

**RAJAGIRI SCHOOL OF ENGINEERING & TECHNOLOGY  
(AUTONOMOUS)**

**B.TECH. DEGREE PROGRAMME**

**SECOND SEMESTER**

**(2020 ADMISSIONS)**

<b>100908/CO900D</b>	<b>BASICS OF CIVIL AND MECHANICAL ENGINEERING</b>
----------------------	---

**SYLLABUS**

Rajagiri Valley, Kakkanad,  
Kochi 682 039, Kerala, INDIA  
[www.rajagiritech.ac.in](http://www.rajagiritech.ac.in)

<b>COURSE CODE</b>	<b>COURSE NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CREDIT</b>	<b>YEAR OF INTRODUCTION</b>
<b>100908/CO900D</b>	<b>BASICS OF CIVIL AND MECHANICAL ENGINEERING</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>2020</b>

**1. Preamble:** Objective of this course is to provide an insight and inculcate the fundamentals of Civil Engineering and Mechanical Engineering to the students.

**2. Prerequisite:** Basics of Physics and Chemistry at the level of higher secondary education.

### **3. Syllabus**

#### **Section 1: Basic Civil Engineering (Modules 1,2 and 3)**

##### **Module 1**

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 built environment. Brief introduction to major disciplines of Civil Engineering like Transportation Engineering, Structural Engineering, Geo-technical Engineering, Water Resources Engineering and Environmental Engineering.

Introduction to buildings: Types of buildings, selection of site for buildings, components of a residential building and their functions.

Building rules and regulations: Relevance of NBC, KBR & 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.

##### **Module 2**

Surveying: Importance, objectives and principles. Construction materials, Conventional construction materials: types, properties and uses of building materials: bricks, stones, cement, sand and timber, Cement concrete: Constituent materials, properties and types. Steel: Steel sections and steel reinforcements, types and uses.

Modern construction materials:- Architectural glass, ceramics, Plastics, composite materials, thermal and acoustic insulating materials, decorative panels, waterproofing materials. Modern uses of gypsum, pre-fabricated building components (brief discussion only).

### **Module 3**

Building Construction: Foundations: Bearing capacity of soil (definition only), functions of foundations, types – shallow and deep (brief discussion only). Load bearing and framed structures (concept only).

Brick masonry: - Header and stretcher bond, English bond & Flemish bond random rubble masonry.

Roofs and floors: - Functions, types; flooring materials (brief discussion only).

Basic infrastructure services: MEP, HVAC, elevators, escalators and ramps (Civil Engineering aspects only), fire safety for buildings.

Green buildings:- Materials, energy systems, water management and environment for green buildings. (brief discussion only).

## **Section 2: Basic 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, vapour 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
2. McKay, W.B. and McKay, J. K., Building Construction, Volumes 1 to 4, Pearson India Education Services

### **(for Section 2)**

3. Benjamin J., “Basic Mechanical Engineering”, Pentex books, 10th Edition, 2019
4. Balachandran, P. “Basic Mechanical Engineering”. Owl Books, 2015.

## **5. Reference Books**

### **(for Section 1)**

1. Chen W.F and Liew J Y R (Eds), The Civil Engineering Handbook. II Edition, CRC Press (Taylor and Francis).
2. Chudley, R and Greeno R, Building construction handbook, Addison Wesley, Longman group, England.
3. Chudley, R, Construction Technology, Vol. I to IV, Longman group, England
4. Kandya A A, Elements of Civil Engineering, Charotar Publishing house
5. Mamlouk, M. S., and Zaniewski, J. P., Materials for Civil and Construction Engineering, Pearson Publishers
6. Rangwala S.C and Dalal K B, Building Construction, Charotar Publishing

House

7. Rangwala S.C and Dalal K B, Engineering Materials, Charotar Publishing

House

**(for Section 2)**

8. Clifford, M., Simmons, K. and Shipway, P., “An Introduction to Mechanical Engineering Part I” - CRC Press

9. Roy and Choudhary, “Elements of Mechanical Engineering”, Media Promoters & Publishers Pvt. Ltd., Mumbai.

10. P.K.Nag, “Engineering Thermodynamics”, McGraw Hill

11. P.L. Bellany, “Thermal Engineering”, Khanna Publishers

12. 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

CO5: Discuss the Materials, energy systems, water management and environment for green buildings.

CO6: Students will be able to understand the important concepts of thermodynamics and will be able to analyze thermodynamic cycles

CO7: Students will be able to Illustrate the working and features of IC Engines and can identify the scope of electronics in IC engines

CO8: Students will be able to identify and differentiate the different components of a refrigerator and air-conditioning unit.

CO9: Students will be able to understand the working of hydraulic machines

CO10: 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.

CO11: Students will be able to classify different manufacturing processes for various applications.

CO12: 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:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3					3	2	2				
CO2	3	2		1	3			3				
CO3	3	2			3				2			
CO4	3	2			3				2			
CO5	3	2			3	2	3		2			
CO6	2	2	-	-	-	-	-	-	-	1	-	-
CO7	2	-	-	-	-	1	-	-	-	1	-	-
CO8	2	1	-	-	-	-	-	-	-	1	-	-
CO9	2	1	-	-	-	-	-	-	-	1	-	-
CO10	2	1	-	-	-	-	-	-	-	1	-	-
CO11	2	-	-	-	-	-	-	-	-	1	-	-
CO12	2	-	-	-	1	1	-	-	-	1	-	-

### 8. Assessment Pattern(marginal changes can be made according to question paper pattern):

Learning Objectives	Section 1 (Basic Civil Engineering)			Section 1 (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	20	7.5	7.5	15
Understand	20	20	30	12.5	12.5	25
Apply	0	0	0	5	5	10

**9. Mark Distribution  
(For Section 1)**

Total	CIE				ESE
	Attendance	Internal Examination	Assignment/Quiz/Course Project	Total	
75	5	12.5	7.5	25	50

**(For Section 2)**

Total	CIE				ESE
	Attendance	Internal Examination	Assignment/Quiz/Course Project	Total	
75	5	12.5	7.5	25	50

**10. End Semester Examination Pattern**

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