ESM 450 ENGINEERING SYSTEMS LABORATORY (REQUIRED)

Credit: 3

COURSE CATALOG DESCRIPTION:

A systems approach will be undertaken to understand the fundamental properties of materials and their implications on engineering design and applications. Advanced gas turbine engine used in energy and propulsion serves as the main testbed for this laboratory class. The system drives requirements in design, materials and processes which are linked together through the class activities, presentation and laboratory. Results from the various laboratories are analyzed in the context of real-world system construction, operation and reliability.

PRE- OR COREQUISITE(S): OLD: ESG 332, ESM 335； NEW: ESG 332, ESM 335 except for BE/MS students who take ESM

TEXT(S) OR OTHER REQUIRED MATERIAL: None required. Students are urged to review information on the internet regarding gas turbine engines. Reference text books relating gas turbines is optional.

The technical content of the laboratory is available through the ESG332 text book.

COURSE LEARNING OUTCOMES	SOS	ASSESSMENT TOOLS
1. Develop an understanding of how complex engineering systems are integrated and the role of materials and design in the selection and assembly of components	c,k, h, j	Presentations, reports and Exams
2. Work in teams to synthesize system data from disparate sources and integrate them into coherent presentations	d, e, g, j	Team presentations, reports
3. Participate in teams in laboratory centered learning of available materials evaluation tools and experiments that will provide a framework to define materials, component and system specifications	a, b, d,k	Group laboratory sessions, joint reports and presentations
4. Analyse results, prepare reports and connect the information gained from laboratory demonstrations to system integration	a, b, c, d, e, g	Laboratory reports, final presentations and exams
5. Explore implications of the experimental components on system performance, safety and reliability	H, I, j, k	Exams and final presentations
6. Learn to work in teams, develop presentations and reports	G, d, I, k	Laboratory activities

COURSE TOPICS

- Indentation methods of testing
- Tensile testing including discussion on fatigue and creep
- Differential thermal analysis
- Dilatometry
- Bilayer curvature analysis for thermostructural coatings
- Metallography
- Scanning Electron Microscopy
- X-ray Diffraction
- Materials processing via thermal spray deposition of coatings

CLASS/ LABORATORY SCHEDULE:

ESM	450	Engineering Systems Laboratory	LEC	1	W	2:20 PM	3:15 PM
			REC	R01	RECM	3:50 PM	4:45 PM
			LAB	L01	W	3:15 PM	6:15 PM

CURRICULUM

This course contributes 3 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	3	2		3	3	2	2	2

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

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

Sanjay Sampath, June 23, 2009