

ECI 130: Structural Engineering of Ancient Roman Architecture
UC DAVIS SUMMER ABROAD
Rome, Italy
June 21 – July 19, 2010
Instructor: Sashi Kunnath, E-mail: skkunnath@ucdavis.edu

ECI 130: Structural Analysis Syllabus

OBJECTIVES:	Develop a fundamental understanding for the mechanics of structural behavior. Introduce flexibility and stiffness based concepts for the analysis of determinate and indeterminate structures.
PREREQUISITES:	MAT 22A, Linear Algebra; ENG 104, Mechanics of Materials
(By topic):	Differential Equations; Stresses in beams; shear and moment diagrams for simple beams and frames; deflection computation for determinate beams
CLASS MEETING:	MON TUE WED: 10 am – noon and 1:00 – 3:00 pm
TEXT:	<u>Structural Analysis</u> - <i>Hibbeler</i> , 7th Edition, Pearson (Prentice-Hall)
HOMEWORK:	Problems will be assigned in class at the end of each lecture. Submission date for each HW SET will be announced in class.
EVALUATION:	Evaluation will be based on homework, a mid-term, and a comprehensive final exam.
GRADING:	Homework: 25 %; Mid-Term: 30 %; Final: 45 %
NOTES:	DO NOT TURN IN WORK THAT DOES NOT REFLECT YOUR OWN EFFORT. Homework assignments must be completed in a neat and professional manner using engineering paper. Late homework will not be accepted.

ECI 130: Outline of topics

Lecture	Topic	Sections	HWK	Problems
1	Introduction	1.1 – 1.2	SET 1	3 problems
	Loads on Structural Systems (but wind, snow & earthquake)	1.3 – 1.4		
	Analysis of Planar Structures			
	- Idealization, superposition	2.1 – 2.2		
2	- Determinacy, stability	2.4		
3	- Equilibrium	2.3 & 2.5		4 problems
<u>ANALYSIS OF DETERMINATE STRUCTURES</u>				
4	Analysis of Truss Systems	3.1 – 3.2	SET 2	2 problems
	- Method of Joints	3.3 – 3.4		
	- Method of Sections	3,5		
5	Internal Forces in Beams & Frames	4.1 – 4.2	SET 3	3 problems
6	Shear and Moment Diagrams	4.3 – 4.4		
7	Influence Lines	6.1 – 6.3	SET 3	4 problems
	Review			
	Mid-Term Exam			
8	Deflection of Beams and Frames			
9a	- Energy Methods			
9b	- Energy Methods	9.1 – 9.5	SET 4	5 problems
<u>ANALYSIS OF INDETERMINATE STRUCTURES</u>				
10a	Flexibility/Force Methods			
10b	Flexibility/Force Methods	10.1 – 10.5	SET 5	5 problems
11	Stiffness/Displacement Methods	11.1 – 11.5	SET 6	5 problems
General Review				
FINAL EXAM (COMPREHENSIVE)				

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ECI 198: Directed Group Study

Instruction (details to be published later)

Lectures: Mon/Tue: 2pm – 3:30pm

Field Trips: Wed/Thu: 2:30 pm – 5:30 pm (short visits)
Friday/Saturdays (full-day visits)

TEXTBOOK: *No textbook; lecture notes and handouts only*

Objectives of the Course

Interpreting the rules followed by the ancient engineers and architects in the light of the modern achievements, with an overview spanning from ancient Egypt (the pyramids) to the Roman times.

Historical Sources of Information

The Secrets of the Golden Number

The Art of Construction in the Roman Times

Classic Masonry Typologies

The Popular Tradition, The Cultural Tradition

The Opus Quadratum and its Mechanics

Vertical and Horizontal Actions, Behavior under in-plane loads

The use of the diàtoni; Chain-like behavior

The Monolithic Wall under Horizontal and Vertical Action

'Collapse modes' of sliding and overturning

Horizontal (e.g., arch thrust); Vertical (e.g., arch weight)

Overturning and Sliding

The Wall of Bricks

Concentrated and Distributed load (seismic action)

The Wall of Ortòstati and Diàtoni

The Role of the Walls & Effectiveness of transverse walls

'Modern' interpretation

Multistory Buildings with Vaults

An example: The Cathedral of S. Angelo dei Lombardi (field trip)

Verification sequence, roof trusses

Check of a Curioni building (field trip)

Arches, Vaults and Domes

The Roman Arches (field trip)

The Pantheon (field trip)

Saint Peter's Dome (Michelangelo) (field trip)

Additional field trips to be announced later

Evaluation (P/NP grade only) – based on required field trip reports