

**1. Course Number and Name:** SE 2: Structural Materials

**2. Credit and Contact Hours:**

Class: a total of 3 hours of class-room instruction per week

Laboratory: a total of 1 hour per week.

**3. Instructor:** Yu Qiao

**4. Textbook:** Foundations of Materials Science and Engineering, William F. Smith and Javed Hashemi. 4<sup>th</sup> Edition, McGraw Hill.

**5. Specific Course Information:**

- a. **Catalog Description:** Structure of engineering materials (metals, ceramics, concrete, composites) tailored to produce desired properties and response in structural components and systems. Mechanical tests, elasticity, plastic deformation, fracture, toughness, creep and fatigue. Selection based on performance requirements/applications.
- b. **Prerequisites:** Chem 6A, Phys 2A
- c. **Required Course**

**6. Specific Goals for the Course:**

*Letters in parentheses relate to the department's student outcomes*

- To provide a general introduction to classes of structural materials, their performance attributes, and structural response under common load regimes (a,b).
- To provide a thorough understanding of the basic principles of materials selection as required in a variety of applications (a,b).
- To teach students to identify design/service requirements and how to relate those needs to engineering performance attributes and hence to the selection of appropriate materials (a,b,d)

**7. List of Topics to be Covered:**

- Motivation and need for differentiation and selection
- Classes of materials and basic differences
- Atomic Bonding and structure
- Defects and Imperfections
- Mechanical properties and failure
- Selection based on strength and stiffness
- Selection based on fatigue and/or toughness
- Selection based on creep
- Selection based on service temperature
- Selection based on durability
- Design characteristics, safety factors, design responsibility
- Materials selection case studies

**Person Who Prepared This Description and Date of Preparation**

Yu Qiao 9/5/2012