COURSE CONTENT

CONCRETE MATERIALS								
IV Semester: CE								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
ACED10	Core	3	0	0	3	40	60	100
Contact Classes: 48	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 48**		
Prerequisite: Nil								

I. COURSE OVERVIEW:

Concrete Materials course is focused on concrete making materials including supplementary cementitious materials. Concrete production process also forms a part of the discussion. Going through the course one would develop first-hand knowledge on concrete production process and fresh and hardened properties of concrete as a modern material of construction. The courses will enable one to make appropriate decision regarding ingredient selection and mix design of concrete.

II. COURSE OBJECTIVES:

The students will try to learn:

I. Fundamental properties of construction materials such as cement, aggregates and admixtures based on laboratory and filed tests for identifying material quality.
II. Factors influencing workability and methods involved in measuring workability of fresh concrete.
III. Importance of water/cement ratio and its influence on compressive tensile and flexural strengths of hardened concrete.
IV. Concept of quality control and design of concrete mix for ensuring quality of concrete.

III. COURSE OUTCOMES:

At the end of the course students should be able to:

CO 1 Choose the basic physical and chemical properties of construction materials for determining quality of concrete.
CO 2 Explain the workability and manufacturing process of concrete for obtaining economical and durable concrete.
CO 3 Inspect the impact of water/cement ratio on strength and durability of concrete by measuring its hardened strength
CO 4 Apply destructive and Non-destructive tests of hardened concrete for calculating compressive, tensile and flexural strengths.
CO 5 Develop the most economical and eco-friendly concrete mix based on standard methods for producing quality of concrete.
CO 6 Examine special concretes and new generation concrete for satisfying the future needs of industry in real time.

IV. COURSE CONTENT:

MODULE - I: CEMENT (09)

Cement: Manufacture of Portland cement, chemical composition, Hydration of Cement: Bogue's compounds, Hydration, Gel formation; Grades of cement, Tests on cement as per Indian standards, Types of cements. Supplementary cementing materials: Fly ash, Silica fume, Ground granulated blast furnace slag, Metakaolin, Rice Husk Ash - Characteristics

MODULE - II: AGGREGATES AND ADMIXTURES (10)

Aggregates: Types and Properties, Tests on aggregates as per Indian standards, Bulking of sand, Sieve analysis –

Grading. Admixtures: chemical admixtures: Water reducing agents, Super-plasticizers, Air entertainers, Accelerators, properties, dosage and effects.

MODULE - III: CONCRETE PRODUCTION, FRESH & HARDENED PROPERTIES (10)

Fresh concrete: Water / Cement ratio, Abram's Law, Gel space ratio, maturity concept, Properties of fresh concrete- Workability – different tests of workability, Factors influencing workability, compaction, finishing, curing.

Hardened concrete: Tests on hardened concrete as per IS codes – Relationship between different strengths – factors influencing strength, curing, Time dependent behavior of concrete- creep and shrinkage, NDE Techniques.

MODULE - IV: CONCRETE MIX DESIGN (09)

Mix proportion and grade of concrete, Factors in the choice of mix proportions, BIS method of mix design, acceptance criteria for concrete as per IS specification. Durability: Factors influencing durability – Chemical effects on concrete- Carbonation, Sulphate attack, Chloride attack.

MODULE - V: SPECIAL CONCRETES (10)

Fibre reinforced concrete, polymer concrete, geo-polymer concrete, shotcrete, self-compacting concrete, light weight concrete, high strength concrete, high performance concrete, bacterial concrete, heavy weight concrete.

V. TEXT BOOKS:

1. Shetty, M.S., *Concrete Technology, Theory & Practice*, S. Chand and Co, 2004.
2. Gambhir, M.L., *Concrete Technology*, Tata McGraw Hill, 2004.

VI. REFERENCE BOOKS:

1. V.N.Vazirani & S.P.Chandola, Ed. by Vineet Kumar,*Concrete technology*, 6th Edition reprint, 2014.
2. Santa kumar A.R., *Concrete Technology*, Oxford University Press, New Delhi, 2007.

VII. ELECTRONICS RESOURCES:

1. https://nptel.ac.in/courses/112105171/1
2. http://royalmechanicalbuzz.blogspot.in/2015/04/strength-of-materials-book-by-r-k-bansal.html

VIII. MATERIAL ONLINE:

1. Course template
2. Tech-talk topics
3. Assignments
4. Definition and terminology
5. Tutorial question bank
6. Model question paper – I
7. Model question paper – II
8. Lecture notes
9. Early lecture readiness videos (ELRV)
10. Power point presentations