CIVE 410 - Structures II

Curricular Area	Civil Engineering – Structural Sequence
Type of Course	Required
Catalogue Description	Stability and determinacy of structures. Energy theorems and applications to trusses, beams, and frames. Analysis of statically indeterminate structures by the flexibility (force) and stiffness methods. Introduction to the direct stiffness method. Influence lines for indeterminate structures.
Prerequisites	CIVE 311
Load	2 sessions per week – 75 min per session; 3 credits
Instructor	Prof. Hisham Basha; E-mail:hb27@aub.edu.lb
Textbook	R.C. Hibbeler, *Structural Analysis*, Sixth or later Edition, Prentice Hall, 2006
Reference Books	1. Leet, K, Uang, C, and Gilbert, A, "Fundamentals of Strutural Analysis", McGrawHill, fourth edition, 2011. 2. West, H., and Geshwindner, L, "Fundamentals of Structural Analysis", John Wiley & Sons, Inc., second edition – 2002. 3. J. McCormac, "Structural Analysis", Harper International Edition, 4th Ed. 4. C. Norris, J. Wilbur, and S. Utku, "Elementary Structural Analysis", McGraw-Hill Intern. Editions, 4th Ed.
Topics	1. Review of basic concepts of structural analysis 2. Equilibrium, stability, indeterminacy, and degrees of freedom. • Basic equations of equilibrium, equations of condition • Stability and determinacy of beams • Indeterminacy of plane frames and trusses, indeterminacy of space frames and trusses • Degrees of freedom, unknowns of a structural system 3. Trusses • Basic theory of simple plane trusses; equilibrium, compatibility, and constitutive equations • Energy methods for computing displacements of statically determinate trusses: method of real work and method of virtual work • Analysis of statically indeterminate trusses: the flexibility (force) method and the direct stiffness (displacement) method; matrix formulation • SAP analysis software 4. Beams and frames • Review of beam theory; equilibrium, compatibility and constitutive equations • Review of geometric methods for computing displacements of statically determinate beams and frames: double integration, moment-area theorems, and the conjugate beam method • Energy methods for computing displacements of statically determinate beams and frames: method of real work and method of virtual work • Analysis of statically indeterminate beams and frames: the flexibility (force) method; stiffness methods: slope deflection and moment distribution, the direct stiffness (displacement) method; matrix formulation • SAP analysis software 5. Influence lines for statically indeterminate structures

Assessment:

1. Attendance (as below).
2. Individual homework assignments (Modeling, manual analysis, validation, synthesis, and report). (10%)
3. Two 1.5-hour quizzes and a 3-hour final exam. (25+25+40%)
4. **ZERO-TOLERANCE** policy on cheating and plagiarism.

Attendance: Attendance is **mandatory**. Class attendance will be taken and students will be penalized for absences according to the rules set by AUB regulations, and specified in the CE Student Manual; i.e. students who miss more than one-fifth of the sessions of any course in the first ten weeks of the semester will be required to withdraw from the course with a grade of "W".

Exam Dates: Quiz 1: Last week of March – 2012– Week 7th
Quiz 2: Last week of April – 2012 – Week 11th
Final Exam: To be set later by AUB registrar.

Learning Outcomes **Correlation with**	**Program Outcomes**	**Program Objectives**
Students will know the fundamental structural concepts of beam and truss theories and the basic principles of structural analysis.	a	1
Students will demonstrate the ability to determine the state of stability and degree of indeterminacy of structures.	a, b	2
Students will demonstrate the ability to apply the fundamental principles of structural analysis to analyze indeterminate trusses, beams, and frames by the flexibility and classical displacement (stiffness) methods – slope deflection and moment distribution.	a, b	2
Students will demonstrate the ability to apply the fundamental principles of structural analysis to implement the classical stiffness methods by matrix formulation (direct stiffness method).	a, b	2
Students will demonstrate the ability to apply the fundamental principles of structural analysis to sketch and plot influence lines of indeterminate beams and frames	a, b	2
Students are familiar with available structural analysis computer programs and will demonstrate the ability to practice their use while working in teams.	e, g, h	2, 6

Learning Outcomes Assessment Tools	**Exam Pbs**	**HW Pbs**	**Lab Reports**	**Project Report**	**Course Survey**
Students will know the fundamental structural concepts of beam and truss theories and the basic principles of structural analysis.	✓	✓			✓
Students will demonstrate the ability to determine the state of stability and degree of indeterminacy of structures.	✓	✓			✓
Students will demonstrate the ability to apply the fundamental principles of structural analysis to analyze indeterminate trusses, beams, and frames by the flexibility and classical displacement (stiffness) methods – slope deflection and moment distribution.	✓	✓			✓
Students will demonstrate the ability to apply the fundamental principles of structural analysis to implement the classical stiffness methods by matrix formulation (direct stiffness method).	✓	✓			✓
Students will demonstrate the ability to apply the fundamental principles of structural analysis to sketch and plot influence lines of indeterminate beams and frames	✓	✓			✓
Students are familiar with available structural analysis computer programs and will demonstrate the ability to practice their use while working in teams.	✓	✓	✓		✓

Prepared by	Dr. Hisham Basha
Date	February, 2012