THE FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE

Department of Civil and Environmental Engineering

CVE 308 – Design of Structures I

COURSE PARTICULARS

Course Code: CVE 308
Course Title: Design of Structures I
No. of Units: 4
Course Duration: Two hours of lecture, one hour of tutorial and three hours of practical per . week for 15 weeks.
Status: Compulsory
Course Email Address: cve308@gmail.com
Course Webpage: http://www.fwt.futa.edu.ng/courseschedule.php?coursecode=FWT%20204
Prerequisite: NIL

COURSE INSTRUCTORS

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COURSE DESCRIPTION

Concept of reinforced concrete and historical development of its theory and practice. Review of the physical and mechanical properties of concrete and reinforcing bars. Fundamentals of design process. Material selection. Building regulations and Codes of Practice. Scopes and Limitations and interpretation of design charts. Design philosophies. Elastic and Limit State designs. Design of reinforced concrete structural elements (slabs, beams, columns and foundations).

COURSE OBJECTIVES

The objectives of this course are to:

- introduce students to the working principles of reinforced concrete;
- introduce students to Building Standards and Codes of Practice; and to
- enable students idealized and design structural elements of reinforced concrete building.

COURSE LEARNING OUTCOMES / COMPETENCIES

Upon successful completion of this course, the student will be able to:
(Knowledge based)

- explain the working principles of reinforced concrete;
- explain material selection processes for the production of concrete;
- explain methods of batching of aggregates for concrete production;
- understand factors that can affect the strength of concrete;
- carryout the design of the structural elements of reinforced concrete structures;

(Skills)

- design of the following structural members:
    - solid slabs spanning in one and two ways;
    - beams;
    - columns;
    - pad footings;
- usage of design software to design reinforced concrete structural elements;
- ability to carry out quality control of reinforced concrete production.
- ability to read and produce structural detailing.

GRADING SYSTEM FOR THE COURSE

This course will be graded as follows:

Assignments	20%
Test(s)	20%
Final Examination	60%
TOTAL	**100%**

GENERAL INSTRUCTIONS

Attendance: It is expected that every student will be in class for lectures and also participate in all practical exercises. Attendance records will be kept and used to determine each person's qualification to sit for the final examination. Students must have at least 70% attendance for them to qualify to sit for the final examination. In case of illness or other unavoidable cause of absence, the student must communicate as soon as possible with any of the instructors, indicating the reason for the absence.

Academic Integrity: Violations of academic integrity, including dishonesty in assignments, examinations, or other academic performances are prohibited. You are not allowed to make copies of another person's work and submit it as your own; that is plagiarism. All cases of academic dishonesty will be reported to the University Management for appropriate sanctions in accordance with the guidelines for handling students' misconduct as spelt out in the Students' Handbook.

Assignments and Group Work: Students are expected to submit assignments as scheduled. Failure to submit an assignment as at when due will earn such student zero score for that assignment. Only under extenuating circumstances, for which a student has notified any of the instructors in advance, will late submission of assignments be permitted.

Code of Conduct in Lecture Rooms and Laboratories: Students should turn off their cell phones during lectures. Students are prohibited from engaging in other activities (such as texting, watching videos, *etc*.) during lectures. Food and drinks are not permitted in the laboratories.

READING LIST

[1,2]Mosley, B., Bungey, J and Hulse, R. (2007). *Reinforced Concrete Design*. 6th Edition. BookPower Publishing, UK.

[1,2]Wight, J.K, and MacGregor, J.G. (2009). *Reinforced Concrete – Mechanics and Design*. Pearson Prentice Hall Publishing, USA.

[2]Olanitori, L.M. (2012). Design of Reinforced Concrete Structures – Lecture notes.

[1,2]BS 8110 (1997). Structural use of Concrete: Part – I: Code of Practice for Design and Construction. British Standards Institution, London.

[1,2]BS 8110 (1985). Structural use of Concrete: Part – III: Design charts for singly reinforced beams, doubly reinforced beams and rectangular columns. British Standards Institution, London.

Legend
1- Available in the University Library
2- Available in Departmental/School Libraries
3- Available on the Internet.
4- Available as Personal Collection
5- Available in local bookshops.

COURSE OUTLINE

Week	Topic	Remarks
1	Introduction and Course Overview. Working principles Reinforced Concrete (RC); RC structural elements and frames; Factors affecting choice of RC for a structure.	During this first class, the expectation of the students from the course will also be documented.
2	Fundamentals of Design Process: • Structural Design Processes • Design Standards Design Philosophies: • Elastic Method of Design • Limit States Design Philosophy Variation of Material Properties • Characteristic Strength • Design Strength • Partial Safety Factor for Strength Types of Loads • Dead Load • Live/Imposed Load • Wind Load • Load combinations Structural Analysis • General Provisions • Methods of Frame Analysis	Practical exercise will involve visiting of construction site so to be able to see structural elements of RC structures and their reinforcement.
3 & 4	Estimation of Dead and Imposed Loads on: • Slabs • Beams • Columns • Pad Footing Analysis of RC Structures using Moment Distribution Method • Analysis of continuous RC beams • Analysis of RC plane frames	Worked examples will be carried out in order to strengthen student's theoretical knowledge. Laboratory work will involve carrying out sieve analysis of both the coarse and fine aggregates, plotting of grain size distribution curve and determine co-efficient of uniformity Cu.

5 & 6	Analysis of RC Section • Elastic analysis of RC section • Ultimate Limit State analysis of rectangular RC section. • Ultimate Limit State analysis of flanged RC section.	Worked examples involving estimation of area of reinforcing bars to resist an applied moment for a given RC section, estimation of the moment of resistance for a given RC section and area of the reinforcing bars and moment redistribution. Laboratory work will involve the determination of degree of workability of a fresh concrete by conducting slump test, compacting factor test and vebe test.
7 & 8	Design of RC beams • Design of simply supported beams for longitudinal and shear reinforcements. • Design of continuous beams for longitudinal and shear reinforcements	Design examples will be carried out using structural plan of a typical three storey building. Laboratory work will involve compressive test of concrete cubes, and the determination of characteristic strength of the concrete cubes.
9 & 10	Design of RC solid slabs • Design of RC solid slabs spanning in one direction. • Design of RC solid slabs spanning in two directions.	Design examples will be carried out using structural plan of a typical three storey building. Individual course work assignments will be given out. This assignment covers the complete design of a multi-storey building. Submission of this assignment is on or before the date of the final examination.
		MID-SEMESTER TEST
11 & 12	Design of RC columns • Design of short braced axially loaded columns • Design of short columns resisting moments and axial forces • Biaxial bending of short columns • Design of slender columns	Design examples will be carried out using structural plan of a typical three storey building.
13 & 14	Design of Pad Footing • Subjected to axial load alone • Subjected to axial load and uniaxial bending	Design examples will be carried out using structural plan of a typical three storey building.

15	REVISION	This is the week preceding the final examination. At this time, evaluation will be done to assess how far the students' expectations for the course have been met.