

ENFP405 Structural Fire Protection

Credits: three credits, two 75-minute lectures weekly

Instructor: James Milke

Textbook:

- Buchanan, A., Structural Design for Fire Safety, NY, John Wiley, 2001.
- SFPE Handbook of Fire Protection Engineering, 5th Edition, M. Hurley (ed), New York: Springer, 2015.
- ASCE/SFPE 29, Standard Calculation Methods for Structural Fire Protection, Reston, VA, ASCE, 2005.

Specific course information:

1. Catalog Description: Structural integrity and compartmentation are principal aspects of fire safety in buildings. This course addresses the effects of fire on materials used in construction assemblies. Characteristics and limitations of standard fire resistance tests are reviewed along with empirical guidelines and correlations from the standard tests. Heat transfer and mechanics-based analyses are applied to evaluate the fire resistance of construction assemblies.
2. Prerequisites: ENES220
3. Required Course

Specific goals for the course:

1. Upon completion of this course the students should be able to:
 - Understand the impact of fire exposure on the materials used in construction assemblies.
 - Relate the importance and role of principal characteristics of construction assemblies on the fire resistance of the assembly.
 - Develop the intended understanding by reviewing data from past experimental programs, applying engineering principles from mechanics and heat transfer and conducting an elementary experiment.
2. This course focuses on two SOs:
 - SO2 - An ability to apply knowledge of mathematics, science, and engineering.
 - SO10 - A knowledge of contemporary issues.

Brief list of topics:

- Fire Endurance Requirements for Construction Assemblies:
- Fire Endurance Tests: building construction assemblies, protection of wall openings, overview of standard test methods, performance criteria, and non-standard evaluations
- Review of Mechanics: applied loads, load combinations, beam analysis, stability/buckling analysis
- Evaluating the Fire Resistance of Timber Structural Elements: material properties, effect of fire exposure, glue-laminated members, and critical char depth

- Evaluating the Fire Resistance of Steel Structural Elements: material properties, empirical correlations for columns, beams and trusses, thermal response, mechanics-based approach, response of structural frames
- Evaluating the Fire Resistance of Concrete & Masonry Assemblies: material properties, empirical correlations, thermal analysis via graphs/tables, moment-bearing capacity analysis
- Light-frame walls