COURSE NUMBER: Vm382	**COURSE TITLE:** Mechanical Behavior of Materials
CREDIT: 4	**PREREQUISITES:** Vm382
TEXTBOOKS/REQUIRED MATERIAL: "Mechanical Behavior of Materials," Norman A. Dowling	**PREPARED BY:** Shane Johnson **DATE OF PREPARATION:** Nov. 4, 2012 **DATE OF UC APPROVAL:** Oct. 30, 2013
INSTRUCTOR(S): Shane Johnson	**SCIENCE/DESIGN:** n/a
CATALOG DESCRIPTION: Material microstructures, dislocations and defects; processing and mechanical properties of metals, polymers, and composites; heat treatment of metals; elastic, plastic, and viscoelastic behavior of materials, strain hardening; fracture, fracture mechanics, fatigue and multi-axis loading; creep and stress relaxation; materials-related design issues, materials selection, corrosion and environmental degradation of materials.	**COURSE TOPICS:** 1. Mechanical properties & basic testing, material selection 2. Metals, ceramics, polymers, and composites (microstructure, modeling, temperature dependence, & flaws) 3. Combined loadings & stress transformations 4. Failure theories & materials-related design & material selection 5. Fracture Mechanics 6. Fatigue Behavior 7. Creep
COURSE STRUCTURE/SCHEDULE: Lecture: twice per week, 90 minutes each	

COURSE OBJECTIVES [Course Outcomes in brackets]	1. To provide the knowledge and experience necessary to select materials for structural designs, and understand microstructure to improve material properties. [1-3,5-7] 2. To provide the knowledge and experience in modeling failure by strength analysis and fracture analysis for different classes of materials for fatigue, creep, temperature and multi-axial loadings. [2, 7-10] 3. To provide the technical language necessary to design and solve problems with different classes of engineering materials. [4]
COURSE OUTCOMES [Program Outcomes in brackets]	After completing Vm382, students should be able to: 1. Relate atomic structure and microstructure to strength and ductility in engineered components [a] 2. Analyze metals, ceramics, polymers, and composites with elastic, plastic, and viscoelastic models [a, e] 3. Analyze material property test methods including axial, torsion, and bending [a, e] 4. Communicate effectively about materials, applications for materials, and testing sensors needed for material property testing [g] 5. Select materials based on strength, stiffness, ductility, toughness, thermal behavior, and multi-axial loadings [a] 6. Perform stress transformations and calculate principal stresses[a] 7. Analyze failure of materials using different models for brittle and ductile materials [a] 8. Model creep and viscoelastic behavior [a, e] 9. Predict crack growth in metals using fracture mechanics [a, e] 10. Predict fatigue life due to known cyclic loadings in metals [a, e]
ASSESSMENT TOOLS [Course Outcomes in brackets]	Homework [1-10] Midterm [1-6] Final Exam [1-10] Oral Presentation, Power Point and Peer evaluations [4]