MSE 8803 C: Nanomaterials and Nanotechnology *Spring 2016 Schedule*

Course Description:
Introduce the concept of ***Nanomaterials and Nanotechnology***. Discuss a large variety of nanomaterials (e.g., organic, inorganic, and organic-inorganic nanohybrid) for use in nanotechnology (optics, electronics, optoelectronics, mechanics, energy and biomedical applications). Describe novel synthesis strategies and methods for various functional nanomaterials.

Instructors: Prof. Zhiqun Lin and Prof. Vladimir Tsukruk

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Prof. Vladimir V. Tsukruk; vladimir@mse.gatech.edu (Oct 9-Dec 4)

Class Offered: Tuesdays and Thursdays, 4:35 – 5:55 pm
Venue: Van Leer C456

Date	Topic
Aug 19-Sept 30	**Lecture 1**: Introduction to Nanomaterials and Nanotechnology
	Lecture 2: Quantum Dots and Quantum Rods
	Lecture 3: Rational Design and Implementation of Organic Templates for Inorganic Nanocrystal Growth
	Lecture 4: Graphene: A Superior Two-Dimensional Nanomaterial in Materials Science and Electronics
	Lecture 5: Ferroelectric Nanomaterials: Fundamentals, Characterization and Applications
	Lecture 6: Fundamentals and Applications of Piezotronics and Piezo-phototronics
	Lectures 7-8: Nanogenerators for Mechanical Energy Harvesting
	Lecture 9: Solar Cells
	Lecture 10: Semiconductor Nanophotocatalysts: Fundamentals, Mechanisms and Issues
	Lecture 11: Progress and Challenges for Rechargeable Lithium Batteries
Oct 2 and Oct 7	**Oral Presentations**
Oct 9-Nov 27 (Oct 9, 16, 21,	**Soft and hybrid nanomaterials** 1. Introduction in soft matter 2. Biological molecules as nanostructured materials

23, 28, 30, Nov 4, 6, 11, 13, 18, 20, 25)	3. Synthetic macromolecules and organic molecules 4. Combining inorganic structures and soft matter **Interfacial and surface phenomena and materials** 5. Electrostatic assembly fundamentals 6. Microcapsules and core-shell structures 7. Biological and synthetic membranes 8. Langmuir-Blodgett monolayers and multilayers 9. Self-assembled monolayers 10. Synthetic brushes 11. Soft lithography 12. Supehydrophobic and superhydrophilic surfaces **Soft nanomaterials and selected applications** 13. Responsive soft nanomaterials 14. Nanoparticles and organic ligands 15. Bio-assisted assembly of nanoparticles 16. Nanocomposites: block-copolymers, clay, nanofibers. 17. Photonic and plasmonic polymer structures 18. AFM, DPN, and others for guided assembly 19. Selected applications: chemo- and biosensing, nanomedicine, nanotribology 20. Selected applications: organic and polymeric light emitting diodes, organic electronics, flexible electronics.
Dec 2 and 4	**Oral Presentations**
Dec 9 (Tues.)	**Final Exam (2:50-5:40pm)**

Note: no class on Tuesday, Oct 14 (Fall 2014 Student Recess from 10/11-10/14), and Thursday, Nov 27 (Official School Holiday from 11/27-11/28)

Teaching Method: In-class lectures; and guest lectures offered by invited speakers (professors, research scientists, and senior graduate students).

Oral Presentation and 2-Page Executive Summary: There will be a 20 min oral presentation, followed by a few minutes for questions, on a specific topic assigned by the instructors. The presentation PPT file should be emailed to the instructor **a week prior to the presentation** (*note: it is 10% of the grade of Oral Presentation and 2-Page Executive Summary*). In addition, each student needs to submit 2-page written summary (11 font size, single line spacing) on the topic to be presented by emailing to the instructors **a week prior to the presentation**. **The outlook for future research on the topic SHOULD be included in the summary, and approximately 1-page in length**. **Late written Executive Summary submission will NOT be accepted.**

Final grades:

Oral Presentation (Section I)	30% (Oct 2 and 7)
2-page Summary (Section I)	20% (due on Sept 30)
Oral Presentation (Section II)	30% (Dec 2 and 4)
2-page Summary (Section II)	20% (due on Nov 25)
Total	100%

Grading Scheme:

A: [85-100]
B: [75-85)
C: [65-75)
D: [60-65)
F: below 60