

CE 513: ADVANCED CONCRETE TECHNOLOGY (3-0-0:3)

Introduction

Different types of cementitious materials, Micro structural aspects of cement paste; Models of hydrated Portland cement gel.

Admixtures and Construction Chemicals

Benefits of admixtures, type of admixtures, plasticizers, action of plasticizers, super- plasticizers, classification of super plasticizers, effect of super-plasticizers, doses of super plasticizers, super plasticizers-cement compatibility, waterproofing admixture, antibacterial and similar admixtures, IS codal provisions for concrete mix design.

Strength and durability of concrete

Factors affecting the strength, curing of concrete, strength in tension, failure in compression, aggregate cement paste interface, effect of age on strength of concrete, relationship between compressive and tensile strength, bond strength. Causes of inadequate durability, transportation mechanism in concrete, diffusion, absorption, water permeability of concrete, air and vapour permeability, carbonation, acid attack on concrete, sulphate attack on concrete, efflorescence, Marine concrete, alkali-silica reaction, chloride attack, and test for penetrability of concrete to chlorides

Special concrete and concreting techniques

Introduction, light weight concrete, ultra-light weight concrete, concrete with different cementitious materials like fly ash, ggbs, silica fume etc., fiber reinforced concrete, polymer concrete composites, jet cement concrete, gap graded concrete, high performance concrete, self-compacting concrete, foamed concrete.

Microstructure analysis techniques

Working principle of Scanning Electron Microscope (SEM), Energy Dispersive X-ray Spectrometry (EDS), X-ray Powder Diffraction (XRD), Fourier Transform Infrared Spectroscopy (FTIR) analysis techniques, TGA (Thermo gravimetric analysis) and DTA (Differential Thermal Analysis).

Text Books and References:

1. Neville, A.M., "*Properties of Concrete*", Standard Publishers Distributors, 5th edition 2012.
2. Zongjin, Li., "*Advanced Concrete Technology*", Wiley, 2011.
3. Varshney, "*Concrete Technology*", Khanna Publishers, New Delhi 1st edition 1982.
4. Shetty. M.S., "*Concrete Technology*", S.Chand & Company Ltd, 1st edition 2006.
5. Santhakumar, A.K., "*Concrete Technology*", Oxford Press, 1st edition 2006.

Expected outcome:

Upon completion of this course, the student will be able to know the various materials in concrete and admixtures. Get a thorough knowledge on strength and durability properties of conventional cement concrete and various types of special concrete. Know the different microstructure analysis of concrete.