1. *Course number and name*

**ENGR 827: Structural Design for Fire Safety**

1. *Credits and contact hours*

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

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

Instructor: Cheng Chen, Professor of Civil Engineering

Course coordinator: Cheng Chen, Professor of Civil Engineering

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

A. H. Buchanan and Anthony Kwabena Abu, Structural Design for Fire Safety, John Wiley, 2017.

*Recommended Resources:*

Jean-Marc Franssen, V. Kodur and R. Zaharia, Designing Steel Structures for Fire Safety, CRC Press, 2009.

J. I. Lataille, Fire Protection Engineering in Building Design, Butterworth-Heinneman, 2003.

John A. Purkiss, Fire Safety Engineering Design of Structures (2nd Ed.), Elsevier, 2007.

D.L. Parkinson and V. Kodur, Performance-Based Design of Structural Steel for Fire Conditions, ASCE, 2009.

R.G. Grewain et al., Facts for Steel Buildings: Fire. AISC, 2003.

Steel Construction Institute, Fire Safe Design: A New Approach to Multi-Story Steel Framed Buildings, 2000.

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

Standard fire time-temperature curve and its limitations, properties of concrete, steel and fire protection materials at elevated temperature; load capacity of structural components under fire; fire resistance design of steel, composite, concrete and timber structures.

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 understands fundamentals of fire dynamics.
* Student understands performance-based fire structural design.
* Student understands properties of construction material (such as concrete and steel) under elevated temperatures.
* Student can conduct basic fire structural design of steel and concrete elements.
* Student understand fire protection material, the code requirement and the corresponding application in building structural design
* Student understands the seismic behavior of fire damaged structural components and systesm.
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, 2, 3, 6, 7

1. *Brief list of topics to be covered*
* Overview of Fire Structural Engineering
* Fundamentals of Fire Dynamics
* Introduction to Existing Codes for Fire Structural Design
* Properties of Concrete under Elevated Temperatures
* Introduction to Fire Structural Design of Concrete Elements
* Properties of Steel under Elevated Temperature
* Introduction to Fire Structural Design of Steel Elements
* Introduction to Fire Structural Design of Composite Elements
* Fire Protection Material; Code Requirement; and Application in Building Structural Design
* Post-Earthquake Fire
* Seismic Behavior of Fire Damaged Structural Components and Systems
* Performance-Based Fire Structural Design