1. MME 2303 Introduction to Materials Science and Engineering

2. 3 Credits and 6 contact hours

3. Shalayna Smith – Fall 2018, Darren Cone – Spring 2019

4. Materials Science & Engineering: An Introduction, 10th Edition, Callister, 2018

5. Specific course information
    a. An introduction to the properties of engineering materials and their relationships to structure, behavior, and processing; materials testing and measurement of properties. Selection of materials for engineering applications considering the interrelationships between structure, properties, processing and performance.
    b. CHEM 1305 with a grade of "C" or better
    c. Required course in the program

6. Specific goals for the course
    a. Learning Outcomes
        - Relate crystalline structures and imperfections to material properties.
        - Summarize fundamental diffusion concepts.
        - Identify the mechanical test that can be used to measure important physical and mechanical properties of industrial materials.
        - Understand the mechanics of the various failure modes (fracture, fatigue and creep).
        - Identify design principles that may be employed to prevent in-service failures.
        - Understand how processing techniques (solidification, plastic deformation and heat treatment) affect material properties.
        - Interpret isomorphous, eutectic and binary phase diagrams.
        - Examine the Fe-C phase diagram and equilibrium structures.
        - Explain the fundamentals of phase transformation with particular emphasis on the Fe-C microstructures.
    b. Student Outcomes
        - Outcome 1: an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
        - Outcome 3: an ability to communicate effectively with a range of audiences
        - Outcome 4: an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
        - Outcome 6: an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
        - Outcome 7: an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

7. Brief list of topics to be covered:
    - Atomic Bonding
    - Crystalline Structures
    - Materials Paradigm
    - Diffusion
    - Solidification
    - Mechanical Testing and Mechanical Properties
    - Physical Properties
    - Failure Mechanisms