Reinforced Concrete Design-I

Course Code	Credit Hours
CE-313	3-1

Course Description

This course covers the properties of concrete as a building material and dependence of its constituents on its properties. This course also encompasses the design of reinforced concrete members including the slabs, beams, columns, and footings. The detailing requirements and code limitations are also covered in the scheme.

Text Book:

1. Properties of Concrete, 4th ed. ELBS, by A.M. Neville.
2. Design of Concrete Structures (Latest Edition), by Arthur H. Nilson, David Darwin, and Charles W. Dolan, McGraw-Hill, New York, NY 10020.
3. ACI Building Code Requirement for reinforce concrete structures 318-11.

Reference Book:

1. Advanced Concrete Technology by John Newman
2. Reinforced Concrete - Mechanics and Design (5th edn) by James K. Wright and James G. MacGregor, Pearson-Prentice Hall, Upper Saddle River New Jersey NJ 07458.

Prerequisites :

Nil

ASSESSMENT SYSTEM FOR THEORY

	Without Project (%)	With Project/Complex Engineering Problems (%)
Quizzes	15	10-15
Assignments	10	5-10
Mid Terms	25	25
Project	-	5-10
End Semester Exam	50	45-50

ASSESSMENT SYSTEM FOR LAB

Lab Work/ Psychomotor Assessment/ Lab Reports	70%
Lab Project/ Open Ended Lab Report/ Assignment/ Quiz	10%
Final Assesment/ Viva	20%

Teaching Plan

Week No	Topics/Learning Outcomes
1 -3	Plain Concrete (Properties, Application and Testing)
	Concrete constituent material and its mechanical properties
	Properties of freshly mixed concrete
	Durability aspects and factors contributing towards durability
	Creep and shrinkage of concrete
	Mix design and quality control
	Additives and admixtures
	Air entrainment
	Lightweight concrete
	Hot and cold weather concrete
	Precast concrete with special reference to cement concrete blocks
	Determination of fundamental structural properties of concrete and non-destructive testing (NDT)
	Predictive Modeling and Design of Specialized Concrete using Machine Learning- An Introduction
4 - 5	Reinforced Concrete (Basic Principles, Working Stress and ultimate Strength Method)
	• Basic principles of reinforced concrete design and associated assumptions, behavior of reinforced concrete members in flexure, design philosophy, design codes, factor of safety and load factors, prevailing methods of design of reinforced concrete members.
	• Working stress method, serviceability criteria and checks for

	deflection, crack width, and crack spacing, Importance of working stress method related to pre-stress.
	• Ultimate strength method, analysis of prismatic and non-prismatic sections in flexure, compatibility-based analysis of sections and code requirements for flexure
6	Structural Framing and Load Calculations of a Simple Structure for Gravity Design
	• Structural framing
	• Load calculations, types of basic loads, service and factored load combinations.
	• Load distribution and calculations for slabs, beams, columns and footings
7 - 8	Slab Analysis and Design for Gravity Loading
	• One-way solid slabs
	• Two-way solid slabs using coefficient method
	• Design detailing
9	**Mid Semester Exam**
10 -12	Beam Analysis and Design for Gravity Loading
	• Flexure analysis and design of beams (singly, doubly, rectangle section, T/L sections, simple span, one end and both end continuous)
	• Shear analysis and design of beams
	• Design detailing
13-15	Columns
	• Analysis of sections in pure compression,
	• Design of short columns under pure compression
	• Design detailing
	• Footings
	• Isolated footings
	• Structural design of isolated and rectangular footing.
	• Design detailing
16	Steel Detailing (Bond, Anchorage & Development Length)

	• Design and detailing for bond, anchorage, development length, laps and splices
17-18	**End Semester Exam**

Practical

Experiment No	Description
1	To study the compressive strength of concrete using cube and cylinder.
2	To prepare mix design for various strengths of concrete.
3	To find workability of concrete using slump cone method, compacting factor method, VeBe time method.
4	To study the effect of w/c ratio on the strength of concrete.
5	Determination of Split tensile strength of concrete
6	Determination of the effect of aging on strength of concrete
7	To determine the strength of concrete using core extraction and to discuss the results from control cylindrical samples.
8	To study the ultrasonic pulse velocity test and Schmidt hammer test on hardened concrete.
9	To study the behaviour of balanced reinforced, under-reinforced and over-reinforced concrete flexural members.
10	To study the behaviour of shear deficient flexural members.