1. *Course number and name*

**ENGR 829: Advanced Topics in Structural Engineering**

1. *Credits and contact hours*

3 credit hours; one 2-hr-45-minute lecture/week

1. *Instructor’s or course coordinator’s name*

Instructor: Jenna Wong, Associate Professor of Civil Engineering

Course coordinator: Jenna Wong, Associate Professor of Civil Engineering

1. *Text book, title, author, and year*

None

*Recommended Resources:*

ASCE 7 Standard

Building for the Future: Durable, Sustainable, Resilient

ISBN: 978-3-031-32513-7

1. *Specific course information*
2. *brief description of the content of the course (catalog description)*

Theory of structures in historic perspective. Advanced structural analysis (matrix methods). Nonlinear theories and post-buckling. Introduction to structural stability. Introduction to nonlinear analysis and performance-based design. Concepts and application of Finite Element Analysis.

1. *prerequisites or co-requisites*

Restricted to graduate Civil Engineering students or permission of the instructor.

1. *indicate whether a required, elective, or selected elective course in the program*

Elective Course for Civil Engineering.

1. *Specific goals for the course*
2. *Specific outcomes of instruction.*

* Student can define structural resilience.
* Student is aware of the design guidelines and standards associated with performance-based design.
* Student is aware of community’s perspective of structural resilience and its impact on the engineering practice.
* Student is aware of ASCE Standard 7.
* Student is aware of the development of sustainability in various perspectives.
* Student is able to define new features to materials and structural designs that are influenced by sustainable goals.
* Student is able to present material related to the use of a new or rediscovered sustainable material and evaluate its potential for being a practical modern construction material.
* Student can define an expected building performance level based on ground motion frequency.
* Student can define the mean return period for various earthquake hazard levels.
* Student is aware of the significance of nonstructural damage and its impact on structural resilience.
* Student can conduct a nonlinear time history analysis using industry common analysis software (i.e., SAP2000, ETABS).
* Student can interpret raw data and post-process data from analysis software as well provide informed commentary on what these results suggest regarding the expected structural and/or nonstructural performance.

1. *explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.*

ABET Student Outcome(s): 1, 3, 4, 6, 7

1. *Brief list of topics to be covered*

* Introduction to and Motivation for Sustainable Structural Resilience
* Performance Based Design
* Traditional Structural Resilience
* Nonstructural Damage
* Traditional to Sustainable Structural Resilience Transition
* Data Post-Processing and Handling
* Development of Modern-Day Sustainability
* Sustainable Systems
* New and Rediscovered Sustainable Materials
* Future of Sustainable Structural Resilience