 3)

Module 1:

Relevance of Civil Engineering in the overall infrastructural development of the country - Responsibility of an engineer in ensuring the safety of built environment -Brief introduction to major disciplines of Civil Engineering like Transportation Engineering, Structural Engineering, Geo-technical Engineering, Water Resources Engineering and Environmental Engineering

Types of constructed facilities: Residential and commercial buildings, roads, bridges canals, hydraulic structures, earth retaining structures, offshore/coastal structures, industrial facilities, water/sewage treatment plants.

Selection of site for buildings, building rules and regulations: Relevance of NBC, KBR (Interior and exterior open spaces & Site plan), CRZ norms (brief discussion only)- Building area: Plinth area, built up area, floor area, carpet area and floor area ratio for a building as per KBR (Numerical Examples)

Module 2:

Types/classifications, properties and uses of stones, soil, timber, bricks, bitumen, cement and other binders, gypsum, aggregates, water, steel, aluminum, glass, ceramics, plastics, thermal and acoustic insulating materials, construction chemicals(grouts, paints, adhesives other coating materials etc.) and composite materials.

Module 3:

Surveying: Importance, objectives and principles, Classification of surveying, Introduction to GIS

Concepts of Building Construction: Earth work and equipment, Types of foundations, brick masonry and random rubble masonry, load bearing and framed structures, types of roofs and floors, MEP, HVAC, elevators, escalators and ramps, fire safety for buildings

Concepts of sustainable construction: green buildings ratings: materials, energy systems, water management and environment for green buildings.

Components of roads and highways, components of bridges

Section 2: Basics of Mechanical Engineering (Modules 4, 5 and 6)

Module 4:

Analysis of thermodynamic cycles: Carnot, Otto, Diesel cycles, Derivation of efficiency of these cycles, Problems to calculate heat added, heat rejected, net work and efficiency. IC Engines: CI, SI, 2- Stroke, 4-Stroke engines. Listing the parts of different types of IC Engines. Efficiencies of IC Engines (Definitions only), Air, Fuel, cooling and lubricating systems in SI and CI Engines, CRDI, MPFI. Concept of hybrid engines.

Module 5:

Refrigeration: Unit of refrigeration, reversed Carnot cycle, COP, vapor compression cycle (only description and no problems); Definitions of dry, wet & dew point temperatures, specific humidity and relative humidity, Cooling and dehumidification, Layout of unit and central air conditioners.

Description about working with sketches of: Reciprocating pump, Centrifugal pump, Pelton turbine, Francis turbine and Kaplan turbine. Overall efficiency, Problems on calculation of input and output power of pumps and turbines (No velocity triangles)

Description about working with sketches of: Belt and Chain drives, Gear and Gear trains, Single plate clutches.

Module 6:

Manufacturing Process: Basic description of the manufacturing processes – Sand Casting, Forging, Rolling, Extrusion and their applications.

Metal Joining Processes: List types of welding, Description with sketches of Arc Welding, Soldering and Brazing and their applications

Basic Machining operations: Turning, Drilling, Milling and Grinding.

Description about working with block diagram of: Lathe, Drilling machine, Milling machine, CNC Machine. Principle of CAD/CAM, Rapid and Additive manufacturing.

4. Text Books

(for section 1)

1. Rangwala, S. C, *Essentials of Civil Engineering*, Charotar Publishing House, 2012
2. Chen W.F and Liew J Y R (Eds), *The Civil Engineering Handbook*, II Edition, CRC (Taylor and Francis), Canada, 2002
3. Kandya A A, *Elements of Civil Engineering*, Charotar Publishing House Pvt Ltd, India, 2017

(for section 2)

4. Benjamin J, *Basic Mechanical Engineering*, Pentex books, 10th Edition, 2019
5. Balachandran, P, *Basic Mechanical Engineering*, Owl Books, 2015

5. Reference Books

(for section 1)

1. Chudley R and Greeno R, *Building Construction Handbook*, 12th Edition, Routledge, Taylor and Francis Group, UK, 2020
2. Chudley R, *Construction Technology*, Vol. I to IV, 2nd Edition, Longman group, UK, 1987
3. Mamlouk M. S., and Zaniewski, J. P., *Materials for Civil and Construction Engineering*, 4th Edition, Pearson international, Singapore, 2017
4. Rangwala S.C, *Building Construction*, 33rd Edition, Charotar Publishing House Pvt Ltd, India, 2019
5. McKay W.B. and McKay J. K, *Building Construction*, Volumes 1 to 4, 5th Edition, Pearson India Education services, New Delhi, 2009

(for section 2)

7. Clifford M, Simmons K. and Shipway, P, *An Introduction to Mechanical Engineering Part I* - CRC Press
8. Roy and Choudhary, *Elements of Mechanical Engineering*, Media Promoters & Publishers Pvt. Ltd., Mumbai.
9. P.K.Nag, *Engineering Thermodynamics*, McGraw Hill
10. P.L. Bellany, *Thermal Engineering*, Khanna Publishers
11. Sawhney, G. S., *Fundamentals of Mechanical Engineering*, PHI

6. Course Outcomes

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

- CO1:** Recall the role of civil engineer in society and to relate the various disciplines of Civil Engineering.
- CO2:** Explain different types of buildings, building components, building materials and building construction
- CO3:** Describe the importance, objectives and principles of surveying.
- CO4:** Summarise the basic infrastructure services MEP, HVAC, elevators, escalators and ramps

C05: Discuss the Materials, energy systems, water management and environment for green buildings.

C06: Students will be able to understand the important concepts of thermodynamics and will be able to analyze thermodynamic cycles

C07: Students will be able to Illustrate the working and features of IC Engines and can identify the scope of electronics in IC engines

C08: Students will be able to identify and differentiate the different components of a refrigerator and air-conditioning unit.

C09: Students will be able to understand the working of hydraulic machines

C010: Students will be able to understand the working of power transmission devices and will be able to select appropriate transmission device for a specific requirement.

C011: Students will be able to classify different manufacturing processes for various applications.

C012: Students will be able to apply their knowledge in machine tools to extend their opportunities in CNC machine tools.

7. Mapping of Course Outcomes with Program Outcomes

| | P01 | P02 | P03 | P04 | P05 | P06 | P07 | P08 | P09 | P010 | P011 | P012 | PS01 | PS02 | PS03 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|
| C01 | 1 | - | - | - | - | 3 | 2 | 2 | - | - | - | - | - | - | - |
| C02 | 3 | 2 | - | | | - | - | | - | - | - | - | - | - | --- |
| C03 | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C04 | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C05 | 2 | - | - | - | - | 2 | 3 | - | - | - | - | - | - | 1 | - |
| C06 | 2 | 2 | - | - | - | - | - | - | - | 1 | - | - | - | - | - |
| C07 | 2 | - | - | - | - | 1 | - | - | - | 1 | - | - | - | - | - |
| C08 | 2 | 1 | - | - | - | - | - | - | | 1 | - | - | - | - | - |
| C09 | 2 | 1 | - | - | - | - | - | - | - | 1 | - | - | - | - | - |
| C010 | 2 | 1 | - | - | - | - | - | - | - | 1 | - | - | - | - | - |
| C011 | 2 | - | - | - | - | - | - | - | - | 1 | - | - | - | - | - |
| C012 | 2 | - | - | - | 1 | 1 | | - | - | 1 | - | - | - | - | - |

8. Assessment Pattern

| Learning Objectives | Section 1: Basic Civil Engineering | | | Section 2: Basic Mechanical Engineering | | |
|---------------------|--------------------------------------|-----------------------------|--|---|-----------------------------|--|
| | Continuous Internal Evaluation (CIE) | | End Semester Examination (ESE out of 50) | Continuous Internal Evaluation (CIE) | | End Semester Examination (ESE out of 50) |
| | Internal Examination 1 (25) | Internal Examination 2 (25) | | Internal Examination 1 (25) | Internal Examination 2 (25) | |
| Remember | 5 | 5 | 10 | 7.5 | 7.5 | 15 |
| Understand | 15 | 20 | 30 | 12.5 | 12.5 | 25 |
| Apply | 5 | | 10 | 5 | 5 | 10 |
| Analyse | | | | | | |
| Evaluate | | | | | | |
| Create | | | | | | |

9. Mark Distribution

| Total | CIE | | | | ESE |
|-------|------------|----------------------|--------------------------------|-------|-----|
| | Attendance | Internal Examination | Assignment/Quiz/Course Project | Total | |
| 150 | 10 | 25 | 15 | 50 | 100 |

10. End Semester Examination Pattern

There will be two parts: Section 1 – Basics of Civil Engineering and Section 2 – Basics of Mechanical Engineering. Section 1 and Section 2 carries 50 marks each. For the end semester examination, Section 1 contains 2 parts - Part A and Part B. Part A contains 5 questions carrying 4 marks each (not exceeding 2 questions from each module). Part B contains 2 questions from each module out of which one to be answered. Each question carries 10 mark and can have maximum 2 sub-divisions. The pattern for end semester examination for Section 2 is same as that of Section 1. **However, student should answer both part I and part 2 in separate answer booklets.**
