To: The Engineering Faculty
From: The Department of Engineering Education
Re: New Graduate Level Course – ENE 602

The faculty of the Department of Engineering Education has approved the following new graduate ENE course. This action is now submitted to the Engineering Faculty with a recommendation for approval.

**ENE 602  Engineering Education Perspectives**
Sem. 1. Cr. 3. Admission by consent of instructor.

Description: Perspectives on the field of engineering education. Emphasis is placed on students’ development of a personal identity within the scholarship of engineering education including engineering practice, teaching engineering, and engineering education research.

Reason: This is a required course for the graduate programs in the Department of Engineering Education (ENE). This new course will also be of interest to graduate students in other Departments, Schools, and Colleges with engineering education or related interests. The intent of the course is to introduce students to the field of engineering education while broadening their views of the roles of and interrelationships between teaching and research.

This course was offered in Fall 2005 as ENE 595A – Introduction to Engineering Education. Fifteen students, including students from ENE, various graduate programs in Engineering, Science Education, and Technology, were enrolled.

Kamyar Haghighi, Head
Engineering Education
ENE 602 Engineering Education Perspectives
Syllabus

COURSE DESCRIPTION:

This course introduces students to the field of engineering education. Emphasis will be placed on students’ development of a personal identity within the scholarship of engineering education including engineering practice, teaching engineering, and engineering education research.

COURSE LEARNING OBJECTIVES:

As a result of taking this course, the participants will develop the knowledge and skills to:
1. Define engineering and the engineering method, and list attributes of engineering as a profession.
2. Describe the context of engineering education in the US and globally
3. Describe the history, the present, and the future scenarios of engineering and engineering education
4. Summarize "state of the art" or "best" practices for teaching and learning engineering
5. Describe drivers and opportunities that are enabling engineering education research
6. Map the landscape of engineering education research
7. Describe the elements of an engineering education research study
8. Articulate a clear personal teaching philosophy statement.
9. Articulate a clear personal research philosophy statement.

GRADING POLICY:

- Participation 10%
- Preparation 10%
- Engineering & Engineering Practice 20%
  - Auto-Biographical Reflection
  - Elevator Speech Draft
  - Elevator Speech Final
- Teaching in Engineering Education 20%
  - Auto-Biographical Reflection
  - Teaching Philosophy Draft
  - Teaching Philosophy Final
- Research in Engineering Education 20%
  - Auto-Biographical Reflection
  - Research Philosophy Draft
  - Research Philosophy Final
- Best Practices Presentation 20%
GENERAL COURSE POLICIES:

Attendance and participation in class activities and discussion, and timely submission of assignments is required. Excellence is expected in all written work. Written assignments must be well-organized and proofread for spelling and meaning.

COURSE OUTCOMES / PRODUCTS:

By the end of the course, participants will have developed a first set of engineering education philosophy statements. These philosophy statements will be developed through a series of revision cycles and include the following topics: engineering practice and engineering education, engineering teaching, and engineering education research. A common feature of these philosophy statements is that they represent YOUR choices about what is important (e.g., your beliefs, attitudes, priorities, and conceptions), and as such are likely to change over time as your identity as an engineering educator evolves. The rationale for incorporating them in this introductory course is that they provide an entry point for discussing your ideas about engineering education (such as a conversation starter) and an initial framework for organizing your current views and exploring future ideas.

As a class, participants will also collaboratively create the following tools and frameworks:
- Landscape of engineering practice
- Landscape of engineering “drivers” (those who influence engineering education)
- Best practices in engineering education teaching
- Landscape of engineering education research
- Frameworks for designing engineering education research studies

Schedule of Topics and Assignments

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<thead>
<tr>
<th>Week</th>
<th>Topics</th>
<th>Assignments Posted</th>
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<tbody>
<tr>
<td>1</td>
<td>Course Syllabus &amp; Expectations</td>
<td>ABR I – Engineering &amp; Engineering Practice Reading – Engineering Education Landscape: Drivers, Opportunities, and Challenges</td>
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<tr>
<td></td>
<td>Community Building</td>
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<tr>
<td></td>
<td>What is engineering practice?</td>
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<td>• Landscape of Engineering Practice</td>
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<td>What are ways to influence (change) engineering education?</td>
<td>Elevator Speech Draft Reading – More on Drivers</td>
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<tr>
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<td>• Drivers, Opportunities, &amp; Challenges</td>
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<td>• Theories of Change</td>
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<td>3</td>
<td>What are opportunities for change?</td>
<td>Best Practices in Engineering Teaching and Learning - List of 10+</td>
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<td>• Homework Report Out – Driver Investigation Revisit: What is engineering practice?</td>
<td>Landscape of Engineering Education: The National Science Foundation as a Driver ABR II – Teaching Engineering Reading - Collaborative / Cooperative Learning</td>
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<td>• Peer Review Elevator Speech</td>
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<td>• Develop review criteria</td>
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<td>• Instructor Feedback on ABR I</td>
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<td>• Insights from the learning sciences</td>
<td>Reading - Reflections on Teaching or Thinking about Teaching Best Practices in Engineering Teaching and Learning – Team Assignment</td>
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| 5 | Cooperative Learning  
- Define what is cooperative learning (consensus) and discuss how to improve CL activities | Reading - Teaching Philosophy
Reading - Teaching & Learning is Disciplinary
Reading for Best Practice 1 – Problem-Based Learning
Reading for Best Practice 2 – Teaching Pedagogies for Diverse Learners |
| 6 | **What are best practices in engineering teaching and learning?**  
- Best Practices Presentations:  
  - Problem-Based Learning  
  - Teaching Pedagogies for Diverse Learners | Best Practices in Engineering Teaching & Learning - Reflection
Teaching Philosophy Rubric – Putting it to Test
Reading for Best Practice 3 - Performance Based Assessment / Authentic Assessment
Reading for Best Practice 4 – Learning from Failure
Readings – Teaching Philosophies |
| 7 | **What are best practices in engineering teaching and learning?**  
- Best Practices Presentations:  
  - Performance Based Assessment / Authentic Assessment  
  - Learning from Failure  
**What is a “good” teaching philosophy?**  
- Generating a Rubric | Frontiers in Education 2005  
- Global/International Paper  
- Education Research Paper  
Reading for Best Practice 5 – Learning Communities |
| 8 | **What are best practices in engineering teaching and learning?**  
- Best Practices Presentations:  
  - Learning Communities  
**How do best practices relate to the teaching philosophy?**  
Navigating FIE | Teaching Philosophy Draft
What is Engineering Education? - read and dissect 2 research papers  
- FIE paper  
- Best Practice related paper |
| 9 | **FRONTIERS IN EDUCATION (FIE)** |  
-  |
| 10 | **What is the engineering education landscape?**  
- Debrief global perspectives (FIE paper)  
- Debrief education research papers  
- Creating an engineering education research landscape based on the EERC | ABR III – Engineering Research
Reading - Perspectives on Research
Expanding the Research Landscape – Generate 10 research question with an EERC theme |
| 11 | **What is engineering education research?**  
- Comparing research in the physical and social sciences  
- Identifying the necessary knowledge and skills  
- Questions, methods, and evidence  
- Generate a research question | Reading - Qualitative and Quantitative Research
Peer Feedback on Teaching Philosophy Drafts
Mapping research questions, evidence, and methods – refining your research question |
| 12 | **What is engineering education research?**  
- Comparing modes of inquiry  
**What is a research philosophy?**  
- Finding your research identity | Reading - Development of a Research Study
Reading - Debate on the Nature of Education Research
Reading - Research Philosophies  
- Locate two research philosophies on the Web. |
### Week 13 Topics
- Teaching Philosophy
  - Redevlop rubrics to evaluate teaching philosophy
- Research Philosophy
  - Develop and test rubrics to evaluate research philosophy

### Assignments Posted
- Teaching Philosophy Final
- Research Philosophy Draft
- Reading: On Becoming an Engineering Education Researcher
- Reading: On Preparing Engineering Education Scholars

### Week 14
- **THANKSGIVING**

### Week 15 Topics
- Engineering education research
  - Identify challenges / strategies about research philosophy statements
  - Summarize features of engineering education research
  - Engineering education as a profession
    - Characterize attributes of a profession - Link to preparation for engineering education profession
  - Characterize forms of scholarship - Link to forms of scholarship in engineering education
  - Design an engineering education program

### Week 15 Assignments
- Peer Feedback on Research Philosophy Drafts
- Peer Evaluation on Teaching Philosophy Finals
- Research Philosophy Final
- Written Course Evaluation

### Week 16 Topics
- Research Philosophies
  - Identify challenges / strategies about research philosophy statements
  - Provide peer feedback on strengths and what needs improvement
  - Elevator Speeches Revisited
  - Reflect on “your role” – has it changed?
  - Engineering education research – What does it look like?

### Week 16 Assignments
- Attend an MS Defense

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