ESG 335 STRENGTH OF MATERIALS (REQUIRED)

Credit: 3

COURSE DESCRIPTION:
This course develops a fundamental understanding of the mechanical behavior of materials. Basic concepts in materials and mechanics such as defect structures, elasticity, plasticity and fracture are introduced and particular emphasis is placed on the materials and mechanics issues associated with fatigue and high temperature deformation of materials. Total life and damage tolerant approaches to fatigue are invoked to understand fatigue crack initiation, fatigue crack propagation and micro-mechanisms of fatigue damage. Advanced topics include smart materials.

PRE/CO- REQUISITE(S):
AMS 261 Applied Calculus III or MAT203 Calculus III with Applications; ESG 302 Thermodynamics.

TEXT(S) OR OTHER REQUIRED MATERIAL: R. E. Reed-Hill and R. Abbaschian – Physical Metallurgy Principles, Third Edition, Thomas Engineering, 1991. T. L. Anderson, Fracture Mechanics – Fundamentals and Applications, Second Edition, CRC Press, 1995. N. Dowling, Mechanical Behavior of Materials, Second Edition, Prentice Hall, 1999. S. Suresh, Fatigue of Materials, Second Edition, Cambridge University Press, 2003. W. D. Callister, Jr., Materials Science and Engineering – An Introduction, Sixth Edition, John Wiley and Sons, 2003.

COURSE LEARNING OUTCOMES	SOS	ASSESSMENT TOOLS
Obtain familiarity with basic concepts of materials science, continuum mechanics and fracture mechanics.	a, e, f, j	Evaluation of exam questions
Understand basic mechanisms of cyclic deformation and high temperature deformation in solids.	a, e, h, i	Evaluation of exam questions
Identify fatigue crack initiation and damage progression processes.	a, e, h, i	Evaluation of exam questions
Develop quantitative methods for life prediction using damage tolerant approach to fatigue crack propagation.	a, e, h, k	Evaluation of home work assignments

COURSE TOPICS:
- Materials Science
- Continuum Mechanics
- Fracture Mechanics
- Cyclic Deformation in Solids
- Fatigue Crack Initiation
- Total Life Approach

- Damage Tolerant Approach
- Smart Materials

CURRICULUM

This course contributes 4 credit hours toward meeting the required 48 hours of engineering topics.

STUDENT OUTCOMES (SCALE 1-3):

A	B	C	D	E	F	G	H	I	J	K
2				2	2		2	2	2	2

3 – Strongly supported **2 – Supported** **1- Minimally supported**

LEAD COORDINATOR(S) WHO PREPARED THIS DESCRIPTION AND DATE OF PREPARATION

T. A. Venkatesh, 05/16/10.