DEPARTMENT OF
Civil and
Environmental Engineering
UNIVERSITY OF WISCONSIN–MADISON

1. **COURSE NAME AND NUMBER**

   CEE 494 Civil and Environmental Engineering Decision Making

2. **CREDITS AND CONTACT HOURS**

   3 credits, 3 contact hours

3. **CANVAS COURSE URL**

   https://canvas.wisc.edu/courses/156534

4. **COURSE DESIGNATIONS AND ATTRIBUTES**

   This course carries the graduate course attribute.

5. **MEETING TIME AND LOCATION**

   Monday and Wednesday, 2:30-3:45pm

   Engineering Hall, Room 2535

6. **INDICATE WHETHER THE COURSE IS REQUIRED, ELECTIVE, OR SELECTED ELECTIVE (IF YOU DO NOT KNOW, CHECK WITH YOUR ABET PROGRAM REPRESENTATIVE).**

   This course is required for Civil and Environmental Engineering students who entered the program during or after the Spring 2017 semester. It is an elective for all other students.

7. **INSTRUCTIONAL MODE**

   Face-to-face

8. **SPECIFY HOW CREDIT HOURS ARE MET BY THE COURSE**

   Traditional Carnegie Definition – One hour (i.e. 50 minutes) of classroom or direct faculty/instructor instruction and a minimum of two hours of out of class student work each week over approximately 15 weeks, or an equivalent amount of engagement over a different number of weeks.

9. **INSTRUCTORS AND TEACHING ASSISTANTS**

   a. **Instructor Title and Name**

      Paul Block, Associate Professor

   b. **Instructor Availability**

      Office hours are Mondays 3:45-5:00pm and by appointment

   c. **Instructor Email/Preferred Contact**

      paul.block@wisc.edu

10. OFFICIAL COURSE DESCRIPTION

Planning, designing, and managing civil engineering systems. Fundamentals of the systems approach; marginal analysis; optimization techniques; decision analysis; economic analysis; cost-effectiveness analysis. Case study applications.

11. REQUISITES

Math 221 or consent of instructor

12. LEARNING OUTCOMES

a. Course Learning Outcomes

By the conclusion of the course, students should be able to:

i. characterize planning, design, and management objectives in civil systems
ii. understand and apply the fundamentals of engineering economics
iii. understand optimization concepts and modeling
iv. formulate, design, and solve linear optimization models
v. understand and apply scheduling and critical paths methods
vi. understand decision theory, methods, and criteria

Additionally, graduate students should also be able to:

i. apply tools and methods to research analysis

b. ABET Student Outcomes

In this course, students will attain:

a) Ability to apply knowledge of mathematics, science, and engineering
c) Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
e) Ability to identify, formulate, and solve engineering problems
g) Ability to communicate effectively
h) Broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
j) Knowledge of contemporary issues
k) Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

13. BRIEF LIST OF TOPICS TO BE COVERED

- Engineering Economics
- Linear Systems Optimization
- Scheduling and Critical Path
- Non-Monetary Valuation
- Decision Theory, Methods, and Criteria

14. DISCUSSION SESSIONS

Not applicable

15. LABORATORY SESSIONS

Not applicable

16. REQUIRED TEXTBOOK, SOFTWARE & OTHER COURSE MATERIALS

Required: Civil and Environmental Systems Engineering (2nd Edition), Revelle and Whitlatch, ISBN: 0130478229

Optional: Practical Optimization: A Gentle Introduction, Chinneck. Free online at: http://www.sce.carleton.ca/faculty/chinneck/po.html

17. GRADING

Assessment Criteria -Undergraduate

Homework:	10%
Quizzes:	15%
Exams (2):	30%
Project:	15%
Participation:	10%
Final Exam:	20%

Graduate

Homework:	10%
Quizzes:	15%
Exams (2):	20%
Project:	25%
Participation:	10%
Final Exam:	20%

Expected Grade Breaks:

A: 100-92%	AB: 92-88%	
B: 88-82%	BC: 82-78%	
C: 78-70%	D: 70-60%	F: < 60%

18. EXAMS, QUIZZES, PAPERS & OTHER MAJOR GRADED WORK

Undergraduate Student Project

Each undergraduate student will complete a project related to environmental disasters and decision making, selecting from the provided list on Canvas (or an alternative disaster with approval.) The project will consist of literature review producing a 2500-3000 word paper (1-inch margins, 12 point Times New Roman font, submitted electronically as a pdf) addressing the following topics (which may be used as headings): Summary of Disaster, Influence of Disaster on Engineering Practice, and How the Disaster Could Have Been Prevented as it Applies to Civil and Environmental Engineering Decision Making. Sources should be appropriately cited using APA citation style and a Reference section included (not counted in word range.) Topic selection is due Week 4, and the final paper is due Week 9.

Graduate Student Project

Each graduate student will complete a project applying some of the tools and methods presented in the course to their graduate research. The final paper must be formatted in manuscript style,

containing the following sections: Abstract, Introduction/Background, Methods, Results, Discussion, Conclusion, and References. The paper should be 10-pages in length (single spaced, 1-inch margins, 12 point Times New Roman font, submitted electronically as a pdf.) Figures or tables can add to this length, appropriately. The target journal should be indicated, although citations should be in APA citation style. Topic selection is due Week 4, and the final paper is due Week 15.

Exams
Three exams will be given during the semester: two midterms and a cumulative final exam.

Quizzes
Quizzes will be administered weekly through the course site in Canvas, typically available on Wednesday and due on Friday (11:59pm). The quiz will consist of questions related to lecture topics and homework problems. You may not collaborate or discuss quiz questions with others in the course; you may confer with the professor.

19. HOMEWORK & OTHER ASSIGNMENTS

Homework Assignments
Homework will typically be assigned each Wednesday and due the following Wednesday at the start of class. Homework will be submitted through Canvas or in hardcopy, as specified. Late assignments will receive an automatic 20% reduction for each day late. Hardcopy submissions *must* be neat and well-organized. You may confer with other students, however submissions should be uniquely your own.

Participation
Participation at all lectures is required; if you will not be able to attend lecture, please email me in advance as a courtesy. In-class questions and surveys will be administered occasionally to gauge understanding of material or opinions on topics. These will be administered digitally using the Canvas learning management system. You will not be able to make up missed surveys; grading will be based on participation.

20. OTHER COURSE INFORMATION

- Lecture power-points will be posted to the course website in advance of each session.
- The following is the expected week by week schedule:

Week	*Date*	*Topic*	*Reading Chp*	*Assignment*
1	Sep 4	Introduction to Systems	1	
2	Sep 9, 11	Decision-making and Problem Solving	2, handout	
3	Sep 16, 18	Engr Econ: interest, discounting, and equivalence	14	
4	Sep 23, 25	Engr Econ: benefit-cost ratios, alternatives	15	**Project Topic (Sep 25)**
5	Sep 30, Oct 2	Engr Econ: depreciation; Optimization Concepts	16, handout	
6	Oct 7, 9	Linear Systems and Programming	3	**Exam 1 (Oct 9)**
7	Oct 14, 16	Linear Systems and Programming	5	
8	Oct 21, 23	Linear Systems and Programming	6	
9	Oct 28, 30	Non-Linear and Dynamic Programming; Marginal Analysis	13	**UG Project (Oct 30)**
10	Nov 4, 6	Scheduling and Critical Path Method	8	
11	Nov 11, 13	Decision Theory: trees & probability	9	
12	Nov 18, 20	Decision Theory: selection criteria, performance metrics, , MCDA	9, handout	**Exam 2 (Nov 18)**
13	Nov 25	Decision Theory: utility, game theory, heuristics	9, handout	
14	Dec 2, 4	Uncertainty, Risk, Reliability	handout	
15	Dec 9, 11	Applications and Case Studies	handout	
--	Dec 13	**Final Exam**, 10:05a-12:05p		**G Project (Dec 16)**

21. RULES, RIGHTS & RESPONSIBILITIES

See the Guide's to Rules, Rights and Responsibilities

22. ACADEMIC INTEGRITY

By enrolling in this course, each student assumes the responsibilities of an active participant in UW-Madison's community of scholars in which everyone's academic work and behavior are held to the highest academic integrity standards. Academic misconduct compromises the integrity of the university. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these acts are examples of academic misconduct, which can result in disciplinary action. This includes but is not limited to failure on the assignment/course, disciplinary probation, or suspension. Substantial or repeated cases of misconduct will be forwarded to the Office of Student Conduct & Community Standards for additional review. For more information, refer to https://conduct.students.wisc.edu/academic-integrity/.

23. ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

McBurney Disability Resource Center syllabus statement: "The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty [me] of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty [I], will work either directly with the student [you] or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA."

http://mcburney.wisc.edu/facstaffother/faculty/syllabus.php

24. DIVERSITY & INCLUSION

Institutional statement on diversity: "Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals.

The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world." https://diversity.wisc.edu/

The instructor reserves the right to modify this syllabus as circumstances warrant.