

ABET Course Syllabus**ENAE 420 Computational Structural Mechanics**

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| <b>Credits &amp; Contact Hours:</b> | 3 credits (3 hours of lecture)   |
| <b>Course Status:</b>               | Not required   |
| <b>Schedule:</b>                    | Offered every Spring semester  |
| <b>Course Description:</b>          | Introductory of finite element methods for aerospace engineering modeling and analysis; equips students with ability to understand manuals of commercial finite element analysis software. |
| <b>Pre-Requisites:</b>              | ENES220, MATH241, Linear Algebra.  |
| <b>Co-Requisites:</b>               | None   |
| <b>Textbooks:</b>                   | None   |
| <b>Other Required Material:</b>     | Course lecture notes and handouts  |
| <b>Course Oversight:</b>            | Structures and Vibration Committee   |
| <b>Syllabus Prepared By/Date:</b>   | Dr. Lee on June, 2011  |

**Course Objectives/Student Learning Outcomes:**

1. Thorough understanding of the fundamentals of the finite element method
2. Introduction of a commercial finite element analysis software package (Solidworks)
3. Ability to read and understand the manuals of any commercial finite element software

**Topics Covered:**

1. Introduction to FE Modeling:
  - a. Axially loaded slender body,
  - b. Virtual work,
  - c. Construction of element stiffness matrix and load vector,
  - d. Assembly of global stiffness matrix and global load vector,
  - e. Determination of displacement and stress
2. Truss Structures: Truss structures in 3D space
3. Beam Bending: Construction of the 4-DOF element
4. Temperature Effect: Load vector due to temperature change
5. Structural Dynamics:
  - a. Consistent mass matrix,
  - b. Modal analysis,
  - c. Numerical integration,
6. Stability: Static stability and dynamic stability

**Relationship of Course Objectives to Program Outcomes**

This course addresses program outcomes: