Department of Electrical and Computer Engineering Carnegie Mellon University

18-793: Optical Image and Radar Processing

Instructor: David Casasent

Spring 2006

Prerequisite: Signals and Systems (18-396)

(Seniors are encouraged to register for this course)

Instructor:	Prof. David Casasent	HH-B202, x8-2464, casasent@ece.cmu.edu	
Office Hours:	Monday and Wednesday	3:30 pm - 4:30 pm	
Lectures:	Monday and Wednesday	4:30 pm - 6:20 pm	
Classroom	Schaife Hall	6 Homeworks , 3 Tests , No Labs	
Website:	https://blackboard.andrew.cmu.edu/courses/1/S06-18793		
Text:	J.W. Goodman, Introduction to Fourier Optics, McGraw-Hill, Second Ed. 1996		
Reserve Books:	J. Gaskill, Linear Systems, FTs, and Optics R. Collier, L. Lin and C. Burckhardt, Optical Holography M.I. Skolnik, Introduction to Radar Systems E. Hecht, Optics		
Teaching Assistant:	Songyot Nakariyakul, HH-B104, x8-3716, snakariy@andrew.cmu.edu		
Course Objective:	The purpose of this course is to provide the student with an introduction to the fundamental concepts, operations, architectures and algorithms used for optical pattern recognition, signal processing, and computing. Image pattern recognition, image processing, and radar signal processing applications will be treated. Although optical processors using laser and other light sources are emphasized, the math and techniques used are appropriate for pattern recognition and signal processing using digital and other diverse disciplines.		
Outline:	1.Math Foundations: Fourier transform, correlation, convolution, linear systems. Ray optics insight. 2.Fundamentals of Optics: Classical optics, diffraction, coherence, interference, noncoherent and coherent systems, Fourier transform and imaging systems, spatial filtering. 3.Pattern Recognition: Holography, matched spatial filtering, optical correlation architectures, applications (memory, neural nets, security, interconnections), computer generated holograms. 4.Advanced Pattern Recognition: Distortion invariant feature spaces, discriminant functions, eigenvectors, distortion-invariant filters, space-variant processors, image preprocessing. 5.Signal Processing and FT Signal Processors: Acousto-optic cells, complex notation, sideband filters, spectrum analyzers, radar fundamentals, range and Doppler measurements, electronic warfare, phased array radar. 6.Advanced Signal Processors: Acousto optic correlators, heterodyne detection, correlation receiver, complex notation, synthetic aperture radar.		