



# BASIC CONSTRUCTION MATERIALS

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**INTENDED AUDIENCE** : Open to all in construction sector

### **COURSE OUTLINE :**

The course intends to provide basic information on the structure and properties of construction materials to undergraduate students. The contents of the course will focus on a fundamental understanding of the structure of common materials, the types of bonds, and mechanisms of damage and failure in materials. It will then introduce the different materials used in construction, with respect to the approaches to their design and use. At the end of the course, the student should be able to link the material choice with the application in construction.

### **ABOUT INSTRUCTOR :**

Prof. Manu Santhanam is a Professor at the Department of Civil Engineering at IIT Madras. His research interests are in multi-scale characterization of concrete, supplementary cementing materials, durability and non-destructive evaluation.

Prof. Radhakrishna G. Pillai is an Associate professor at the Department of Civil Engineering at the Indian Institute of Technology Madras, Chennai, India, where he is working since 2010. He earned his M.S. and Ph.D. in Civil Engineering from Texas A&M University (TAMU), College Station, Texas, USA. He has co-authored more than 70 publications in the areas of structural and materials performance, concrete technology, and corrosion mechanisms and service life estimation in concrete structures. In addition, he is a lead investigator for various research projects funded by public and private agencies involving corrosion, condition assessment and restoration of concrete structures.

### **COURSE PLAN :**

#### **Week 1:** Structure and properties of materials

Fundamentals of material structure, from atomic bonding to failure theories; structure-property relationships; general engineering properties of materials

#### **Week 2:** Structure and properties of materials

Fundamentals of material structure, from atomic bonding to failure theories; structure-property relationships; general engineering properties of materials

**Week 3:** Structure and properties of materials

Fundamentals of material structure, from atomic bonding to failure theories; structure-property relationships; general engineering properties of materials

**Week 4:** Stone / Brick / Mortar

Properties and application of masonry materials; types of bonding; deterioration processes

**Week 5:** Cement and Concrete

Cement composition and properties; properties of other ingredients; basic concrete mixture proportioning; Early age and long term properties; construction methods with concrete

**Week 6:** Cement and Concrete

Cement composition and properties; properties of other ingredients; basic concrete mixture proportioning; Early age and long term properties; construction methods with concrete

**Week 7:** Cement and Concrete

Cement composition and properties; properties of other ingredients; basic concrete mixture proportioning; Early age and long term properties; construction methods with concrete

**Week 8:** Steel / Aluminium / Copper

Structure of iron and steel – phase diagrams; properties of reinforcing steel and structural steel; corrosion; properties and applications of Al and Cu

**Week 9:** Steel / Aluminium / Copper

Structure of iron and steel – phase diagrams; properties of reinforcing steel and structural steel; corrosion; properties and applications of Al and Cu

**Week 10:** Composite materials / FRP / Polymers and Plastics

Particulate and fibre reinforced composites; structure and behaviour of polymers and plastics

**Week 11:** Wood / Glass

Structure of wood; processing of timber for construction; defects and deterioration of wood; properties and applications of glass

**Week 12:** Pavement materials

Basic pavement materials such as WBM and WMM; structure and properties of asphalt; proportioning and application of bituminous concrete for flexible pavements; understanding of rigid pavements – jointed, doweled and continuously reinforced