

CIVENV 205 – ECONOMICS AND FINANCE FOR ENGINEERS  
Fall 2017

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<b>Class Times and Locations:</b>	Tuesday and Thursday 4:00–5:20 (Tech M345)
<b>Class Website:</b>	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.

## INTENDED AUDIENCE

The intended audience for this course consists of undergraduate students in Engineering and Sciences. 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;
- Allow the 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), probability, and statistics (CEE 306, IEMS 202, or IEMS 303) may be useful but not necessary. Familiarity with Microsoft Excel will also be helpful.

## MATERIALS

The required textbook for the class is D. G. Newnan, J. P. Lavelle, and T. G. Eschenbach (2017), *Engineering Economic Analysis*, 13th Edition.<sup>1</sup>

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.

## 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 material includes:

<b>Topic</b>	<b>Approximate Duration</b>
<i>Financial Evaluation &amp; Selection</i> Cash-flow evaluation Project selection Sensitivity analysis Depreciation and taxes Fixed-income securities	5 weeks
<i>Evaluation &amp; Selection under uncertainty</i> Decision trees & value of information Dynamic Programming: resource allocation & replacement Real-options analysis	4 weeks
<i>Discount Rate Selection</i>	1 week

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

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<sup>1</sup>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.

## REQUIREMENTS AND ASSESSMENT

1. Homework assignments (25%). 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 occasionally, you may scan your homework and submit it by the start of class via email to [pdc@northwestern.edu](mailto:pdc@northwestern.edu). Solutions will be provided on the days the assignment are due. Therefore, no late homework can be accepted. Approximately half of the homework problems will 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 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. Case-studies and Writing Assignments (25%). There will be two case studies and a short writing assignment. 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 3 (one report per group). The writing assignment will be similar to the case studies, except that rather than solving a specific problem, students will be asked to provide a critical assessment of a set of readings.

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 midterm exam is scheduled **during class, i.e., 4:00–5:20, on Thursday, October 19**. Following the schedule produced by NU’s Office of the Registrar, the final exam is scheduled **7:00–9:00 PM on Tuesday, December 5**.

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.