CLARKSON UNIVERSITY
Department of Civil and Environmental Engineering
CE 320 Structural Analysis **Fall 2006**
Course Outline

Instructor: Dr. Levon Minnetyan, PE
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Office Hours: 2:30-3:30 daily or by appointment

Teaching Assistant: Mr. Mashal Sheban, Camp Annex 198; Tel: 268-4236;
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Lecture/Lab: MWF 11:00– 12:15 Science Center 362

Text: No specific textbook is required. Students attending all lectures and taking regular class notes should not need an accompanying textbook. However, if you feel more comfortable to have an additional resource, one of the following references is recommended as most commonly used structural analysis textbooks.

References:
1. ``Structural Analysis," Any Edition (1-6), by Russell C. Hibbeler, Prentice-Hall Publishing Company. ISBN (5^{th} Ed) 0-13-041825-0
2. ``Structural Analysis," Any Edition (1-2), by Aslam Kassimali, PWS Publishing Company ISBN (2nd Ed) 0-534-95324-7
3. ``Fundamentals of Structural Analysis," Any Edition, by Harry H. West and Louis F. Geschwindner, John Wiley & Sons, Inc. ISBN (2^{nd} Ed) 0-471-3556-9
4. "Analysis and Behavior of Structures," by Edwin C. Rossow, Prentice-Hall Publishing Company, 1996. ISBN 0-02-403913-6
5. ``Fundamentals of Structural Analysis," Any Edition, by Kenneth M. Leet and Chia-Ming Uang, McGraw-Hill Publishing Co. ISBN (2nd Ed) 0-07-297315-3

Prerequisites: ES 222 Strength of Materials

Catalog Description: Linear elastic analysis of structural systems including the computation of internal and external forces and displacements produced by the application of loads. Statically determinate and indeterminate systems are considered. Laboratory experience included. (1 credit of design)

Course Objectives:	CEE Outcomes addressed	Evaluation Methods
To examine and comprehend the principles involved in structural analysis methods for the design of practical experiments.	1b, 3c	1, 2, 3, 4
To enable students to use fundamental principles of mechanics for the development and applications of structural analysis.	1a, 1c, 1d, 1e, 2a	1, 3, 4
To introduce modern computational methods and software for the analysis of structures.	1f	5
To prepare teams of students to apply the principles learned in the course to the analysis and design of structures.	1g, 2a, 2c, 3d	2, 4

Evaluation Methods:	1. Exam I (Sept. 27)	14	14%
	1. Exam II (Oct 27)	17	17%
	1. Exam III (Nov. 17)	19	19%
	1. Final Exam	20	20%
	2. Laboratory	15	15%
	3. Homework	8	8%
	4. Workshops	5	5%
	5. Computer Project	2	2%
		100 total points	

CE 320 – Structural Analysis Topics

Introduction
Classification of Structures
Analytical Models
Loads on Structures
Thermal and Other Effects
Load Combinations

Analysis of Statically Determinate Structures
Equilibrium of Structures
Support Reactions
External and Internal Forces
Static Determinacy, Indeterminacy, and Stability
Analysis of Trusses
Analysis of Beams and Frames
Review of Shear and Moment Diagrams

Influence Lines
Definition of an Influence Line
Drawing Influence Lines by Equilibrium
Muller-Breslau Principle
Influence Lines for Girders and Floor Systems
Influence Lines for Trusses

Applications of Influence Lines
Response at a location due to Single Concentrated Load
Response at a location due to Distributed Loads
Response at a location due to Series of Concentrated Loads
Absolute Maximum Response

Deflections of Beams
Differential Equation of Beam Displacements
Review of Direct Integration
Superposition Principle
Moment-Area Theorems
Conjugate Beam Method

Work-Energy Methods for Computing Displacements
Work and Virtual Work
Principle of Virtual Work
Unit Load Theorem
Deflections of Trusses by the Unit Load Method
Deflections of Beams and Frames by the Unit Load Method
Structural Deflections and Serviceability
` Conservation of Energy
Castigliano's Second Theorem for Computing Displacements
Betti's Reciprocal Theorem

Analysis of Statically Indeterminate Structures
Advantages and Disadvantages of Static Indeterminacy (Redundancy)
Method of Consistent Deformations (Force/Flexibility Method)
Selection of Redundant Actions for Analysis
Support Settlements, Temperature Changes, and Fabrication Errors
Introduction to Displacement (stiffness) Methods
Use of Computer Codes for Structural Analysis

Examination policy:

The three in-class exams will be given in the Science Center Lecture Room 362 on Wednesday September 27, Friday October 27, and Friday November 17 at 11:00am. The Final Exam will be as scheduled during the final exams week. There will be no make-up exams. In unusual circumstances excuses may be granted for the in-class exams. For predictable absences excuses must be requested well in advance of the exam day. Excused exams will increase the weight of remaining exams and the Final Exam. There will be no excuse for the Final Exam. Exams will be closed book and closed notes. Only an original handwritten sheet of personal notes without example problems will be allowed during examinations. Exams will contain problems from completed laboratory experiments as well as the other covered topics.

Structures Laboratory:

There will be three laboratory sessions as follows: (1) design of experiments for measurement of flexural stiffness, strain, and stress in beams; (2) Influence lines and effects of moving loads on beams; (3) Virtual work and indeterminate structures experiments. There will be 3 or 4 students in each lab group. However, individual reports are required from each student. Laboratory sessions will be scheduled by each group with the TA assigned to the course. There will be three meetings by each team in the Structures Laboratory (CAMP 191) for the three labs. There will be a laboratory lecture preceding each laboratory on the following Fridays: (a) September 1, (b) October 6, and (c) November 3. Satisfactory completion of the laboratory experience by each student is required for passing this course.

Workshops:

There will be up to seven in-class problem workshops that are tentatively scheduled on the following Fridays: September 8, 15, 22, October 13, 20, November 10, and December 1. Workshops will be collected at the end of class, graded and returned in the following lecture.