

**Division of Engineering and Mathematics
School of Science, Technology, Engineering, and Mathematics
University of Washington Bothell**

**B ME 482 A Engineering Professional Development II:
Professional Engineer
Winter 2017**

Time and Location: MW 8:45 - 10:45 in UW1 - 210

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Canvas Homepage: <https://canvas.uw.edu/courses/1112359>

Overview

Professional Engineer is a continuation of the Engineering Professional Practice series in mechanical engineering that starts with Citizen Engineer in fall quarter. It covers economic analysis of engineering projects, leadership, and preparation for licensure.

Economic analysis deals with techniques for factoring costs into engineering decisions. Rarely are engineering decisions made solely on the basis of technical considerations; cost and time often come into play. An elegant solution that bankrupts employer is no solution at all. Nor is a gizmo with the most advanced features, but which requires a price higher than the market will bear to generate an acceptable rate of return, likely to win plaudits for the proposing engineer. We will learn ways of estimating costs, analyzing cash flows, comparing benefits to costs, and deciding which alternative to choose based on financial metrics set by the employer.

Engineering economics is one of the many subjects covered in the Fundamentals of Engineering (FE) exam, passing of which is the first step toward licensure as a Professional Engineer. The FE Exam tests candidates' knowledge of basic math and science that cuts across engineering fields, as well as ability to solve problems in the main subject areas of Mechanical Engineering.

In the third part of the class, we consider models of leadership in an engineering context. We will try to identify characteristics associated with success in getting jobs done, managing projects, and leading people. In the penultimate assignment, students reflect on their own development and potential as engineering leaders.

Learning Outcomes

At the end of this course, students will be able to:

1. Apply accounting and economic methods to analyze investments in engineering projects.
2. Choose among competing engineering projects and designs the one that best meets client needs within budgetary, technical, legal, and other constraints.
3. Pass the Fundamentals of Engineering (FE) Exam.
4. Describe the process of becoming a licensed Professional Engineer (PE).
5. Describe the ethical and legal responsibilities of the licensed Professional Engineer (PE).
6. Identify characteristics of good engineering leadership, and examine their own leadership strengths and weaknesses in relation to their own goals.

ABET Learning Outcomes

The learning outcomes for this course map to ABET outcomes (f), (g), (h), and (i):

- (f) Understanding of ethical and professional responsibility.
- (g) Communicates effectively.
- (h) Broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- (i) Recognition of the need for, and an ability to engage in, lifelong learning.

Course Materials

1. Donald G. Newnan et al, *Engineering Economic Analysis*, Twelfth Edition (Oxford University Press, 2014).
2. Access PPI's "FE Prep University" learning management system at <http://learning.feprep.com>
3. National Council of Examiners for Engineering and Surveying (NCEES), *FE Reference Handbook*, 9.4 Version for Computer-Based Testing, which can be downloaded as a pdf document at <http://www.ncees.org>. Use while studying the FE Mechanical Review Manual and taking online quizzes on the FE Prep website.

Item 1 is a book that can be purchased from the UWB Bookstore.

Item 2 must be purchased from PPI. Follow these instructions:

- (1) Visit this URL: <http://feprep.com/university/student>
- (2) Enter the Group Code UNWBFA16, add the \$45 product bundle to your cart, and check out.
- (3) Wait a minute or so for email confirmation from PPI.
- (4) Follow instructions in email to activate your 6-month access.

Upon confirmation, you will be enrolled in the site as my student. As the administrator, I'll be able to monitor your activity and track your progress as you work through the online quizzes. You'll also have access to the FE Mechanical Review Manual and other tools to help you master the body of knowledge you are expected know for the FE Exam.

Item 3 can be accessed from the NCEES website by creating an account and downloading it for free at <http://ncees.org/engineering/fe/>
See <https://youtu.be/QcjQdlAvjV8> for more information.

Other Resources for the FE/PE Exams:

- (1) FE Mechanical Exam Specifications (topics covered and approximate number of questions on each topic):

<http://ncees.org/wp-content/uploads/2015/07/FE-Mec-CBT-specs.pdf>

- (2) Information on the PE Exam (Note that ME's take the PE exam in one of three specialties: HVAC and refrigeration, machine design and materials, and thermal fluids.)

<http://ncees.org/engineering/pe/>

- (3) NCEES Examinee Guide:

http://ncees.org/wp-content/uploads/ExamineeGuide_December-2016.pdf

Info on exam logistics, fees, scoring, reporting of results, what to bring to the exam, etc.

- (4) Washington State Department of Licensing:

<http://www.dol.wa.gov/business/engineerslandsurveyors/engapply-exam.html>

Although the FE exams are developed and administered by NCEES, which is a national organization, individual states determine eligibility requirements, and ensure that licensed engineers operate in compliance with state laws. In Washington, the governing body is the Board of Registration for Professional Engineers and Land Surveyors. Graduates of ABET-accredited programs normally register for the FE Exam directly on the NCEES website as early as the spring of senior year. Until our program has received its formal accreditation in August 2017, ME students at UWB must wait until they have graduated to apply to take the exam. Upon graduation, students petition the WA State DOL to have their eligibility reviewed by submitting this form and having transcripts sent:

<http://www.dol.wa.gov/forms/651018.pdf>.

Once approved by the Board, students will be able to sign up at the NCEES web site to schedule the exam.

Assignments

The assignments, due dates, and weightings are as follows:

1. Problem sets (18 %):

Six problems sets are assigned throughout the quarter. These are to be done on green engineering paper and submitted in class on the due date. Problems cover engineering economics and may occasionally include FE Exam-type problems, as well as short-answer questions on professional practice.

2. Online quizzes, given on the day homework is submitted (15 %):

Online quizzes are self-generated in the PPI FE Prep learning management system. Because I have not used this system before, and it will not allow me to create assignments until students have registered to use the site, I won't know exactly how it works until the first quiz has been assigned and the results recorded. But the goal is to assign quizzes most

weeks to be completed by Friday at 11:59 pm. I will give instructions on the total number of questions and subject areas to include in the quiz. Students input the number of questions and the subject areas for the quiz, and the system assembles the quiz from questions drawn randomly from its data base. Students take the quiz question by question, using the pdf version of the FE Reference Handbook as their source for equations and data. Note that the quiz is timed, and the system will time out and end the quiz if students take too long. On the real exam, you have an average of only around 3 minutes to answer each question. So fully review the material and be ready to be tested on it BEFORE attempting a quiz. The grade assigned for this component of the course will be based in part on timely completion of exams and evidence of improvement over time.

- 3. Short essays (20 %):** Four short essays, each between 300 and 500 words, are assigned throughout the quarter. The essays will be on prompts related to the leadership readings: each will generally summarize a reading, and offer commentary on it based on personal experience or other considerations noted in the prompt. Type the essays in 12-point, Times New Roman font, with full double spacing; write name and word count at the end, and submit in class in hard copy on the due date.
- 4. Leadership Self-Assessment (15 %):**
This is a 750-1000 word reflection on your growth and development as an engineer over the past year. It should take the following form: First, what are the two or three most important attributes of the successful engineering leader? Second, what do you see as your strengths and weaknesses in relation to these attributes? In other words, how do you measure up against your own standards? Finally, what do you need to do, and what are you planning to do, to overcome weaknesses and be the best engineer you can possibly be? This essay is due in Canvas at 11:59 pm, March 10.
- 5. Comprehensive In-Class Final Exam (25 %), two hours, open book and use of computer allowed.**
The exam consists of two parts: Part I covers engineering economic analysis, and Part II is a mock FE Exam. Part I consists of problems similar to those in the problem sets; problems are worked out fully, and partial credit is possible. Part II is multiple choice, covering all subject areas of the real exam; only correct answers count, and there is no partial credit.
- 6. Participation (7 %),** in class discussion and other activities; includes grades on practice in-class quizzes and other written exercises.

Policies and Campus Resources

Classroom Conduct and Etiquette: Maintaining a productive learning environment requires everybody's cooperation. Turn portable devices to silent mode. If you must make a call or send a text, please do it outside the classroom. Laptops and tablets may be used for note-taking, though you will learn better by writing notes by hand. Using devices for purposes unrelated to the class causes you to lose credibility and may result in my calling you out for it in class or even asking you to leave the room. Be in class on time, and stay until the end.

Office hours and email: My office hours are listed at the top of the first page of this syllabus. If you need to email me, please do so in Canvas, and I'll respond usually within 24 hours.

Late Policy: Individual assignments will be penalized 0.5 grade points for each late day. Missed exams without a valid excuse cannot be made up. Students who anticipate not being present for a scheduled exam should make other arrangements with me at least two weeks in advance.

Grading: Grades are recorded on a 4-point scale, in accordance with UW policy. I generally use the following conversion from a 100-point scale to the 4-point scale: 99-100=4.0, 97-98=3.9, 95-96=3.8, 93-94=3.7, 91-92=3.6, 90=3.5, 89=3.4, 88=3.3, 85=3.0, 82=2.7, 80=2.5. In exceptional circumstances, grades may be curved using the appropriate statistical measures. More information on the UW grading system can be found here: http://www.washington.edu/students/genclat/front/Grading_Sys.html

Incompletes: University rules state that “an incomplete is given only when the student has been in attendance and has done satisfactory work until within two weeks at the end of the quarter and has furnished proof satisfactory to the instructor that the work cannot be completed because of illness or other circumstances beyond the student’s control.”

Academic integrity: Students are responsible for knowing what constitutes a violation of the University of Washington Student Code, and they will be held responsible for any such violations whether they were intentional or not. The standards for student conduct and procedures for dealing with misconduct are prescribed in the Student Conduct Code for the University of Washington (<http://app.leg.wa.gov/wac/default.aspx?cite=478-120>). Issues concerning academic integrity and misconduct are handled by Student Affairs, with information available here: <http://www.uwb.edu/studentaffairs/studentconduct>.

Plagiarism is a serious academic offense. You should recognize it (see “What is Plagiarism?” at <http://libguides.uwb.edu/content.php?pid=87430&sid=691950>) and take strategies to avoid it in your own writing (see “Strategies for Avoiding Plagiarism” at <http://libguides.uwb.edu/content.php?pid=87430&sid=691952>). If I suspect that an assignment has been plagiarized, I will ask for an explanation. Possible sanctions include failure on the assignment and reporting to Student Affairs.

Respect for Diversity: Diverse backgrounds, embodiments and experiences are essential to the critical thinking endeavor at the heart of university education. Students are expected to respect individual differences which may include, but are not limited to: age, cultural background, disability, ethnicity, family status, gender presentation, immigration status, national origin, race, religious and political beliefs, sex, sexual orientation, socioeconomic status, and veteran status. Students seeking support around these issues can find more information at <http://www.uwb.edu/diversity>.

Access and Disability Resources: It is the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law. If you have already established accommodations with Disability Resources for Students (DRS), please communicate your approved accommodations to me at your earliest convenience so we can discuss your needs in this course. If you have not yet established services through DRS, but have a temporary health condition or permanent disability that requires accommodations (conditions include but not limited to; mental health, attention-related, learning, vision, hearing, physical or health impacts), you are welcome to

contact DRS at 425-352-5307 or uwbdrs@uw.edu. DRS offers resources and coordinates reasonable accommodations for students with disabilities and/or temporary health conditions.

Class cancellation and inclement weather policy: Should illness, inclement weather, or other unexpected event require cancellation of a class meeting, I will post an announcement on Canvas at the earliest opportunity. Students can learn of campus operations status from the website or by calling the Campus Information Hotline at 425-352-3333. You may also sign up with an alert system that will contact you via email or text message if classes are canceled. For more information on the alert process, please see <http://www.uwb.edu/alert>. Class activities will be rescheduled as needed. Alternatively, I will record a lecture or create other online media to deliver the day's lesson on-line.

Support for Students: UW Bothell provides a wide range of services to assist students with academic, career, and personal matters.

Academic Advising for Engineering: Charlotte Emigh at cemigh@uw.edu, 425-352-3746

Counseling Center: <http://www.uwb.edu/studentaffairs/counseling>, UW1-080, 425-352-3183

IT Helpdesk: IT@uw.edu, 425-352-3456

Library: www.uwb.edu/library, 425-352-5340. The Engineering Librarian is Penelope Wood (425-352-3467, woodpd@uw.edu).

Quantitative Skills Center: <http://www.uwb.edu/qsc>, UW2-030, 425-352-3170.

Student Success Center: <http://www.uwb.edu/studentsuccesscenter>, 425-352-3427

Writing and Communication Center: <http://www.uwb.edu/wacc>, UW2-124, 425-352-5253.

B ME 482 Schedule

In the course schedule on the next page, note the following:

- “Econ” refers to the textbook *Engineering Economic Analysis*, Twelfth Edition.
- “FE Review” refers to the online *FE Mechanical Review Manual* available on the FE Prep University website.
- Other readings will be posted in Canvas.

Date	Topic	Reading	Activity
Jan 4	Introduction	Econ, Ch 1	Register FE Prep, NCEES Online FE Quiz 1 (by 1/6)
Jan 9	FE Math Review 1: Algebra/Trig Estimating Costs and Benefits	FE Review, Chs 1 - 2 Econ, Ch 2	
Jan 11	FE Math Review 2: Calculus Interest and Equivalence	FE Review, Chs 4 - 5 Econ, Ch 3	Problem Set 1 Online FE Quiz 2 (by 1/13)
Jan 16	MLK Holiday — No Class		
Jan 18	FE Probability/Stats Review Repeated Cash Flows Leadership 1: Hyman Rickover	FE Review, Ch 6 Econ, Ch 4 “Rickover”	Online FE Quiz 3 (by 1/20)
Jan 23	FE Fluid Mechanics Review 1 Present Worth Analysis	FE Review, Chs 7 - 9 Econ, Ch 5	Problem Set 2
Jan 25	FE Fluid Mechanics Review 2 Annual Worth Analysis	FE Review, Chs 10 - 12 Econ, Ch 6	Short Essay 1 Online Quiz 4 (by 1/27)
Jan 30	FE Review Thermo 1 Leadership 2: Jessica McKellar	FE Review, Chs 13 - 15 “McKellar”	
Feb 1	FE Review Thermo 2 Rate of Return Analysis	FE Review, Chs 16 - 18 Econ, Ch 7	Problem Set 3 Online Quiz 5 (by 2/3)
Feb 6	FE Review Heat Transfer Comparing Investment Alternatives	FE Review, Chs 19 - 21 Econ, Chs 8 - 9	Short Essay 2
Feb 8	FE Review Statics Leadership 3: Robert Gates	FE Review, Chs 22 - 25 “Gates”	Problem Set 4 Online Quiz 6 (by 2/10)
Feb 13	FE Review Dynamics/Vibrations Depreciation Leadership 4: When to Speak Up	FE Review, Chs 37 - 41 Econ, Ch 11 “Out on a Limb”	Short Essay 3
Feb 15	FE Review Materials Corporate Income Taxes	FE Review, Chs 26 - 28 Econ, Ch 12	Problem Set 5 Online Quiz 7 (by 2/17)
Feb 20	President’s Day — No Class		
Feb 22	FE Review Mechanics of Materials Leadership 5: When to Act	FE Review, Chs 29 - 32 “Fools Rush In”	Short Essay 4 Online Quiz 8 (by 2/24)
Feb 27	FE Review Electricity/Magnetism FE Review Ethics/Prof. Practice	FE Review Chs 33 - 36 FE Review Chs 51 - 53	Problem Set 6
Mar 1	FE Review Controls/ Computation Leadership 6: You	FE Review Chs 47 - 49 “Fasano”	Online Quiz 9 (by 3/3)
Mar 6	FE Review Machine Design	FE Review, Chs 42 - 46	
Mar 8	Conclusions and Reflections	TBA	Reflection Essay (by 3/10)
Mar 13	Final Exam		