

ELEMENTS OF CIVIL ENGINEERING AND MECHANICS

Semester	: I/II	CIE Marks	: 40
Course Code	: 18CIV14/24	SEE Marks	: 60
Teaching Hours/week (L:T:P)	: 2:2:0	Exam Hours	: 03
Credits : 03			

Course Objectives:

The objectives of this course are:

- To make students to learn Scope of various fields of Civil Engineering, basics of civil engineering concepts and importance of infrastructure development.
- To develop a student's ability to analyze the problems involving Forces and Moments with their applications, Centroid and Moment of inertia and Kinetics of bodies.

Module-1

Introduction to Civil Engineering: Scope of different fields of Civil Engineering; Surveying, Building Materials, Construction Technology, Geotechnical Engineering, Structural Engineering, Hydraulics, Water Resources & Irrigation Engineering, Transportation Engineering and Environmental Engineering. Role of Civil Engineers in the Infrastructural development, effect of infrastructural facilities on social-economic development of a country.

(RBT Level : L1)

Introduction to Engineering Mechanics: Basic concepts of idealization-Particle, Continuum and Rigid Body; Force; Systems of Forces; Basic Principles – Physical Independence of forces, Superposition, Transmissibility, Newton's Laws of Motion, Resolution and Composition of forces, Law of parallelogram of forces, Polygonal law, Resultant of Concurrent coplanar force systems, Coplanar Non Concurrent Force System: Moment of a Forces, couple, Varignon's theorem, Resultant of Coplanar non-concurrent force system.

(RBT Level : L1, L2 & L3)

Module-2

Equilibrium of Forces: Free body diagrams, Lami's theorem, Equations of Equilibrium, equilibrium of concurrent and non concurrent coplanar force systems.

(RBT Level : L1, L2 & L3)

Friction: Types of friction, Laws of dry Friction, Limiting friction, Concept of Static and Dynamic Friction; Numerical problems on motion of single and connected bodies on planes, wedge friction, ladder friction, rope and Pulley systems.

(RBT Level : L1, L2 & L3)

Module-3

Support Reactions: Types of Loads and Supports, statically determinate and indeterminate beams, Support Reaction in beams, Numerical problems on support reactions for statically determinate beams (Point load, uniformly distributed & uniformly varying loads and Moments)

(RBT Level : L1, L2 & L3)

Analysis of Simple trusses: Types of trusses, Analysis of statically determinate trusses using method of joints and method of sections.

(RBT Level : L1, L2 & L3)

Module-4

Centroid: Centroid of simple figures from first principle, Centroid of composite/built-up sections; **Moment of Inertia:** Introduction, second moment of area of plane sections from first principles, Parallel axes and perpendicular axes Theorems, Radius of gyration, Moment of inertia of composite area and built-up sections.

Concept of Product of Inertia(No Problems)

(RBT Level : L1, L2 & L3)

Module-5

Kinematics: Definitions, Displacement, Average velocity, Instantaneous velocity, Speed, Acceleration, Average acceleration, Variable acceleration, Acceleration due to gravity, Newton's Laws of Motion. Rectilinear Motion-Numerical problems. Curvilinear Motion-Super elevation, Projectile Motion, Relative motion, Numerical problems. Motion under gravity, Numerical problems,

(RBT Level : L1, L2 & L3)

Kinetics: D'Alembert's principle and its applications in plane motion and connected bodies including pulleys

(RBT Level : L2 & L3)

Course outcomes: After a successful completion of the course, the student will be able to:

1. Mention the applications of various fields of Civil Engineering.
2. Compute the resultant of given force system subjected to various loads.
3. Comprehend the action of Forces, Moments and other loads on systems of rigid bodies and compute the reactive forces that develop as a result of the external loads.
4. Locate the Centroid and compute the Moment of Inertia of regular and built-up sections.
5. Express the relationship between the motion of bodies and analyze the bodies in motion.

Question paper pattern:

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60.
- The question paper will have ten full questions carrying equal marks.
- Each full question consisting of 20 marks.
- There will be two full questions (with a maximum of three sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Textbooks:

1. R. C. Hibbler, Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.
2. Bansal R.K., A Text Book of Engineering Mechanics, Laxmi Publications.

Reference Books:

1. Andy Ruina and Rudra Pratap , Introduction to Statics and Dynamics, Oxford University Press.
2. Reddy Vijaykumar K. and K. Suresh Kumar, Singer's Engineering Mechanics.
3. F. P. Beer and E. R. Johnston, Mechanics for Engineers, Statics and Dynamics, McGraw Hill.
4. Irving H. Shames, Engineering Mechanics, Prentice Hall.


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