

CIV 414 - Advanced Construction Materials

Current Catalog Description: This course is targeted at senior undergraduate or graduate students in civil engineering specializing in structural materials. Students from material science engineering or mechanical engineering may also take this course. This course introduces emerging structural materials in construction which includes high performance concrete, fiber-reinforced polymers, calcium sulfoaluminate cement, and high performance steel.

Prerequisite: CIV 340 or MEC 317 or ESM 335

Corequisite: None

Textbooks and/or Other Required Material: Required Texts:
Mamlouk, M.S., and Zaniewski, J.P., “Materials for Civil and Construction Engineers,” Pearson, 2016.

This course is: Not Required;
Technical Elective Option

- Topics Covered:**
1. Materials Science Concepts
 2. Fundamentals of Metallic Materials
 3. Steel Production and Steel Alloys
 4. Structural Steel
 5. Natural Aggregates, Portland Cement and Admixtures
 6. Portland Cement Concrete
 7. High-performance Concrete
 8. Hot-mix Asphalt Concrete
 9. Wood
 10. Fiber-reinforced Polymer Composites

Course Learning Objectives:

Understand the basic molecular composition of materials
Understand the basic constitutive response of materials and the determination of engineering properties
Understand the composition of metals and metal alloys
Understand the properties of structural steel
Compute various aggregate physical properties
Describe Portland Cement/Concrete constituents and hydration chemistry
Design Portland Cement Concrete mixture design under given design constraints
Compute Portland Cement fresh and hardened properties
Design hot mix asphalt concrete mixture design under given design constraints
Describe the nature of wood as a structural material
Understand the composition of fiber-reinforced polymer composites
Compute the effective engineering properties of fiber-reinforced polymers
Describe the role of materials in increasing sustainability of civil infrastructure

Prepared by: Rigoberto Burgueño (2019) and Marija Krstic (2020)