

SAGES Seminar – Spring 2008

“The Role of Materials Science in Emerging Technologies”

Tentative Syllabus

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Course Description:

The development of engineering applications is, and has historically been, closely related to the development of new engineering materials. In fact, specific civilizations and time periods in the past are classified by the materials used for engineering applications, e.g., the Bronze Age. This university seminar will examine the role of materials developments in the past, as well as explore the needs and impact of new materials in emerging technologies.

Justification:

Materials science and the development of new materials with specific properties play a critical role on the on the development of new technology, and new technology can have profound societal implications. Thus, the role of materials developments on emerging technologies should have a broad interest spanning many interdisciplinary subject matters.

Reading Material:

The reading assignments will be identified by the students by targeted searches using the facilities provided by the Kelvin Smith Library. An example of an additional reading assignment would be a recent article published in a professional journal, e.g., the MRS Bulletin.

References:

- 1) “Engineering in time – The systematics of Engineering History and its Contemporary Context,” A.A. Harms, B.W. Baetz, and R.R. Volti, Imperial College Press, London, UK (2004). ISBN: 1-86094-433-7.
- 2) Understanding Materials Science – History • Properties • Applications,” R.E. Hummel, Springer, New York, NY (1998). ISBN: 0-387-98303-1

Basic Course Outline:

The historical role of materials science and its impact on three areas of technology currently under development will be examined

Part 1: Historical Perspective (Individual paper)

Part 2: Power generation, transmission and storage (Group Presentation)

Part 3: Electronic devices and electronic applications (Group Pres.)

Part 4: Biomedical engineering and medical imaging applications (Group Pres.)

(Individual Paper on selected area from Parts 2-4)

During each of these four segments the students will work in small groups (2-3 students per group) and review different thrusts of materials development for specific applications in these broader areas of development.

Tentative Grading Criteria:

1: Historical Perspectives (Group Presentation 10% + citation page, Individual Papers and participation 15%)	25%
2: Power generation, transmission and storage (Group Presentation + citation page 10%, Class participation 5%)	15%
3: Electronic devices and electronic applications (Group Presentation 10% + citation page, Class participation 5%)	15%
4: Biomedical eng. and medical imaging appl. (Group Presentation 10% + citation page, Class participation 5%)	15%
Individual Research Papers	30%

A: 90-100; B: 80-90; C: 70-80; D: 60-70; and F: <70

Part 1: Historical Perspective: Groups of 2 (or 3) students will research the societal effects of different materials (e.g., Copper, Steel, Aluminum, Concrete, Plastics, Silicon, Glass, etc.).

- Week 1 (Jan 14, 16 and 18): Review of common reading material - Learning to use library resources on F 1/18.
- Week 2 (Jan 23 and 25): Selection of group research projects - discussion on F 1/25.
- Week 3 (Jan 28, 30 and Feb 1): Group/individual research - preparation of written document and presentation.
- Week 4 (Feb 4, 6 and 8): Group Presentations

Individual Short Papers due February 8

Part 2: The role of materials science in power generation, transmission and storage: Groups of 2 (or 3) students will research different material needs in emerging technologies

- Week 5 (Feb 11, 13 and 15): Review of common reading material - selection of group research projects - discussion on F 2/15.
- Week 6 (Feb 18, 20 and 22): Individual research - preparation of written document and presentation.
- Week 7 (Feb 25, 27 and 29): Group Presentations

Individual Short Papers due February 29

Part 3: The role of materials science in electronic devices and electronic

applications: Groups of 2 (or 3) students will research different material needs in emerging technologies

- Week 8 (March 3, 5 and 7): Review of common reading material - selection of group research projects - discussion on F 3/7.

Spring Break (March 10, 12 and 14) No Classes

- Week 9 (March 17, 19 and 21): Individual research - preparation of written document and presentation.
- Week 10 (March 24, 26 and 28): Group Presentations

Individual Short Papers due March 28

Part 4: The role of materials science in biomedical engineering and medical imaging

applications: Groups of 2 (or 3) students will research different material needs in emerging technologies

- Week 11 (March 31, April 2 and 4): Review of common reading material - selection of group research projects - discussion on F 4/4.
- Week 12 (April 7, 9 and 11): Individual research - preparation of written document and presentation.
- Week 13 (April 14, 16 and 18): Group Presentations

Individual Short Papers due April 18

Final Paper (and possibly Presentations):

Week 14 (April 21, 23 and 25): An independent study of one application identified during parts 2, 3, or 4 resulting in an 8-10 page individual research paper due on April 28.

Individual Research Papers due April 28