CivEnv 205 – Economics and Finance for Engineers
Fall 2018

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Teaching Assistant	Jingyuan Bao Office Hours: Monday 5:00–6:00 (Tech A308), Wednesday 1:30–4:00 (Tech A125), and by appointment Email: JingyuanBao2018@u.northwestern.edu
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Class Times and Locations:	
Lecture:	Tuesday and Thursday 3:30–4:50 (Tech M345)
Discussion:	Wednesday 12:00–12:50 (Tech L361)
	Wednesday 4:00–4:50 (Tech L211)
Class Website:	Northwestern Course Management System

Course Description

The course introduces students to fundamental concepts in economics and finance in the context of decisions that arise in contemporary planning and management of social and environmentally-relevant (civil) engineering systems. These concepts underlie quantitative analysis techniques, e.g., evaluating/solving systems of equations or optimization models, to assess and select between alternative investment projects.

Intended Audience

The intended audience for this course consists of undergraduate students in Engineering and Science. The course satisfies a **basic engineering** requirement in the *systems engineering and analysis* category.

Objectives

The course objectives are to:

- Instill in students a recognition and appreciation that large-scale, long-term engineering projects have complex economic, environmental, and social consequences and tradeoffs. In this context, the course aims to provide students technical tools to represent, evaluate, and select among projects based on their financial consequences;
- Prepare students to become financially conversant in their professional careers and personal lives;
- Train students to become proficient in the use of commercial software to solve engineering problems; and
- Prepare students to take advanced courses in systems engineering, financial engineering, and managerial accounting.

Prerequisites

This course has no formal prerequisites. Previous coursework in calculus (MATH 220, MATH 224, MATH 230), probability, and statistics (CivEnv 306, IEMS 202, or IEMS 303) may be useful but not necessary. Familiarity with Microsoft Excel will also be helpful.

Due to significant overlap, CivEnv 205 should not be taken concurrently or after IEMS 326, Econ 360-1, KELLG_FE 310-0, and probably BUS_INST 304. Take advantage of being at NU to build additional skills in finance and economics.

Materials

The required textbook for the class is D. G. Newnan, J. P. Lavelle, and T. G. Eschenbach (2017), Engineering Economic Analysis, 13th Edition. Readings and homework problems from this edition of the textbook will be assigned approximately on a weekly basis.[1]

Other useful reference texts include:

1. C. S. Park (2016), Contemporary Engineering Economics, 6th Edition.
2. D. G. Luenberger (2014), Investment Science, 2nd Edition.
3. deNeufville, R. (1990), Applied Systems Analysis, McGraw-Hill. This book is out of print, but available on-line for free at `http://ardent.mit.edu/real_options/ASA_Text/asa_Text_index.html`.

Outline

The first part of the course will introduce basic concepts and tools in finance to evaluate and select projects in deterministic situations. The second part of the course presents analysis tools that are appropriate in situations where decision-makers have to contend with uncertainty. Throughout, the objective is to integrate methodological tools with contemporary applications that arise in planning and management of civil and environmental engineering systems. Lectures will be devoted to learning the tools and solving problems to reinforce the material. In addition, there will be sessions devoted to learning how to solve the problems using commercial software (MS Excel). The content includes:

Topic	**Approximate Duration**
Deterministic Financial Evaluation & Selection Cash-flow evaluation Project selection Sensitivity analysis Fixed-income securities Depreciation and taxes	5 weeks
Evaluation & Selection under Uncertainty Decision trees & value of information Utility Theory Portfolio Optimization Theory	5 weeks

This outline is subject to change in order to accommodate time and interests.

[1] Other versions of the textbook are acceptable, as long as it is understood that the student is responsible for completing the assigned readings and homework problems. We will NOT make readings/problems from the book available.

Requirements and Assessment

1. Homework assignments (20%). Homework will be assigned approximately on a weekly basis and will be due at the start of class as indicated on the assignments. If you are unable to attend class, you may scan your homework and upload it by the start of class via Canvas (.pdf, .docx, or .xlsx formats will be accepted). Solutions will be provided on the days the assignment are due. Therefore, no late homework can be accepted. Given the size of the class and the available resources, 30–50% of the homework problems may be selected at random and graded thoroughly. The 2 lowest scores (by percentage) will be dropped from the final homework score. You should start working on the homework early so that you have time to ask questions in class, during discussion sections, and during office hours before the due date. Please feel free to work in groups, or to ask for help from fellow students or the instructor. Each student must submit **his/her own work** unless otherwise stated. To earn credit on assignments, you must **show your work**, i.e., writing an answer, even if correct, is not sufficient.

   The assignments may have some in-depth problems that will be labeled "Extra Credit". These problems are not required for the course but thorough solutions may be rewarded with extra credit.

2. Two case-studies (15% each). The case studies are meant to give the students experience addressing problems that are richer (in scale and scope) than textbook problems. At their core, the case studies will involve formulating quantitative models for the problems, using software to solve them, and making recommendations. A short report will be submitted for each case study. The report will give the students an opportunity to discuss issues that may not be captured in the models. Students will have 2–3 weeks to complete the case studies. Specific instructions will be provided along with the first case study. Students are highly encouraged to work in groups of 4–5 (one report per group).

3. Two in-class exams (25% each). The exams will be designed to test your understanding of the material presented in class and in the homework assignments. The first exam is scheduled **3:30–4:50 on Tuesday, October 30**. The second exam is scheduled **3:30–4:50 on Thursday, December 6**.

   Special arrangements for the exams must be discussed with the instructor at least two weeks prior to the exam's scheduled date. Travel arrangements are not sufficient to warrant special accommodations. Following guidelines provided AccessibleNU, any student requesting accommodations related to a disability or other condition is required to register with AccessibleNU (accessiblenu@northwestern.edu; 847-467-5530) and provide professors with an accommodation notification from AccessibleNU, preferably within the first two weeks of class. All information will remain confidential.