



## Course Specifications

|                      |                            |
|----------------------|----------------------------|
| <b>Course Title:</b> | Structural Materials       |
| <b>Course Code:</b>  | CE 308                     |
| <b>Program:</b>      | B.Sc. in Civil Engineering |
| <b>Department:</b>   | Civil Engineering          |
| <b>College:</b>      | Jubail University College  |
| <b>Institution:</b>  | Jubail University College  |

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## A. Course Identification

|   |   |
|---|---|
| <b>1. Credit hours:</b>                               | 4   |
| <b>2. Course type</b>                                 |   |
| a.  | University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/> |
| b.  | Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>  |
| <b>3. Level/year at which this course is offered:</b> | Level 4, Second Year  |
| <b>4. Pre-requisites for this course (if any):</b>    | CE 204 Structural Mechanics I   |
| <b>5. Co-requisites for this course (if any):</b>     | None  |

### 6. Mode of Instruction (mark all that apply)

| No | Mode of Instruction   | Contact Hours | Percentage |
|----|-----------------------|---------------|------------|
| 1  | Traditional classroom | ✓             | 100        |
| 2  | Blended               |               |            |
| 3  | E-learning            |               |            |
| 4  | Correspondence        |               |            |
| 5  | Other                 |               |            |

### 7. Contact Hours (based on academic semester)

| No                   | Activity          | Contact Hours |
|----------------------|-------------------|---------------|
| <b>Contact Hours</b> |                   |               |
| 1                    | Lecture           | 45            |
| 2                    | Laboratory/Studio | 45            |
| 3                    | Tutorial          |               |
| 4                    | Others (specify)  |               |
|                      | <b>Total</b>      | <b>90</b>     |

## B. Course Objectives and Learning Outcomes

### 1. Course Description

**CE308 Structural Materials (3-3-4)**

**Prerequisite: CE 204**

Composition and Properties of Hydraulic cements; characteristics of local aggregates and water mix; properties of fresh concrete; production, handling and placement of cement and fresh concrete; properties of hardened concrete; mix design; durability in the gulf environment; problems of hot weather concreting; introduction to repair materials and techniques, types, engineering properties, and usage of structural steel, aluminium, timber, glass and plastics. Laboratory sessions will concentrate on various tests of concrete constituents, fresh and hardened concrete, aggregate gradation and mix design; flexure behavior of reinforced beams; hardness test, tensile and compressive tests on metals, measurement of Poisson's ratio and stress concentration and bending tests on steel beams

## 2. Course Main Objective

•The main purpose of this course is to prepare students to understand the properties of concrete and other construction materials and design a concrete mix together with the knowledge and skills to perform necessary tests for various civil engineering materials.

## 3. Course Learning Outcomes

| CLOs |   | Aligned PLOs |
|------|---|--------------|
| 1    | <b>Knowledge and Understanding</b>  |              |
| 1.1  | Explain the constituents of concrete, fresh concrete and their specific properties  | 8            |
| 1.2  | Describe steel, timber and other construction materials for structural construction | 8            |
| 1.3  | Describe the problems related to durability of concrete and hot weather concreting. | 8            |
| 2    | <b>Skills</b>   |              |
| 2.1  | Calculate the fineness modulus of aggregates  | 1            |
| 2.2  | Design concrete mixes for compression test of concrete                              | 1            |
| 2.3  | Evaluate experimental results of testing of structural materials                    | 6            |
| 2.4  | Show the different properties and uses of various construction materials            | 3            |
| 3    | <b>Values: N/A</b>  |              |

## C. Course Content

| No | List of Topics   | Contact Hours |
|----|--|---------------|
| 1  | <b>Unit 01. Cement:</b><br>1.1 Portland cement ,<br>1.2 Manufacturing process,<br>1.3 Special cements,<br>1.4 Hydration of cement<br>1.5 Tests of cement, fineness, soundness, consistency, setting time, compressive strength,<br>1.6 Storage of cement.<br>1.7 Laboratory tests on setting time of cement, physical characteristics of coarse aggregates   | 18            |
| 2  | <b>Unit 02. Aggregate:</b><br>1.1 Sources and types of fine and course aggregate<br>1.2 Grading of fine and course aggregate<br>1.3 Test of aggregate bulk density, relative density, absorption and surface moisture<br>Laboratory test on sieve analysis of fine aggregates, coarse aggregates and silt content  | 18            |
| 3  | <b>Unit 03. Concrete:</b><br>1.1 Paste and aggregate requirements for concrete making<br>1.2 Water cement ratio<br>1.3 Mixing and consolidation requirements, curing, freeze-thaw resistance, concrete shrinkage.<br>1.4 Mixture proportioning, selection of mix characteristics, proportioning of concrete mixture ,methods of proportioning<br>1.5 Design mix, workability of concrete, slump test, temperature test, air content, chloride content test, strength test. | 18            |

|              |   |    |
|--------------|---|----|
|              | 1.6 Laboratory tests on workability of concrete, preparation of cubes and beams   |    |
| 4            | <b>Unit 04. Admixtures:</b><br>1.1 Introduction<br>1.2 Classification by function<br>1.3 Reasons for using admixtures.<br>Laboratory tests on compressive strength of concrete cubes , cement mortar cubes for 7 days   | 6  |
| 5            | <b>Unit 05. Supplementary cementing materials:</b><br>1.1 Pozzolan, fly ash, silica fume, slag, natural pozzolan, metakaoline<br>1.2 Effects of fly ash, silica fume, slag and metakaoline on freshly mixed concrete.<br>Laboratory tests on compressive strength of concrete cubes , cement mortar cubes and beams for 14 days | 6  |
| 6            | <b>Unit 06. Durability of concrete :</b><br>1.1 Problems, sulphate attack, reinforcement corrosion ,alkali-silica reactivity<br>1.2 Problems of hot weather concreting.<br>Tensile test on steel rod,   | 12 |
| 7            | <b>Unit 07. Iron and steel :</b><br>1.1 Introduction, advantages, shapes,<br>1.2 Mechanical testing,<br>1.3 Corrosion,<br>1.4 Reinforced concrete.<br>Laboratory tests on compressive strength of concrete cubes , cement mortar cubes and beams for 28 days  | 6  |
| 8            | <b>Unit 08. Wood / timber:</b><br>1.1 Introduction, uses, advantages, types and properties<br>1.2 Seasoning and defects,<br>Review of all laboratory experiment   | 6  |
| <b>Total</b> |   | 90 |

## D. Teaching and Assessment

### 1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

| Code | Course Learning Outcomes  | Teaching Strategies                            | Assessment Methods                 |
|------|---|--|------------------------------------|
| 1.0  | <b>Knowledge and Understanding</b>  |  |                                    |
| 1.1  | Explain the constituents of concrete, fresh concrete and their specific properties  | Interactive learning<br>Self-directed learning | Quiz 1, Midterm, Assignment1,Final |
| 1.2  | Describe steel, timber and other construction materials for structural construction |  | Quiz-2, Assignment2, Final         |
| 1.3  | Describe problems related to durability of concrete and hot weather concreting.     |  | Final                              |

| Code | Course Learning Outcomes   | Teaching Strategies   | Assessment Methods            |
|------|--|---|-------------------------------|
| 2.0  | <b>Skills</b>  |   |                               |
| 2.1  | Calculate the fineness modulus of aggregates                             | Interactive learning<br>Self-directed learning  | Mid term                      |
| 2.2  | Design concrete mixes for compression test of concrete                   |   | Quiz-2, Final                 |
| 2.3  | Evaluate experimental results of testing of structural materials         | •Co-operative learning<br>•Promote critical thinking<br>•Independent learning<br>•Experiential Learning | Mid lab exam , Final Lab exam |
| 2.4  | Show the different properties and uses of various construction materials | •Interactive learning<br>•Developing oral and written communication skills                              | Assignments                   |
| 3.0  | <b>Values: N/A</b>   |   |                               |

## 2. Assessment Tasks for Students

| #  | Assessment task* | Week Due | Percentage of Total Assessment Score |
|----|------------------|----------|--------------------------------------|
| 1  | Quiz 1           | 4        | 5 %                                  |
| 2  | Assignment 1     | 6        | 5 %                                  |
| 3  | Mid-term LB      | 7        | 5 %                                  |
| 4  | Mid-term LT      | 8        | 20 %                                 |
| 5  | Quiz 2           | 12       | 5 %                                  |
| 6  | Assignment 2     | 13       | 5 %                                  |
| 7  | Final Exam -LB   | 16       | 10 %                                 |
| 8  | Performance LB   | 16       | 10 %                                 |
| 9  | Lab Record       | 16       | 5 %                                  |
| 10 | Final Exam-LT    | 17-19    | 30%                                  |

\*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

## E. Student Academic Counseling and Support

**Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :**

- Office hours 6 hr/week; students can go in times of office hours for teacher to explain what could not be understood from the lesson.
- Students can communicate with a staff member outside the official working hours by email.
- Students are also encouraged to visit their academic advisors.

## F. Learning Resources and Facilities

### 1. Learning Resources

|                                       |   |
|---------------------------------------|---|
| <b>Required Textbooks</b>             | <a href="#">Steven, H. K., Beatrix, K.</a> and <a href="#">William C. P.</a> (2002). Design and control of concrete mixtures, USA: Portland Cement Association Publisher  |
| <b>Essential References Materials</b> | . List Essential References <ul style="list-style-type: none"> <li>• ASTM standards (American Society for Testing and Materials)</li> <li>• AASHTO Standards ( American Association of State Highway and Transportation Officials)</li> </ul> |
| <b>Electronic Materials</b>           | <a href="http://www.aci.int.org">http://www.aci.int.org</a><br><a href="http://cement.org">http://cement.org</a>  |
| <b>Other Learning Materials</b>       | N/A   |

### 2. Facilities Required

| Item   | Resources  |
|--|--|
| <b>Accommodation</b><br>(Classrooms, laboratories, demonstration rooms/labs, etc.)   | Lecture rooms with a capacity of at least 25 students and fitted with multimedia projector and a computer. |
| <b>Technology Resources</b><br>(AV, data show, Smart Board, software, etc.)  | None   |
| <b>Other Resources</b><br>(Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list) | Lab equipped with latest equipment related to testing of the building materials                            |

## G. Course Quality Evaluation

| Evaluation Areas/Issues   | Evaluators            | Evaluation Methods   |
|---|-----------------------|--|
| Effectiveness of teaching and assessment as per QMS-Policy-006 Feedback Survey, QMS-QAP-116 Monitoring Students' Satisfaction   | Students              | Indirect: Analyzing the results of the following surveys<br>Course Evaluation Survey (CES), Program Evaluation Survey (PES), Student Experience Survey (SES) |
| Quality of Exam papers and Verifying Standards of Student Achievement as per QMS-Policy-004 Policy for Examinations and Marking, QMS-ACP-102 Procedure for Marking Examinations | Examination Committee | Direct: Peer review of examination papers and review or double check a minimum of three or 10% of answer papers. Verifying the                               |

| Evaluation Areas/Issues   | Evaluators                                   | Evaluation Methods  |
|---|--|---|
|   |  | entries in the Activity Mark Sheet.   |
| Achievement of learning outcomes as per QMS-Policy-001 Course Review, QMS-CDP-106, QMS-CDP-112 Curriculum Review  | Faculty                                      | Direct: Course Report (Section B-3)   |
| Implementation of the action plans based on previous semester as per QMS-Policy-001 Course Review, QMS-CDP-106 Procedure for Course Review, QMS-CDP-112 Procedure for Curriculum Review | Faculty                                      | Direct and Indirect: Course report (Section G-1, G-2)   |
| Monitoring Teaching and Learning as per QMS-Policy-005 Monitoring of Teaching and Learning  | Chairperson/Program Director/Course Director | Indirect: Feedback by Chairperson/Program director/Course director. Program Delivery Record.                                    |
| Effectiveness of planned Teaching Strategies QMS-Policy-001 Course Review   | Faculty                                      | Indirect: Course Report (Section B-4)   |
| Course effectiveness and planning for improvement as per QMS-Policy-001 Course Review, QMS-CDP-106 Procedure for Course Review, QMS-CDP-112 Procedure for Curriculum Review             | Faculty                                      | Direct and Indirect: Course report (Section G-3)  |
| Verifying Standards of Student Achievement and Quality of Exam papers as per QMS-ACP-119 External Assessment Review   | Assessment External Reviewer                 | Direct: Report of assessment external reviewer. Review of sample of ten or 10% of student's assessments and coursework scripts. |

**Evaluation areas** (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

**Evaluators** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

**Assessment Methods** (Direct, Indirect)

## H. Specification Approval Data

|                            |                                      |
|----------------------------|--------------------------------------|
| <b>Council / Committee</b> | Civil Engineering Department Council |
| <b>Reference No.</b>       | REG MIN-CED-10                       |
| <b>Date</b>                | 27-04-2020                           |



## Appendix A Revision Details

| Revision no. | DESCRIPTION   | Reference MoMs |   |     |   |
|--------------|---|----------------|---|-----|---|
|              |   | DC             |   | CDC |   |
|              |   | Sem            | # | Sem | # |
| 1            | Revision of Course Teaching Strategies and action verbs based on the comments of NCAAA reviewer | 392            | 4 | 392 | 4 |
| 2            | Course Specification Template 2018  | 402            |   |     |   |