

CEE 2090 Civil and Environmental Engineering Systems

Credits and Contact Hours

(3-0-0-3) 3 hours of lecture per week, 3 credit hours

Instructor

Dr. Joe Manous, PE, BC.WRE

Textbook and Materials

Assigned course readings and course website.

Blank, L., and A. Tarquin. *Engineering Economy*. 8th ed. McGraw-Hill Education, 2018.

Labi, S. *Introduction to Civil Engineering Systems: A Systems Perspective to the Development of Civil Engineering Facilities*. J. Wiley & Sons, 2014.

Catalog Description

Infrastructure viewed from a systems perspective; planning, analytical and evaluation approaches for civil- and environmental-engineered facilities; sustainability - engineering economy; environmental and social quality of life considerations.

Prerequisites

MATH 1551 Differential Calculus and CEE 1090 Exploring CEE

Course Outcomes

Outcome 1: The student will demonstrate an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science and math.

Outcome 2: The student will demonstrate an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety and welfare, as well as global, cultural, social, environmental, and economic factors.

Outcome 3: The student will demonstrate an ability to communicate effectively with a range of audiences.

Outcome 4: The student will demonstrate an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

Outcome 5: The student will demonstrate an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

Outcome 6: The student will demonstrate an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Outcome 7: The student will demonstrate an ability to apply these concepts and skills in a term project evaluating a large-scale infrastructure system, and make recommendations to improve the system performance sustainably while demonstrating the application of research, collaboration, and professional communication skills.

Topics Covered

- Concepts of Sustainability: Current and Future; Civil Engineering Ethics.
- Introduction to Civil & Environmental Engineering Systems.
- Sustainable Development Models, Tools and Applications in Civil and Environmental Engineering.
- Introduction to Multiple Criteria Decision Making (MCDM) Analysis for Monitoring Sustainable Development Goals.
- Introduction to Infrastructure Asset Management.
- Introduction to Environmental Impact Analysis, Environmental Justice Analysis.
- Team Effectiveness Development.
- Engineering Communication – Written, Visual, and Oral.
- Community Engagement.
- Mathematical Optimization: Algebraic Optimization, Linear and Integer Programming.
- Incorporating Uncertainty in Systems Analysis: Probability Theory, Queuing Analysis and Simulation.
- Engineering Economic Analysis and Project Evaluation, including Time Value of Money, Present Worth Analysis, Equivalent Uniform Annual Worth, Perpetuity Calculations, Effective Interest Rates, Arithmetic Gradients, and Geometric Gradients.
- Project Evaluation: Net Present Worth Analysis, Benefit/Cost Analysis, Internal Rate of Return Analysis.
- Inflation.

- Depreciation.
- Multi-attribute Decision Making (MADM): Application to Evaluating Large-Scale Infrastructure Systems.
- Application of Excel Functions for Engineering Economic Analysis.
- Use of generative AI within the course topics.