

Special Topics Course Descriptions—Fall 2009
Electrical and Computer Engineering
Northeastern University

EECE5698 Special Topics Electromagnetics/Photonic Devices
Professor Mosallaei Sequence E TF 11:45-1:25
CRN/KEY Number 15753

Introduction to basic principles of photonic devices. Topics include crystal optics, dielectric optical waveguides, waveguide couplers, electro-optic devices, magneto-optic devices, acousto-optic devices, second-harmonic generation, optical Kerr effect, optical switching devices - Theory and concept with novel optical applications are highlighted. This will be a multidisciplinary course and many emerging areas in THz and NanoOptics are highlighted, helping the students to find their desired career in academia or industry.

EECE5698 Special Topics Biophotonics
Professor Niedre, Sequence B MW 2:50-4:30
CRN/Key Number 15751

This special topics course treats “biophotonics” and discusses the theory and practice of biological and medical applications of lasers. Topics covered include fundamentals of light propagation in biological tissues, light-matter interactions such as elastic and inelastic scattering, fluorescence and phosphorescence; diagnostic imaging techniques such as confocal fluorescence microscopy, diffuse optical tomography and optical coherence tomography; therapeutic interventional techniques including photodynamic therapy, laser thermal therapies and fluorescence guided surgeries

EECE5698 Special Topics Acoustics and Sensing
Professor Ratilal
Sequence D TF 9:50-11:35
CRN/Key 15847

Introduces the fundamental concepts of acoustics and sensing with waves. Provides a unified theoretical approach to the physics of image formation through scattering and wave propagation in sensing. The linear and nonlinear acoustic wave equation, sources of sound. Reflection, refraction, transmission and absorption. Bearing and range estimation by sensor array processing, beamforming, matched filtering, and focusing. Diffraction, bandwidth, ambient noise and reverberation limitations. Scattering from objects, surfaces and volumes by Green's Theorem. Forward scatter, shadows, Babinet's (continued on next page)

principle, extinction and attenuation. Raytracing and waveguides in remote sensing. Applications to acoustic, radar, seismic, thermal and optical sensing and exploration.

EECE5698 Special Topics Computer Vision
Professor Camps
Sequence F TF 1:35-3:15
CRN/key 15852

COMPUTER VISION SYSTEMS bring together imaging devices, computers, and sophisticated algorithms to solve problems in areas such as industrial inspection, autonomous navigation, human-computer interfaces, medicine, image retrieval from databases, realistic computer graphics rendering, document analysis, and remote sensing. The goal of computer vision is to make useful decisions about real physical objects and scenes based on sensed images. Achieving this goal requires obtaining and using descriptions (models) of the sensors and the world. Computer vision is an exciting but disorganized field that builds on very diverse disciplines such as image processing, statistics, pattern recognition, control theory and system identification, physics, geometry, computer graphics, and learning theory. In this class we will present an introduction to topics such as image formation, segmentation, feature extraction, matching, shape recovery, dynamic scene analysis and object recognition.