

**ESM 508:  
Impact of Materials on Environment  
Fall 2017**

Lectures: Wednesday 5:30-8:20 pm.  
Location: FREY HALL 105 WEST CAMP  
Office hours: Wednesday 2:00-3:00 pm by appointment, 216 Heavy Engineering.  
Instructor: Prof. Alexander Orlov

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**Synopsis:**

This course will focus on several concepts underlying the impact of materials on the environment and various methods of minimizing them. More specifically this course will explore the concepts of air and water pollution associated with product manufacturing, various concepts of hazardous materials impact on human health, few topics of sustainable developments and selected methods of contaminated water and air treatment. Additionally this course will addressing the issues of how to minimize the environmental pollution by product substitution and by decreasing the energy input into materials production. It will also give an overview of the concepts of green chemistry, green engineering and industrial ecology.

**Course project:**

Each student should submit a report on using the concepts discussed in the class. It should be focused on environmental effects of traditional and emerging technologies of materials production and use. A topic of the paper should be chosen in consultation with the course instructor. The project should include recommendations that promise to change the industrial processes and material use to the ones that are more sustainable.

**Grading:**

The course grade will be based on mid-term exam (40%), final project (30%) and homeworks (30%). Late homeworks and project submissions: 10% grade reduction for every day after deadline

**Class Schedule:**

Lectures will take place every Tuesday (5:30-8:20 pm)

**Textbook:**

Recommended for Materials Selection Part: Michael Ashby: Materials and the Environment: Eco-Informed Choice.

**Lectures:**

Week 2. Introduction.  
Week 3. Hazardous pollutants and environmental health.  
Week 4. Introductory concepts of thermodynamics in environmental chemistry  
Week 5. Introductory concepts of thermodynamics in environmental chemistry. Materials Degradation in the Environment.  
Week 6. Introduction to physicochemical principles for water treatment. Advanced topics in water treatment.  
Week 7. Introduction to air pollution control. Advanced topics in air pollution.  
Week 8. Introduction to solid waste treatment and disposal. Advanced topics in solid waste.  
Week 9. Recitation and exam.  
Week 10. Pollution prevention and industrial ecology. Materials Selection.  
Week 11. Industrial ecology and green chemistry.  
Week 12. Environmental nanotechnology. Energy and environment.  
Week 13. Class Presentations. Final project submission.