MEGN 312 - Introduction to Solid Mechanics
Incorporating Active Learning Strategies

BACKGROUND

**Purpose:**
- To introduce students to the theory and application of the principles of Solid Mechanics.
- To teach students to apply the principles of Solid Mechanics to analysis and design of machine elements and structures.

**Population:**
- Offered to Mechanical Engineering students, and Physics students pursuing combined MS degree.
- 360-370 students per year.
- 6 Sections per year (Fall - 1, Spring – 4, Summer - 1).
- 3 cr. h. lecture and recitation.
- Course is delivered by 4-5 Faculty with assistance from Teaching Assistant and graders.

**Reasons for re-design:**
- To incorporate active learning and positive classroom climate strategies.

REDESIGNED COURSE

**Significant elements of the course redesign:**
- Implement norms and consequences to ensure inclusive and productive classroom climate.
- Regularly share course and lesson Learning Outcomes (LO) with students, and use as study guides for exams.
- Enhance reading assignments with reading guides and focus questions, relation to course LO, and advice for the upcoming in-class discussion.
- Add screen casts, of problem solving examples, to the out-of-class reading assignment. Implement guided in-class individual and group based activities.

**Planned activities and scaffolding:**

- Written HW problems
- Guided HW problems
- Conceptual HW questions with links to relevant text
- Online multimedia modules (Mecmovies)
- Online multimedia course modules
- Reading assignments and minute paper
- Hands-on activities and demonstrations
- Written HW problems
- Lesson Learning Outcomes
- Large group discussions
- Conceptual HW questions with links to relevant text
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INTENDED OUTCOMES

**It is expected to increase student’s achievement and retention based on the following principles of learning:**
- Improve the way students organize knowledge, i.e. make their own connections.
- Increase student’s motivation by making connections to real life examples.
- Offer targeted and appropriate practice and feedback.
- Increase students’ abilities to transfer knowledge or adapt their learning to new contexts (metacognition).

ASSESSMENT

**Planned Formative Classroom Assessment:**
- Application cards, minute paper, gots and needs.
- Documented problem solutions.
- Short concept and attention quizzes (>clickers).

**Summative Assessment:**
- Online HW problems.
- Written HW problems.
- Two in terms tests and final exam (with data collected for all questions).

**Further assessment and research opportunities:**
- Concept Inventory – implemented on Canvas at the end-of-course; afterwards - in the following course(s).
- Problem solving:
  - Interviews.
  - Observations and think-alouds.

Sample Pre-Session Reading Assignment(s):
- Read textbook chapters 1.3 and 1.4.
- Review Mecmovies 1.1, 1.7-10 associated with the chapters.
- Be prepared to explain (in words and diagrams) and discuss single and double shear. Identify the ways a simple single shear connection can fail.
- Watch the screen cast associated with the lecture.

Sample Pre-Session Reading Assignment Submission (on Canvas as Graded Survey)
- **Question 1:** About the last lecture: “What was the most important thing that you learned during this class?”
- **Question 2:** About the last lecture: “What was the least challenging concept or explanation in the assigned book chapters?”
- **Question 3:** About the reading assignment: “What was the most challenging concept or explanation in the assigned book chapters?”
- **Question 4:** About the reading assignment: “What important question remains unanswered?”

About the reading assignment:
- “What was the least challenging concept or explanation in the assigned book chapters?”

**Previously**

**Additional**

**Sample Pre-Session Reading Assignment Submission**
- On Canvas as Graded Survey

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