

**ASEN 5007 - Introduction to Finite Element Methods, Fall 2013**

**Homework Assignments #7 and #8— Chapters 17–19**

Due **Thursday October 31**, 2013 for on-campus students, **Tuesday November 5** for CAETE students

*Do not forget to attach this cover sheet to your returned homework and write your name(s) on it*

Exercises:

17.1 and 17.2 (easy)

18.1 or 18.4 (pick one)

18.8 or 18.9 (pick one)

Grading weights posted at the start of the Exercises.

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Next homework, on Chapter 19, will be very short, and due **Tuesday November 5** for on-campus students and **Thursday November 7** for CAETE students. That will allow posting of all HW solutions for Part II before the second midterm scheduled for November 14 (see below).

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Notes:

Exercises 17.1 and 17.2 are just verifications of a two-dimensional element. They can be done by hand or by CAS. Doing it by hand will take much longer but will be more instructive.

When you verify that the sum of shape functions of an element is identically one, do it algebraically (*not* numerically at specific points). Two examples are provided in §16.6.2. For the shape functions of the cubic triangle, one quick way using *Mathematica* is to write down the 10 shape functions symbolically in the triangular coordinates, say  $z_1$ ,  $z_2$  and  $z_3$ . Add them up and call their sum  $S$ . Then write  $S = \text{Simplify}[S /. \{z_3 \rightarrow 1 - z_1 - z_2\}]$  and print  $S$ . The answer should be exactly 1. If not, check for errors.

As preparation for midterm exam 2 (announced below) you may want to do more Exercises than the minimum. Solutions for all of the Exercises listed above will be posted by November 8.

Grading weights posted at the start of the Exercises.

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**Second Midterm Exam**

Schedule date: **Thursday November 14** for on-campus students, or CAETE students who plan to take it on-campus. Remote CAETE students will take the exam through their EO, who should receive early that week; cover page will specify the date range.

Review session on Tuesday November 12.

Exam covers: Chapters 11, 15–19. Skip Chapters 12, 3 (not covered) and 13 (advance material). Chapter 14, which formulates the plane stress problem, can be also skipped since it is mostly continuum mechanics. Omit also any small-print sections (with title marked by asterisk).