COURSE NUMBER: Ve434	**COURSE TITLE:** Principles of Photonics
CREDIT: 4	**PREREQUISITES:** VE 230 or VE334 or graduate standing
TEXTBOOKS/REQUIRED MATERIAL: B.E.A. Saleh and M.C. Teich, "Fundamentals of Photonics" Additional References: A. Yariv, "Optical Electronics in Modern Communications" E. Hecht, "Optics" H.A. Haus, "Waves and Fields in Optoelectronics"	**INSTRUCTOR:** Tian Yang **DATE OF PREPARATION:** Sept. 20, 2012 **DATE OF UC APPROVAL:** Oct. 30, 2013
INSTRUCTOR(S): Tian Yang	**SCIENCE/DESIGN:**
CATALOG DESCRIPTION: Introduction to the fundamental concepts in lightwave propagation, confinement and resonance, and semiconductor optoelectronic devices. Selected topics on applications and frontier research will be discussed, e.g. imaging, photonic integrated circuits, fiber-optic communication, display, solar cells and LEDs, and nanophotonics. One lab session on fiber-optic sensors.	**COURSE TOPICS:** 1. Electromagnetism 2. Mirrors and interferometers 3. Polarization optics 4. Guided wave optics 5. Fiber optics 6. Waveguide coupling 7. Optical resonators 8. Lasers and LEDs 9. Photodetectors and Photovoltaics 10. Electro- and acousto-optic modulation 11. Nanophotonics
COURSE STRUCTURE/SCHEDULE: Lecture: twice per week, 100 minutes each; Laboratory: 4 hrs	

COURSE OBJECTIVES [Course Outcomes in brackets]	1. To teach students the basics of photonics: generation, transmission, detection & manipulation of light; [a,b,e,k] 2. To teach students some applications of photonics, including imaging, display, optical communication and energy harvesting; [a,b,e,h,j,k] 3. To lead students to the frontier research and development of optics: optical interconnection, nano-photonics, biosensing and quantum optics. [a,b,e,h,i,j,k]
COURSE OUTCOMES [Program Outcomes in brackets]	After completing Ve434, students should be able to: 1. Ability to analyze and design simple free optics systems, including implementation of polarization and interference effects; [a,b,e,k] 2. Ability to understand and interpret simple guided wave optical devices, including on-chip waveguides, fibers and couplers; [a,b,e,k] 3. Ability to design and calculate electro-optical modulator devices; [a,e,k] 4. Ability to understand and interpret basic fiber optic telecommunication systems; [a,b,e,k] 5. Ability to design and calculate optical resonators and laser cavities; [a,b,e,k] 6. Ability to understand basic physical processes in lasers, light emitting diodes, optical sensors, detectors and photovoltaic solar cells; [a,b,e,k] 7. Ability to appreciate the field of optics and photonics, to read literature and to pursue advanced study in the field. [a,b,e,h,i,j,k]
ASSESSMENT TOOLS [Course Outcomes in brackets]	Midterm exam 30% [a,e,k,m] Open-book open-notes final exam 30% [a,e,k] Final paper and presentation 30% [a,e,g,h,i,j,k] Homework and class attendance 10% [a,b,e,k,m]