

**MSE 8803I / 4803I – IGERT - Fundamentals of Nanomaterials For Biomedicine & Energy Applications**  
**Instructional Center (IC) Bld; room 119** (note: lab demonstrations may initiate in different locations)

[Tu/Thu @ 4:30-6pm](#)

**Course Objective:** to provide graduate and undergraduate students of diverse backgrounds with a fundamental understanding of the scientific principles to design, characterization, modeling and applications of materials for Biomedical & Energy-Related Applications. Lab tours & demonstrations are the integral part of this course.

**Instructors:** Prof. Gleb Yushin ([yushin@gatech.edu](mailto:yushin@gatech.edu)) & Dr. Kostiantyn Turcheniuk ([k.turcheniuk@gatech.edu](mailto:k.turcheniuk@gatech.edu)), School of Materials Science & Engineering

	<b>Sections</b>
1	Background Fundamentals: Thermodynamics and Kinetics; Types of Bonding and Structure-Bonding-Properties Relationships; Crystallography; Diffusion;
2	Advanced Electron Microscopy Techniques in Materials Science
3	Microfluidic Systems for Drug Delivery
4	Modeling of Mechanical Behaviors for Energy-Related Materials
5.	Machine Learning Techniques for Materials Genome
6	Surface Engineering for Organic Photovoltaics
7	Energy Applications of Thermal Interface Materials
8	Synthesis of Nanocrystals and Their Applications in Biomedicine
9	Bioinspired Interfaces: Self-Assembling and Applications
10	Smart Textiles and Their Use in Future Clothes
11	Fundamental Properties of Hydrodynamics and Elasticity in Nature's Designs
12	Fundamentals of Micro and Nano Electromechanical Systems (MEMS&NEMS) for Energy Harvesting
13	Solid-State NMR Techniques in Materials Science
14	Nanostructured and Porous Materials for Li-ion Batteries and Supercapacitors
15	Final Q&A, Discussions

**Grading:**

- 1) Take Home Test on section #1 (Fundamentals of Materials) given on January 21 (due date is **February, 7**) - 30% of the total score
- 2) Essay # 1 on any one of the topics covered in sections 2- 8 (due date is **March, 27**) – 30% of the total score. Note – please get an email approval for the topic pre-selected by you from the instructor before starting working on it to make sure it does not overlap too much with a topic selected by another student in the class
- 3) Essay # 2 (take home Final Exam) on any one of the topics covered in sections 8- 14 (due date is **May, 2**) – 30% of the total score. Note – please get an email approval for your topic from the instructor
- 4) Attendance (to be recorded on every lecture) – 10 % of the total score