City University of Hong Kong
Course Syllabus

offered by Division of Building Science and Technology
with effect from Semester A 2018/19

Part I Course Overview

Course Title:	Construction Materials and Structures
Course Code:	BST22331
Course Duration:	1 semester
Credit Units:	3 credits
Level:	A2
Proposed Area: *(for GE courses only)*	☐ Arts and Humanities ☐ Study of Societies, Social and Business Organisations ☐ Science and Technology
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: *(Course Code and Title)*	Nil
Precursors: *(Course Code and Title)*	Nil
Equivalent Courses: *(Course Code and Title)*	Nil
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

(A 150-word description about the course)

This course covers two subject area, construction materials and building structures.
This course aims to:

- facilitate students to acquire knowledge of the essential and principal properties and applications of materials commonly used in construction; and
- guide students to establish a reasoning approach based on scientific principles in selecting materials for construction.
- facilitate students to develop an understanding of the fundamental concepts of structures, engineering statics and an ability to analyze simple structures using statics.

2. Course Intended Learning Outcomes (CILOs)

(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs	Weighting* (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	*A2*	*A3*
1.	Explain the suitability of common building materials based on performance requirements.	5	✓	✓	
2.	Identify the types and properties of cement, aggregate and concrete, and the factors affecting the properties of traditional concrete. Explain issues relating to modern concrete: durability, temperature control, pozzolans, alkali-aggregate reaction and lightweight concrete.	15	✓	✓	
3.	Describe classifications, properties, protection and application of metals, glass, timber and wood-based products.	20	✓	✓	
4.	Describe the various classifications, properties, and applications of brick, block, mortar, plaster, bituminous materials and paint.	10	✓	✓	
5.	Apply the basic concepts of structures and statics to analyze simple beams and structures	50	✓	✓	
		100%			

** If weighting is assigned to CILOs, they should add up to 100%.*

 # Please specify the alignment of CILOs to the Gateway Education Programme Intended Learning outcomes (PILOs) in Section A of Annex.

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 self-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.

3. Teaching and Learning Activities (TLAs)

(TLAs designed to facilitate students' achievement of the CILOs.)

TLA	Brief Description	CILO No.					Hours/week (if applicable)
		1	2	3	4	5	
Lecture (Average class size: Around 100 students)	This is a large-class activity involving the whole class and mainly consists of oral and multimedia presentation by instructors and discussions with students.	✓	✓	✓	✓	✓	3 hrs/week for 10 weeks
Video of lab experiment	Video of four lab tests are explained in the lecture and students are required to watch the videos as homework assignment	✓	✓	✓			
Workshop	To facilitate active learning in a large-class environment, during which students will be required to complete in-class exercises. These exercises are designed to encourage students to apply basics to real-life contexts. During such workshops, peer discussion is encouraged to facilitate peer's learning. Interactive discussion and feedback between students and instructors will be emphasized.					✓	3 hrs/week for 2 weeks

4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CILOs.)

Assessment Tasks/Activities	CILO No.					Weighting*	Remarks
	1	2	3	4	5		
Continuous Assessment: 40%							
Quiz on materials	✓	✓	✓	✓		25	
Quiz on structure					✓	10	
In-class exercises					✓	5	
Examination: 60% (duration: 2.5 hours)							
** The weightings should add up to 100%.*						100%	

Note: A student must obtain a minimum mark of 35 in both coursework and examination components and an overall mark of 40 to pass the course.

5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
Quiz and examination	Students work is judged by whether the student has achieved all ILOs with in-depth understanding of the materials listed in the syllabus. Whether the student work contained strong evidence showing students' ability to select materials and/or analyse structures properly based on scientific principles and/or environmental considerations for common engineering problems. The student work is also judged by the quality of data processing, data interpretation, and presentation.	High	Significant	Moderate	Basic	Not even reaching marginal level

Part III Other Information (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

(An indication of the key topics of the course.)

Introduction to materials in built environment: classification, common performance requirements and performance measurement when considering suitability of materials for an application.

Cement, aggregate and concrete: cement hydration, types and properties of cement, types and properties of aggregates, sieve analysis, mixing water for concrete, properties of fresh concrete, properties and strength development of hardening concrete, factors affecting properties of fresh and hardened concrete, concrete mix design.

Topics relating environment protection and sustainable built environment: durability of plain and reinforced concrete, pozzolans in concrete - silica fume, pulverised fuel ash, ground granulated blast furnace slag and natural pozzolans, alkali-aggregate reaction, temperature problems and temperature control of hardening concrete, lightweight concrete, Significance of design and quality control of concrete in sustainable built environment.

Ferrous metals, stainless steel and other alloy steels: production of ferrous metals, manipulation of plain carbon steels, influence of carbon content, steel for structural sections, steel reinforcement, corrosion of steel and other metals, stainless steel, weathering steel.

Non-ferrous metals and principal alloys: properties of aluminium, copper, lead, zinc and tin, alloys of aluminium, extrusion process, anodised aluminium alloy, alloy of copper, zinc used in corrosion protection for steel.

Brick block and masonry mortar: types, properties and applications.

Plasters and renderings: types, properties and applications.

Bituminous materials: products, sources, types, properties of bituminous materials.

Timber and wood-based products: types, properties and applications, factors affect properties, durability, and protection.

Paint: types and composition, surface preparation, curing mechanisms, selection and applications.

Glasses: production, heat treatment, types and properties of glasses, choice and application, durability, fire resistance, tests.

Fundamental concepts of static equilibrium: Basic features of a structure; Basic concepts of structural elements: tension, compression, bending and shear; Structural behaviour of beams: deflection, bending moment and shear force diagrams; Structural behaviour of columns: stability and strength.

2. Reading List

2.1 Compulsory Readings

(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)

1.	Taylor, G D (2002) Materials in construction: principles, practice and performance, 2nd Ed. Pearson Education Limited.
2.	Neville A. M. and Brooks J. J. (2001) *Concrete Technology*, Revised Ed., Harlow, Essex, UK: Prentice Hall.
3.	Derek Seward (1994), *Understanding Structures: analysis, materials, design*, Basingstoke, Hants: Macmillan.

2.2 Additional Readings

(Additional references for students to learn to expand their knowledge about the subject.)

1.	Everett, A. Revised by Barritt C.M.H. (1994) *Materials*, Harlow, Essex: Longman Scientific & Technical.
2.	Taylor, G D (2002) *Materials in construction: principles, practice and performance*, 2nd Ed., Harlow, Essex: Longman.
3.	Hong Kong Government (2010) *Construction Standard: Testing Concrete*, Hong Kong Government Printer, 2010.
4	Hong Kong Government (1995) *Construction Standard: Carbon Steel Bars for the Reinforcement of Concrete*, Hong Kong Government Printer, 1995.