

16CE201 BUILDING MATERIALS AND CONCRETE TECHNOLOGY

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HSB	CS	SA	S	BS
45	15	-	20	48	6	12	3	5



Course Description and Objectives:

This course provides an understanding of various engineering properties of building materials like stones, bricks, lime, timber, steel and paints. The objective of this course is to provide basic knowledge about properties and testing of various building materials used in civil constructions.

Course Outcomes:

The student will be able to:

- understand the properties of all construction materials including bricks, lime, timber etc.
- understand the properties of ingredients of concrete.
- analyse behavior of concrete in its fresh and hardened state.
- analyse concrete design mix.

SKILLS:

- ✓ *Identify different composition of building materials*
- ✓ *Make concrete mix proportions for different grades*
- ✓ *Test concrete cube to calculate characteristic compressive strength.*
- ✓ *Test fresh concrete to understand creep and shrinkage.*
- ✓ *Analyse engineering properties of special concretes such as green concrete, light weight concrete, fiber reinforced concrete etc.*

ACTIVITIES:

- Calculate the water cement ratio of a concrete for a specified grade.
- Prepare different grades of concrete.
- Test concrete cube of M20 and M30 grade and find out their characteristic compressive strength using UTM.
- Prepare special concrete mixes like green concrete, pervious concrete and test their engineering properties.
- Calculate the strength of concrete at age of 7 days and 28 days of curing.

UNIT – 1**L-9, T-3****BUILDING MATERIALS:****STONES:** Qualities of a good building stones, Common building stones of India.**BRICKS:** General, Composition of good brick earth, Harmful ingredients in brickearth, Manufacturing of bricks by clamp burning and kiln (Hoffman's kiln only) burning, Qualities of good bricks, Tests for bricks, Classification of bricks, Size and weight of bricks.**LIME:** General, Definitions, Sources of lime, Constituents of limestones, Classification of limes, Properties of fat lime and hydraulic lime, Manufacture of lime.**TIMBER:** Definition, Structure of a tree, Qualities of good timber, Decay of timber, Seasoning of timber, Preservation of timber, Advantages of timber construction.**UNIT – 2****L-9, T-3****CEMENT AND AGGREGATES: CEMENTS:** Portland cement, Chemical composition, Hydration, Setting of cement, Structure of hydrated cement, Tests on physical properties, Different grades of cement.**AGGREGATES:** Classification, Source, Size and shape, Texture and influence of texture on strength, Specific gravity of aggregates, Moisture in aggregates, Bulking of fine aggregate, Methods used for determination of moisture content of aggregates, Grading of aggregates, Sieve analysis, Standard grading curve, Grading limits of fine aggregates as per BIS.**UNIT – 3****L-9, T-3****FRESH CONCRETE AND ADMIXTURES:** Workability, Factors affecting workability, Measurement of workability by different tests, Setting times of concrete, Effect of time and temperature on workability, Segregation and bleeding, Mixing and vibration of concrete, Methods of curing, Quality of mixing water.**ADMIXTURES:** General, Plasticizers and super plasticizer, Dosage, Mixing procedure, Equipment, Effect of super plasticizers on the properties of hardened concrete, Retarders, accelerators, Air-entraining admixtures, Factors affecting amount of air-entrainment, Effect of air-entrainment on the properties of concrete, Fly ash, Effect of fly ash on fresh and hardened concrete, High volume fly ash concrete, Silica fume, Available forms, Effect of silica fume on compressive strength of concrete, Construction chemicals for curing, Construction chemicals for water proofing.**HARDENED CONCRETE:** General, Water-cement ratio, Gel/space ratio, Gain of strength with age, Maturity concept of concrete, Effect of maximum size of aggregate on strength.**TESTING OF HARDENED CONCRETE:** Compression tests, Factors affecting strength, Flexure test, Splitting tests, Non-destructive testing methods, Cdal provisions for NDT.**UNIT – 4****L-9, T-3****ELASTICITY, CREEP & SHRINKAGE:** Modulus of elasticity, Dynamic modulus of elasticity, Poisson's ratio, Creep of concrete, Factors influencing creep, Relation between creep and time, Nature of creep, Effects of creep, Shrinkage, Types of shrinkage.**DURABILITY OF CONCRETE:** Factors contributing to cracks in concrete, Sulphate attack and methods of controlling sulphate attack, Chloride attack, Corrosion of steel and its control.**UNIT – 5****L-9, T-3****MIX DESIGN:** Factors in the choice of mix proportions, Quality Control of concrete, Statistical methods, Acceptance criteria, proportioning of concrete mixes by various methods, BIS method of mix design.**SPECIAL CONCRETES:** Light weight aggregates, Light weight aggregate concrete, Fiber reinforced concrete, Different types of fibers, Factors affecting properties of F.R.C, High performance concrete, Self-Compacting Concrete and High Performance Concrete.**TEXT BOOKS:**

1. M. S. Shetty, "Concrete Technology", 1st edition, S.Chand and Co publications, 2005.
2. S. C. Rangwala, "Engineering Materials", 36th edition, Charotar Publishing House, 2009.

REFERENCE BOOKS:

1. M. L. Gambhir, "Concrete Technology", 5th edition, Tata McGraw Hill Publishers, New Delhi, 2013.
2. A.R. Santha Kumar, "Concrete Technology", 3rd edition, Oxford University Press, New Delhi, 2009.