Approval: 9th Senate Meeting

Course Number: CE 552

Course Name: Concrete Technology

Credits: 3-0-0-3

Prerequisites: None
Intended for: UG/PG

Distribution: Discipline Elective

Semester: Odd/Even

Preamble: Concrete is the most widely used building material of modern era.A sound comprehension of concrete technology is therefore of immense significance to the profession of civil engineering. This course addresses the necessity by adequately covering all the essential aspects, including, concrete ingredients, concrete types, the production process of concrete and its properties in fresh and hardened states.

Course Outline: The course covers all the fundamental topics relating to concrete technology. This includes cement, supplementary cementitious materials, aggregates, chemical admixtures, equipment and operations involved in concrete production, monitoring of quality and testing of concrete properties in fresh and hardened states.

Modules:

1. History of Concrete construction **(1 contact hour)**
2. Introduction to Special concretes:
   - High strength/performance concrete: Principle, Ingredient properties, Material selection, Design principles, Production, Curing, Properties in fresh state and hardened states, Durability.
   - Self-consolidating concrete: Benefits and Limitations, Properties in fresh and hardened states, design principles and Quality Control.
   - Fibre reinforced concrete: Types of fibres, Structure of matrix, Fibre-Cement interactions, Cracking mechanics.
   - Light weight concrete: Production and properties of No-fines concrete, Aerated and foamed concrete, Lightweight aggregate concrete.
   - Recycled aggregate concrete – Use of industrial, construction and demolition wastes and their effect on concrete properties. **(6 contact hours)**

3. Cement – Manufacture, Types, Aspects of hydration. **(5 contact hours)**

4. Supplementary cementing materials: Fly ash, Silica fume, Ground granulated blast furnace slag, Metakaolin, Rice Husk Ash – Characteristics, Properties of mortar and concrete in fresh and hardened states, Durability of concrete. **(5 contact hours)**

5. Chemical admixtures: Water reducing agents, Super-plasticizers, Air entertainers, Accelerators, Damp proofers and Corrosion inhibitors. **(4 contact hours)**
6. Aggregates – Types and Properties. **(4 contact hours)**

7. Principles of mix design. **(3 contact hours)**
8. Concrete production, Placement and Curing: Equipment and practices; Formwork for concrete structures: Economy, Pressures on formwork, Forms for beams, columns, slabs and footings, Slipforms and Failures of formwork. **(5 contact hours)**
9. Introduction to the testing of fresh, mechanical and durability characteristics of concrete. **(5 contact hours)**

10. Introduction to Prescriptive and Performance specifications. **(2 contact hours)**
11. Quality control: Nature of variability, Control charts. **(2 contact hours)**

Text Books:

a) A. M. Neville, 'Properties of concrete 4th Edn.', Pearson Education, India, 1963.
b) Neville and Brooks, 'Concrete technology', Prentice Hall, UK, 2006.
c) Mehta, P.K. and Monteiro, P.J.M., 'Concrete: structure, properties and materials', Prentice Hall, NJ, 2006.
d) Mindess, S., Young, J.F. and Darwin, D., 'Concrete', Prentice Hall, NJ, 2003.

Reference Books:

a) Siddique, P. and Khan, M.I., 'Supplementary cementitious materials', Springer, London and New York, 2011.
b) Rixom, R. and Mailvaganam, N., 'Chemical admixtures for concrete', E & FN SPON, London, 2002.
c) Aitcin, P.C., 'High performance concrete', E & FN SPON, London and New York, 2011.
d) Bentur, A. and Mindess, S., 'Fibre reinforced cementitious composites', E & FN SPON, London and New York, 2006.
e) Brito, J.de and Saikia, N., 'Recycled aggregate in concrete: use of industrial, construction and demolition waste', Springer, London, Heidelberg, New York and Dordrecht, 2012.
f) Day, K.W., 'Concrete mix design, quality control and specification', E & FN SPON, London and New York, 2006.
g) Peurifoy, R. L. and Oberlender, G. D., 'Formwork for concrete structures', McGraw Hill, New York, 1996.
h) Dackzo, J.A., 'Self-consolidating concrete', Spon press, New York and London, 2012.