EECS 598-002 Nanophotonics and Nanoscale Fabrication

Winter 2006 Syllabus

Updated 1/26/05

No	Date	Topic	Details
Overview	1/5 Thu		
Nanophotonics	1/10 Tue	EM wave review	Review of Maxwell's Equations Concepts of fields and waves Radiation and evanescent waves Near fields and far fields Interface phenomena Diffraction and scattering basics Wave guiding Gain and loss Scaling and symmetry
	1/12 Thu		
	1/17 Tue		
	1/19 Thu	Concept of photons	Concepts of photons and a brief review of other quanta such as electrons and phonons
	1/24 Tue		
	1/26 Thu	Light-matter interaction	Introduction to light-matter interaction (1 lecture): * How to determine ε(r)? * The relationship to basic excitations. Basic excitations and measurement of ε(r). (1 lecture) Structure dependence of ε(r) overview (1 lecture) Surface effects (2 lectures): * Surface EM wave * Surface polaritons * Size dependence Case studies (3 lectures): * Quantum wells, wires, and dots * Nanophotonics in microscopy * Nanophotonics in plasmonics Dispersion engineering (3 lectures): * Material dispersion * Waveguide dispersion (photonic crystals)
	1/31 Tue		
	2/2 Thu		
	2/7 Tue		
	2/9 Thu		
	2/14 Tue		
	2/16 Thu		
	2/21 Tue		
	2/23 Thu		
	3/7 Tue		
	3/9 Thu		
Nanoscale Fabrication	3/14 Tue	Overview	
	3/16 Thu	Top-down approach	Optical lithography introduction
	3/21 Tue		Resolution enhancement techniques • phase shifted mask • optical proximity correction • interference lithography
	3/23 Thu		
	3/28 Tue		Other lithographic techniques • Direct write • Imprint
	3/30 Thu		Thin film technologies and CMP/damascene process
	4/4 Tue		
	4/6 Thu	Bottom-up approach	Strain induced nanostructures, chemical synthesis, selective-area epitaxy, atomic manipulation, etc.
	4/11 Tue		
	4/13 Thu		

Term paper presentation	4/18 and 4/20 or 4/25 and 4/27