**Department:** Civil  
**Number:** CE 6306  
**Title:** Infrastructure Engineering

**Catalog Description:** A hands-on course that provides information about the basic concepts of deterioration engineering, material science, testing and evaluation, project evaluation and planning and construction management and environmental impact.

**Prerequisites:** CE 4340.


**Objectives:** This graduate course is designed to complement and extend upon the course materials delivered in the CE 6301 Infrastructure Management, with a particular emphasis on the introduction of system engineering concept and advanced methodologies that are essential for modeling and solving common civil infrastructure design, management, and decision-making problems.

The primary objective of this course is to equip graduate students with skills to:

- Engage thinking of civil infrastructure from a system engineering and system dynamics perspective (1,2).
- Understand normative and descriptive decisions related to various phases of civil infrastructure life cycle (1,2).
- Describe infrastructure engineering (in all disciplines) design problems, in terms of decision, objectives and constraints that can be applied to areas such as water resource planning, structure design, transportation systems design and operation, solid/hazardous waste management, construction management, geotechnical design, etc (1,2).
- Systematically characterize the problem, if necessary, and formulate the decision, objectives and constraints in mathematical terms. (1)
- Select appropriate mathematical tools (in both optimization and econometrics) to solve the defined problem (most likely by computer). (1,2)
- Interpret the solution and perform sensitivity analysis. (1)
- Become comfortable with the use of computer by working on computer-based design project that will require the use of spreadsheet, math programming software and programming language for one or several assignments and term project. (1,2)
- Be able to work in a team in several assignments including delivering a professional presentation on a specific topic related to the course subjects (3,4)

**Topics covered**
- Infrastructure systems engineering concepts and framework
  - System engineering processes
  - System design requirements and design methods
  - Design review and evaluation

Comment [YC1]: This is my thinking. No sure if we need to go with the catalogue or not.
- System engineering program planning
  Modeling of civil infrastructure systems design and management (applications in various areas included)
- Basic concept of optimization
- Linear programming (with modeling techniques)
- Non-linear programming (with modeling techniques)
- Heuristics
  Decision making in civil infrastructure systems design and management (applications in various areas included)
- Overview of probability and statistics
- Introduction of utility theory
- Decision tree analysis
- Multi-attribute decision making
- Multi-objective decision making

Class/Laboratory Schedule

Class: MW 7:30-8:50 PM

Contribution of course to meeting the professional component: This course is a major contributor in exposing the students to profession of transportation engineering

Prepared by: Dr. Yi-Chang Chiu
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