**Syllabus EE412/512 Nanophotonics Fall 2013**

**Credit Hours: 3, Instructor: Natalia M. Litchinitser**

This course introduces nanophotonics as a field within science and engineering that includes research focused on creating nanoscale structures with desired optical properties, new approaches to manipulating light on subwavelength scale, as well as using photons to fabricate and characterize nanoscale systems. The topics covered include introduction to nanophotonics, lithography, growth and synthesis of nanomaterials, structural and optical characterization of nanostructured materials, quantum and optically confined devices, plasmonics and metamaterials. Applications of nanophotonic devices for bioimaging, sensing, solar energy, and solid-state lighting will be discussed.

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**Lecture**

Lecture: Tu Th 2:00PM-3:20PM

201 Capen Hall

Course Web Site: UB Learns

Instructor: Dr. Natalia Litchinitser, Associate Professor

230L Davis Hall

Email: natashal@buffalo.edu

Office Hour: Wed 2:00PM-3:00PM or by appointment

TA: Kai Liu, kailiu@buffalo.edu

Office hour: Tue 10:00AM-11:00AM 230V Davis Hall

**References**

No required textbook

Handouts, recent journal publications and reading assignments will be given during the lectures

Useful References:

 "Fundamentals of Photonics," B.E.A. Saleh, M.C. Teich (Wiley-Interscience; 2 edition,

 2007)

 "Plasmonics: Fundamentals and Applications," S. Maier (Springer, 2007).

 "Principles of Nano-Optics," L. Novotny, B. Hecht (Cambridge University Press, 2006)

 "Nanophotonics," P. N. Prasad (Wiley-Interscience, 2004)

 "Photonic Crystals: Molding the Flow of Light ," J. D. Joannopoulos, R. D. Meade, J. N. Winn (Princeton University Press, 1995)

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**Prerequisites**

 PHY 207; MTH 242

**Evaluation**

Midterm Exam 30%, Homework & Quizzes 30%, Individual Project and Report 40%

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**Individual Project**

Students will be asked to choose one application of nanophotonics (e.g., bioimaging, nanolithography, etc.) or a device based on nanostructured materials (e.g., sensors, solar cells, etc.) and to prepare experimental, numerical, or peer-reviewed literature-based 15min. presentation in class and a written 5 pages report on the topic of their choice.

**Three options**:

1. Experimental/design project (goal: prepare a presentation/report to teach the audience how to use a particular experimental/fabrication technique to characterize/make a particular nanophotonic device)

2. Numerical modeling project (goal: prepare a presentation to teach the audience how to use a particular modeling tool to design a particular application)

3. Peer-reviewed literature-based project (not Wikipedia! High quality scientific journals like Science, Nature, Nature Photonics, Nature Nanotechnology, Nano Letters, Optics Letters, or Physical Review Letters)