

# CA2674: CONSTRUCTION MATERIALS

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## Effective Term

Semester A 2023/24

## Part I Course Overview

### Course Title

Construction Materials

### Subject Code

CA - Civil and Architectural Engineering

### Course Number

2674

### Academic Unit

Architecture and Civil Engineering (CA)

### College/School

College of Engineering (EG)

### Course Duration

One Semester

### Credit Units

3

### Level

B1, B2, B3, B4 - Bachelor's Degree

### Medium of Instruction

English

### Medium of Assessment

English

### Prerequisites

Nil

### Precursors

Nil

### Equivalent Courses

BC2674 Construction Materials

### Exclusive Courses

Nil

## Part II Course Details

### Abstract

To provide students the fundamental knowledge of the principal properties of construction materials, with particular reference to their performance in use, and the factors which lead to their deterioration; to further develop students

knowledge of the structural aspects of building design and construction. This course provides the necessary backgrounds for studying the other courses in the programme.

### Course Intended Learning Outcomes (CILOs)

CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	describe the properties of concrete and its constituents, such as cement, aggregates, and admixtures, as a construction material; apply different methods in measuring the properties and performance of fresh and hardened concrete;	x		
2	Outline the design principles and limitations of various types of structural systems (including the frames, trusses, arches, plates/shells, cables, and membranes);		x	
3	Identify the factors that affect the properties and performance of concrete as a construction material, and make decisions on design of concrete mix;		x	
4	describe the principal properties of construction materials: ferrous metals, timber, polymers and glass;	x		
5	identify the factors that affect the structural performances of the construction materials; destructive and non-destructive tests;		x	

#### A1: Attitude

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

#### A2: Ability

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

#### A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

### Teaching and Learning Activities (TLAs)

TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Explain the key principles, theories on concrete, cement, aggregates and Admixtures; performance of fresh and hardened concrete and durability of concrete.	1, 2, 3, 4, 5

2	Tutorial	Require the students to discuss the factors affecting properties of concrete and decision on concrete mix design.	1, 2, 3, 4	
3	Laboratory	Require the students to take part on engineering tests methods on construction materials; to discover the stress-strain behavior of steel bars.	1, 2, 3, 4	

**Assessment Tasks / Activities (ATs)**

ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Assignment/Mid-term Test	1, 2, 3, 4, 5	20
2	Laboratory Report	1, 2, 3, 4	30

**Continuous Assessment (%)**

50

**Examination (%)**

50

**Examination Duration (Hours)**

3

**Additional Information for ATs**

To pass a course, a student must obtain minimum marks of 30% in both coursework and examination components, and an overall mark of at least 40%.

**Assessment Rubrics (AR)****Assessment Task**

Assignment/Mid-term Test

**Criterion**

1. CAPACITY to DISCUSS the properties of concrete and its constituents as a construction materials
2. ABILITY to RECOGNIZE different methods in measuring the properties and performance of fresh and hardened concrete

**Excellent (A+, A, A-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Not even reaching marginal levels

**Assessment Task**

Laboratory Report

**Criterion**

1. ABILITY to APPLY suitable testing methods of fresh and hardened concrete

**Excellent (A+, A, A-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Not even reaching marginal levels

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**Assessment Task**

Examination

**Criterion**

1. CAPACITY to RECOGNIZE and DISCUSS the properties of concrete and its constituents as construction material, and DISCUSS the factors that affect the properties and performance of concrete and ferrous metals
2. ABILITY to DISCUSS the test methods in measuring performance of fresh and hardened concrete, destructive and non-destructive test

**Excellent (A+, A, A-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Not even reaching marginal levels

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## Part III Other Information

### Keyword Syllabus

Construction materials: Cement; Aggregates; Admixtures; Properties of fresh and hardened concrete; Destructive and non-destructive testing of concrete; Concrete mix design; Reinforced concrete; Fibre-reinforced composite materials; Durability of concrete. Properties of ferrous metals, timber, polymers and glass including their applications; Mechanical destructive and non-destructive testing of ferrous metals; Corrosion and surface protection of steel in service.

### Reading List

#### Compulsory Readings

Title	
1	Nil

#### Additional Readings

Title	
1	Neville, A.M. & Brooks, J.J. (2001), Concrete Technology, Revised Edition 2001, Harlow, Essex, UK. (TA439 .N46)
2	Davis, J.R. (2000), Corrosion: Understanding the Basics, Materials Park, Ohio: ASM International. (TA462 .C668)
3	Callister, William D. (2010), Materials Science and Engineering: An Introduction, 8th Edition, NJ : John Wiley. (TA403 .C23)
4	Taylor, Geoffrey D. (2000), Materials in Construction: An Introduction, 3rd Edition, Harlow: Longman. (TA403 .T39)
5	Illston, J. & Domone, P. (2010), Construction Materials: Their Nature and Behaviour, 4th Edition, New York: Spon Press. (TA403 .C636)
6	Allen, Edward (1999), Fundamentals of Building Construction: Materials and Methods, 5th Edition, NJ: John Wiley. (TH145 .A417)
7	Iwamoto, L. (2009). Digital Fabrications: Architectural and Material Techniques. New York: Princeton Architectural Press.
8	Schierle, G.G. (2008). Structure and Design, Cognella. ISBN: 978-1-93426-937-4
9	Spence, W. P. , Kultermann, E. (2011). Construction Materials, Methods and Techniques. Building for a sustainable future. New York: Delmar, Cengage Learning
10	Smith, B.S. , Coull, A. (1991). Tall Building Structures - Analysis and Design. New York: John Wiley & Sons.
11	Staib, G., Doerrhoefer, S., Rosenthal, M. (2008). Components and Systems: Modular Construction: Design, Structure, New Technologies. Basel: Birkhaeuser
12	Stavridis, L. (2010). Structural Systems: Behaviour and Design, ICE Publishing. ISBN: 978-0727741066