Introduction

A

Prentice Hall

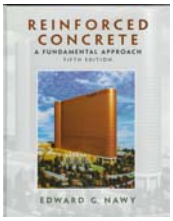
REINFORCED CONCRETE

A Fundamental Approach - Fifth Edition

SYLLABUS, MAJOR TOPICS & COMPUTERS

A. J. Clark School of Engineering •Department of Civil and Environmental Engineering

SPRING 2004



By
Dr . Ibrahim. Assakkaf

ENCE 454 – Design of Concrete Structures
Department of Civil and Environmental Engineering
University of Maryland, College Park

Course Syllabus

- ENCE 454 – Design of Concrete Structures
- Tu Th 9:30 am – 10:45 am, EGR 1110

Course Syllabus

INSTRUCTOR:

Name:	Dr. Ibrahim A. Assakkaf
Office Hours:	Tu Th 11:00 am - 12:00 noon, and 1:00 pm - 2:00 pm F 12:00 noon -1:00 pm, and by appointment
Room:	0305, Engineering Classroom Building (EGR) Center for Technology and Systems Management (CTSM)
Telephone:	(W) 301-405-3279
Email:	assakkaf@eng.umd.edu
URL:	http://ctsm.umd.edu/assakkaf

Course Syllabus

TEACHING ASSISTANT:

Name:	Ms. Kyungha (Kelly) Park
Office Hours:	Tu Th 11:00 am – 12:00 noon
Room:	1129, Engineering Laboratory Building (EGL)
Telephone:	(301) 405-8718
Email:	pdiva78@hotmail.com

Course Syllabus

TEXTBOOKS:

1. "*Reinforced Concrete- A Fundamental Approach*" Edward G. Nawy, 5th Edition, 2003, Prentice Hall.
2. "*Building Code Requirements for Structural Concrete (318-02) and Commentary (318-02),"* American Concrete Institute (ACI).

Course Syllabus

REFERENCES:

1. *"Reinforced Concrete Design,"* 5th Edition, Spiegel, L. and Limbrunner, G. F., 2003, Prentice Hall.
2. *"Design of Concrete Structures,"* 12th Edition, Nilson, A. H., 1997, McGraw Hill.

Course Syllabus

GRADING:

Homework	20%
Project	20%
Midterm Exam	25%
Final Exam	35%
Quizzes & Attendance (±)	
	100%

Course Syllabus

PREREQUISITES:

- ENCE 353 and ENCE 355
- Permission of the Department

GENERAL COURSE DESCRIPTION (UM SCHEDULE OF CLASSES, SPRING 2004):

Formerly ENCE 451. Combined bending and compression, development and anchorage of reinforcement, deflections, design of slabs including one-way and two-way, design of footings, retaining walls, introduction to pre-stressed concrete, design of multi-story buildings.

Course Syllabus

HOMEWORK ASSIGNMENTS:

Professional presentation of homework assignments is required. Professional presentation consists of neat and organized solution of problems on **one side of 8.5"x11" papers**. Any homework not complying with professional standards will not be graded and will be assigned zero credit. The homework assignments are due one week after they are assigned. Homework will be assigned as the material is covered. Assignments turned in late will be docked 10% for each day it is late past the original due date.

Course Syllabus

HOMEWORK ASSIGNMENTS (cont'd):

Solutions will be available from the TA and on the class website after the problems are returned. No assignment will be accepted after the answers have been posted. Students are encouraged to discuss and formulate solutions to the problems by working in teams. However, assignments must be completed and submitted individually. *Simply copying the answers from another student or from a solutions manual is not acceptable and will not be tolerated.*

Course Syllabus

HOMEWORK ASSIGNMENTS (cont'd):

Guidelines for homework are given below:

1. Use good quality paper, such as engineering graph paper or college-ruled paper, any color, with no spiral edges
2. Write on only one side of the paper
3. Either pen or pencil is acceptable
4. Include your name, section, and page number (e.g. 1/3 means 1 of 3) on each sheet
5. Staple all pages together in the upper left corner
6. Neatly box all answers, and include appropriate units for numerical answers
7. Show all work (e.g. no work means no credit will be given)

Course Syllabus

HOMEWORK ASSIGNMENTS (cont'd):

If the above guidelines are not followed, the TA will either reject the assignment outright, for extreme cases, or deduct points for items that do not conform to the specifications.

Course Syllabus

EXAMS AND QUIZZES:

All students must take all exams and quizzes including the final exam. Only extenuating circumstances will be accepted as an excuse for missing an exam. The student must notify the instructor of the reason for absence as soon as possible. Health related excuses require **medical reports** and the **signature of a physician** that provided treatment. You are encouraged to go over Chapter 4 of the Undergraduate Catalogue for the University policies, or visit http://www.inform.umd.edu/ugradcat/chapter4/attendance.html

Course Syllabus

COURSE WEBSITE: Students are encourage to access course web site at **http://www.ajconline.umd.edu** to download course materials such as homework sets and solutions. Timely information will also be posted on the web site. At initial login, use your wam account name as the username, and your SID as the password. You are advised to change your password after your first login. Report any problem with the course web site to the instructor. For technical problems of the web site, contact the Instructional Technologies staffs at 0123 Martin Hall.

Topics to be Covered in This Course

- Concrete and reinforced concrete
- Loads
- Beams
  - Flexure
  - Shear and diagonal tension
  - Serviceability considerations
- Serviceability (deflection) of Beams and one-way slabs

Topics to be Covered in This Course

- Columns
  - Axially loaded
  - Combined compression and bending
- Bond development of reinforcing bars
- Design of two-way slabs and plates
- Design of footings and retaining walls
- Introduction to prestressed concrete
- Design of multi-story buildings

Course Syllabus

- Schedule for Lectures

Week	Date	Topic of Discussion	Source
1	Tu, Jan. 27 Th, Jan. 29	Introduction to Course (General Overview) Introduction to Concrete	Handout Handout
2	Tu, Feb. 3 Th, Feb. 5	Introduction Concrete-Producing Materials Concrete	Chapter 1 Chapter 2 Chapter 3
3	Tu, Feb. 10 Th, Feb. 12	Reinforced Concrete Flexure in Beams	Chapter 4 Chapter 5
4	Tu, Feb. 17 Th, Feb. 19	Flexure in Beam (cont'd) Flexure in Beams (con't)	Chapter 5 Chapter 5
5	Tu, Feb. 24 Th, Feb. 26	Shear and Diagonal Tension in Beams Shear and Diagonal Tension in Beams (cont'd)	Chapter 6 Chapter 6
6	Tu, Mar. 2 Th, Mar. 4	Serviceability of Beams and One-Way Slabs Serviceability of Beams and One-Way Slabs (cont'd)	Chapter 8 Chapter 8

Course Syllabus

- Schedule for Lecture (cont'd)

Week	Date	Topic of Discussion	Source
7	Tu, Mar. 9 Th, Mar. 11	Columns: Combined Compression and Bending Columns: Combined Compression and Bending (cont'd)	Chapter 9 Chapter 9
8	Tu, Mar. 16 **Th, Mar. 18**	Columns: Combined Compression and Bending (cont'd) **MIDTERM EXAM**	Chapter 9
	Mar. 21-28	**** S P R N G B R E AK (NO CLASSES) ****	
9	Tu, Mar. 30 Th, Apr. 1	Bond Development of Reinforced Bars Bond Development of Reinforced Bars (cont'd)	Chapter 10 Chapter 10
10	Tu, Apr. 6 Th, Apr. 8	Design of Two-Way Slabs and Plates Design of Two-Way Slabs and Plates	Chapter 11 Chapter 11
11	Tu, Apr. 13 Th, Apr. 15	Footings Footings	Chapter 12 Chapter 12

Course Syllabus

- Schedule for Lecture (cont'd)

Week	Date	Topic of Discussion	Source
12	Tu, Apr. 20 Th, Apr. 22	Design of Retaining Walls Design of Retaining Walls (cont'd)	Handout Handout
13	Tu, Apr. 27 Th, Apr. 29	Continuous Reinforced Concrete Structures Continuous Reinforced Concrete Structures	Chapter 13 Chapter 13
14	Tu, May. 4 Th, May 6	Introduction to Pre-stressed Concrete Review and Project Presentations	Chapter 14
15	Tu, May 11	Project Presentations	
16	**W, May 19**	**FINAL EXAM (Wednesday, 8:00 am – 10:00 am, EGR (1110)**	

Course Syllabus

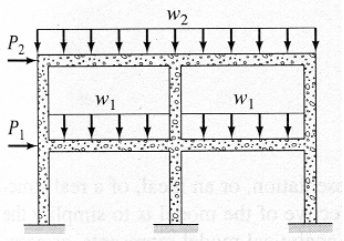
- Course Objective
  - To understand the behavior of reinforced concrete elements and systems.
  - To illustrate and integrate design information on reinforced concrete components to enable students to design basic structural systems for both vertical and horizontal loads, and other types of loading.

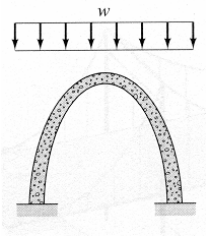
Major Topics

Concrete Design and Analysis

Major Topics

Concrete Design and Analysis





Major Topics

- Concrete is a mixture of cement, fine and coarse aggregates, and water.
- Water is the key ingredient for chemical reaction for curing.

Add Water

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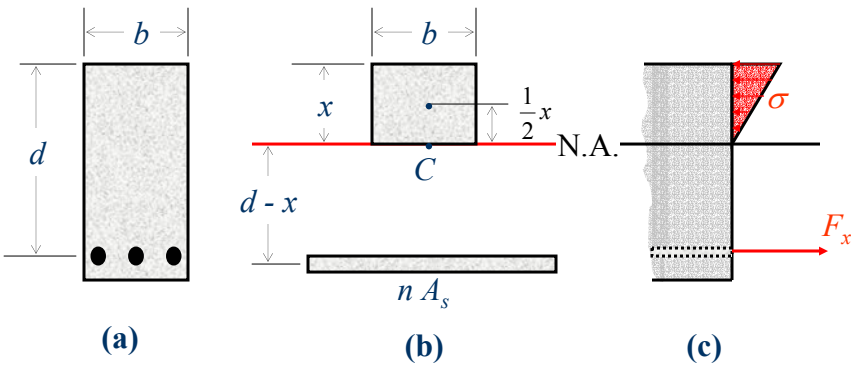
Cement + Aggregates = Concrete

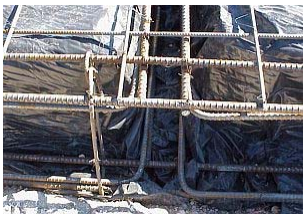
Major Topics

- Materials and Mechanics of Bending
  - Concrete Strength

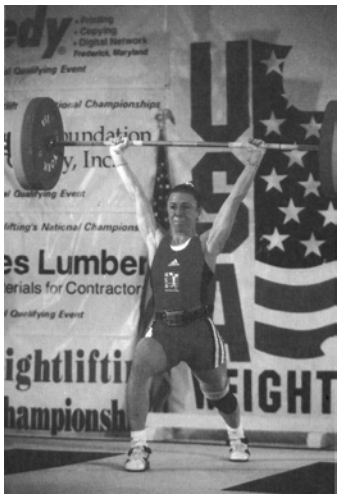


Major Topics

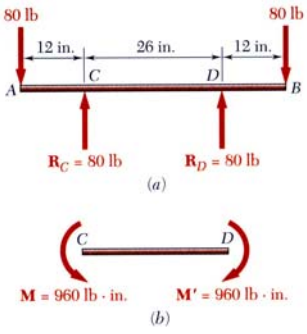
Reinforcing Steel



Major Topics



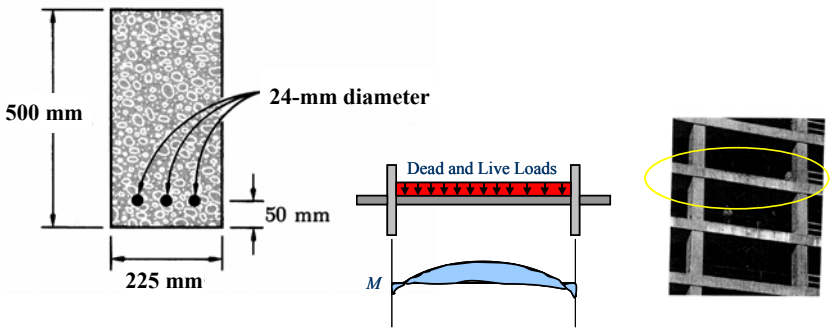
Mechanics of Bending



Pure Bending: Prismatic members subjected to equal and opposite couples acting in the same longitudinal plane

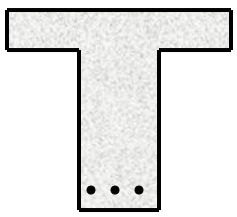
Major Topics

- RECTANGULAR R/C CONCRETE BEAMS: TENSION STEEL ONLY

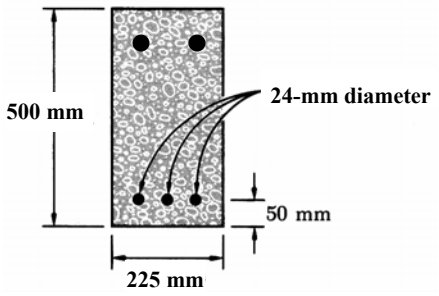


Major Topics

- Reinforced Concrete Beams: T-Beams and Doubly Reinforced Beams



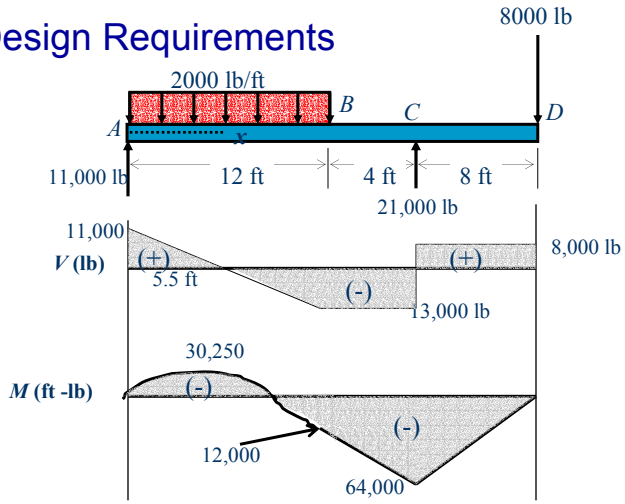
T-Beam



Doubly Reinforced

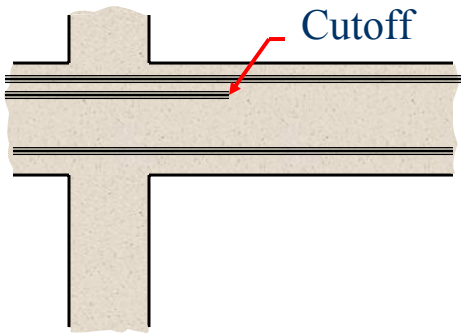
Major Topics

- Shear in Beams
  - Design Requirements



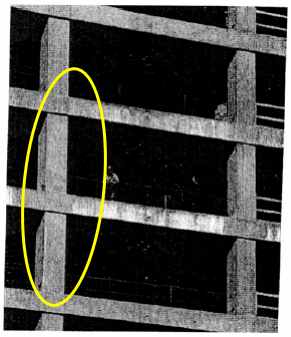
Major Topics

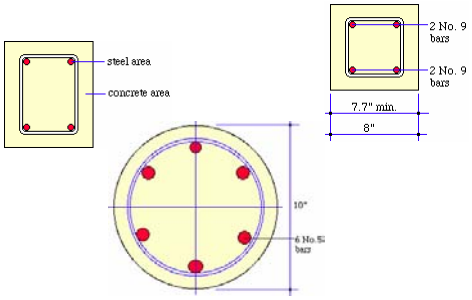
- Development Length, Splices, and Simple Span Bar Cutoffs



Major Topics

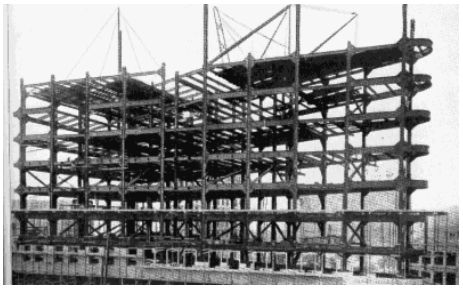
- Reinforced Concrete Columns

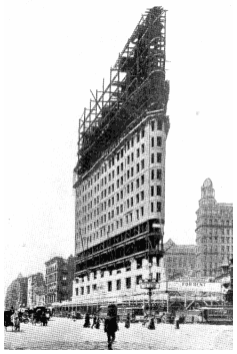




Major Topics

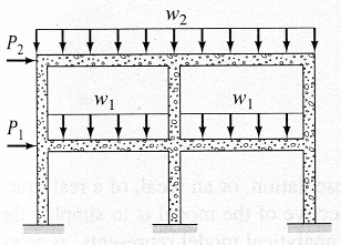
- **Introduction to the Design of Axially Loaded Compression Members**

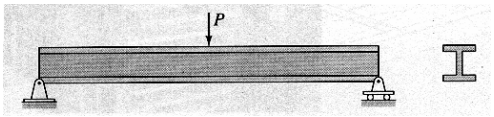




Major Topics

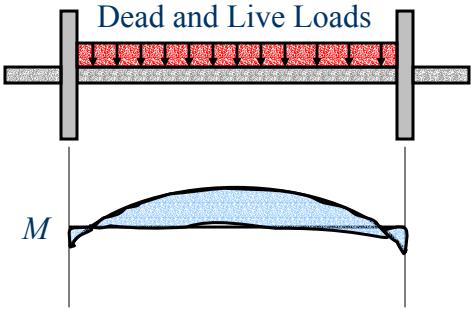
- Introduction to the Analysis and Design of Beams for Moments

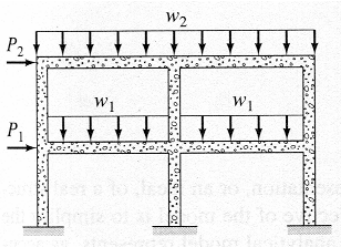




Major Topics

- Introduction to the Analysis and Design of Beams for Moments





Computers and Software

- Computers Evolution Era (Chapra & Canale 1988)
  - Zero Generation - Manual & Mechanical (pre 1951)
  - First Generation – Vacuum tubes (1951 – 1958)
  - Second Generation – Transistors (1958 – 1964)

Computers and Software

- Computers Evolution Era (Chapra & Canale 1988)
  - Third Generation – Integrated circuits (1964 – 1971)
  - Fourth Generation – Very large scale integration (1971 – present)
    - Mainframes, Supercomputers
    - Personal Computers, Microcomputers, and Minicomputers

Computers and Software

- Computers Evolution Era (Chapra & Canale 1988)
  - Fifth Generation (1990?)
    - Parallel Processing
    - Artificial intelligence

Computers and Software

- High-level Languages
  - FORTRAN (introduced by IBM in 1957)
    - FORTRAN = *FORmula TRANslation*
    - *Developed for the IBM 704 Computer*
    - *Developed by John Backus and a team of 13 other programmers*
  - BASIC
  - Pascal
  - Others

Computers and Software

- Software Packages
  - MATLAB
  - MathCad
  - Spreadsheet
    - MS Excel
    - Quattro Pro
  - Specialized Structural Packages
    - GTSTRUDLE
    - ETABS
    - SAP & INSTEP32 Design Software
    - etc



Be Proud To Be An Engineer