

CONCRETE TECHNOLOGY

Course Learning Objectives:

- To learn the concepts of Concrete production and its behavior in various environments.
- To learn the test procedures for the determination of properties of concrete.
- To understand durability properties of concrete in various environments.

Course Outcomes:

Upon successful completion of this course, student can able to

- Understand the basic concepts of concrete.
- Realize the importance of quality of concrete.
- Familiarize the basic ingredients of concrete and their role in the production of concrete and its behavior in the field.
- Test the fresh concrete properties and the hardened concrete properties and evaluate the ingredients of concrete through lab test results.
- Design the concrete mix by BIS method.

SYLLABUS

UNIT I

Ingredients of Concrete Cements & Admixtures:

Portland cement – Chemical composition – Hydration, Setting of cement, Fineness of cement, Structure of hydrate cement – Test for physical properties – Different grades of cements – Admixtures – Mineral and Chemical Admixtures – Accelerators, Retarders, Air Entainers, Plasticizers, Super Plasticizers, Fly Ash and Silica Fume.

Aggregates: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregates – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded and well graded aggregate as per relevant IS code – Maximum aggregate size. Quality of mixing water.

UNIT II

Fresh Concrete:

Steps in Manufacture of Concrete – proportion, mixing, placing, compaction, finishing, curing – including various types in each stage. Properties of fresh concrete – Workability – Factors affecting workability – Measurement of workability by different tests, Setting times of concrete, Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete, Ready mixed concrete, Shotcrete

UNIT III

Hardened Concrete:

Water / Cement ratio – Abram's Law – Gel space ratio – Nature of strength of concrete – Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength – Curing, Testing of Hardened Concrete: Compression tests – Tension tests – Factors affecting strength – Flexure tests – Splitting tests – Non-destructive testing methods – codal provisions for NDT.

UNIT IV

Elasticity, Creep & Shrinkage:

Modulus of elasticity, Dynamic modulus of elasticity, Poisson's ratio, Creep of concrete, Factors influencing creep, Relation between creep & time, Nature of creep, Effects of creep – Shrinkage – types of shrinkage.

UNIT V

Mix Design:

Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Concepts Proportioning of concrete mixes by various methods – BIS method of mix design.

TEXT BOOKS

1. Concrete Technology by M. S. Shetty. – S. Chand & Company
2. Concrete Technology by A. R. Santha Kumar, Oxford University Press, New Delhi

REFERENCES

1. Properties of Concrete by A. M. Neville – Pearson – 4th edition
2. Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi