ENFP405 Structural Fire Protection

Credits: Three (3)

Contact hours: Two lectures per week, 75 minutes each.

Table 5-1 category: Engineering topic with significant design component

Instructor: Ni

Textbook: Buchanan, A., Structural Design for Fire Safety, NY, John Wiley, 2001.
Other supplemental materials:
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

Catalog description:
Effects of elevated temperature on structural materials; steel, concrete, wood, gypsum, glass and reinforced plastics. Experimental evaluation of fire resistance of building assemblies. Analytical methods to evaluate fire resistance of structural members.

Prerequisites and Corequisites:
Prerequisite: ENES220. Restriction: Must be in Engineering: Fire Protection program; and permission of ENGR-Fire Protection Engineering department.

Credit only granted for: ENFP405 or ENFP621.

Table 5-1 Course Type: Required

Specific outcomes of instruction:
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.

Student outcomes assessed: SO1, SO2.4, SO6.3

Brief list of topics covered:
- 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

- Thermal actions: nominal fire curves and physics-based fire models (parametric fire model and localized fire models)
- 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