ELEMENTS OF CIVIL ENGINEERING AND MECHANICS
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2017 -2018)
SEMESTER - I/II

Subject Code	17CIV13/23	IA Marks	40
Number of Lecture Hours/Week	04	Exam Marks	60
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS - 04

COURSE OBJECTIVES:

The objectives of this course is to make students to learn basics of Civil Engineering concepts and infrastructure development, solve problems involving Forces, loads and Moments and know their applications in allied subjects. It is a pre-requisite for several courses involving Forces, Moments, Centroids, Moment of inertia and Kinematics.

Particulars	Hours
Module 1: Introduction to Civil Engineering &Engineering Mechanics	**10**
Introduction to Civil Engineering Scope of different fields of Civil Engineering - Surveying, Building Materials, Construction Technology, Geotechnical Engineering, Structural Engineering, Hydraulics, WaterResources and Irrigation Engineering, Transportation Engineering, Environmental Engineering.	01
Infrastructure: Types of infrastructure, Role of Civil Engineer in theInfrastructural Development, Effect of the infrastructural facilities onsocio-economic development of a country.	01
Roads: Classification of Roads and their functions, Comparison of Flexible and Rigid Pavements (Advantages and Limitations)	01

Bridges: Types of Bridges and Culverts, RCC, Steel and Composite Bridges	01
Dams: Different types of Dams based on Material, Structural behavior and functionality with simple sketches.	01
Introduction to Engineering Mechanics: Basic idealizations - Particle, Continuum and Rigid body; Newton's lawsCForce and its characteristics, types of forces-Gravity, Lateral and its distribution on surfaces, Classification of force systems, Principle of physical independence, superposition, transmissibility of forces, , Introduction to SI units.	02
Couple, Moment of a couple, Characteristics of couple, Moment of a force, Equivalent force - Couple system; Numerical problems on moment of forces and couples, on equivalent force - couple system.	03
Module 2: Analysis of Concurrent Force Systems	**10**
Concepts: Resultants and Equilibrium Composition of forces - Definition of Resultant; Composition of coplanar -concurrent force system, Parallelogram Law of forces, Principle of resolved parts;	03
Numerical problems on composition of coplanar concurrent force systems. Equilibrium of forces - Definition of Equilibrant; Conditions of static equilibrium for different force systems, Lami's theorem; Numerical problems on equilibrium of coplanar – concurrent and non-concurrent force systems.	03
Application- Static Friction in rigid bodies in contact Types of friction, Laws of static friction, Limiting friction, Angle of friction, angle of repose; Impending motion on horizontal and inclined planes; Numerical Problems on single and two blocks on inclined planes	02 02

Module - 3 Analysis of Non-Concurrent Force Systems	10
Concepts: Resultants and Equilibrium Composition of coplanar - non-concurrent force system, Varignon's principle of moments; Numerical problems on composition of coplanar non-concurrent Force system.	05
Application-Support Reaction in beams Types of Loads and Supports, statically determinate beams, Numerical problems onsupport reactions for statically determinate beams with Point load (Normal and inclined) and uniformly distributed and uniformly varying loads and Moments.	05
Module 4 Centroids and Moments of Inertia of Engineering Sections:	10
Centroids Introduction to the concept, centroid of line and area, centroid of basic geometrical figures, computing centroid for– T, L, I, Z and full/quadrant circular sections and their built up sections. Numerical problems	05
Moment of Inertia Introduction to the concept, Radius of gyration, Parallel axis theorem, Perpendicular axis theorem, Moment of Inertia of basic planar figures, computing moment of Inertia for – T, L, I, Z and full/quadrant circular sections and their built up sections. Numerical problems	05
Module 5: Kinematics	10
Concepts and Applications Definitions – Displacement – Average velocity – Instantaneous velocity – Speed – Acceleration - Average acceleration – Variable acceleration – Acceleration due to gravity – Newton's Laws of Motion.	02
Rectilinear Motion–Numerical problems.	02
Curvilinear Motion – Super elevation – ProjectileMotion – Relative motion – Numerical problems.	03
Motion under gravity – Numerical problems.	03
COURSE OUTCOMES After a successful completion of the course, the student will be able to:	

1. Know basics of Civil Engineering, its scope of study, knowledge about Roads, Bridges and Dams;
2. Comprehend the action of Forces, Moments and other loads on systems of rigid bodies;
3. Compute the reactive forces and the effects that develop as a result of the external loads;
4. Locate the Centroid and compute the Moment of Inertia of regular cross-sections.
5. Express the relationship between the motion of bodies and
6. Equipped to pursue studies in allied courses in Mechanics.

Question Paper Pattern:

- 10 Questions are to be set such that 2 questions are selected from each module.
- 2 Questions are to be set under respective modules.
- Intra module questions are to be set such that the questions should cover the entire module and further, should be answerable for the set marks.
- Each question should be set for 20 marks (Preferably 10 marks each)
- Not more than 3 sub questions are to be set under any main question
- Students should answer 5 full questions selecting at least 1 from each module.

TEXT BOOKS

1. Elements of Civil Engineering and Engineering Mechanics by M.N. Shesha Prakash and Ganesh. B. Mogaveer, PHI Learning, 3rd Revised edition (2014)

2. Engineering Mechanics-Statics and Dynamics by A Nelson, Tata McGraw Hill Education Private Ltd, New Delhi, 2009.

3. Elements of Civil Engineering (IV Edition) by S.S. Bhavikatti, New Age International Publisher, New Delhi, 3rd edition 2009.

REFERENCES

1. Engineering Mechanics by S.Timoshenko,D.H.Young, and J.V.Rao, TATA McGraw-Hill Book Company, New Delhi

2. Beer FP and Johnson ER, **"Mechanics for Engineers- Dynamics and Statics"**- 3rd SI Metric edition, Tata McGraw Hill. - 2008

3. Shames IH, **"Engineering Mechanics – Statics & Dynamics"**- PHI – 2009