Engineering Faculty Document No. 16-07
May 16, 2007

TO: The Faculty of the College of Engineering
FROM: The Faculty of the School of Electrical and Computer Engineering
RE: ECE 513 Changes in Terms Offered, Description, Text and Content

The faculty of the School of Electrical and Computer Engineering has approved the following changes in ECE 513. This action is now submitted to the Engineering Faculty with a recommendation for approval.

From: **ECE 513 – Diffraction, Fourier Optics, and Imaging**
Sem. 1 and 2. Class 3, cr. 3. Offered every third semester.
Prerequisite: ECE 301, 311. Authorized equivalent courses or consent of instructor may be used in satisfying course pre- and co-requisites. Departmental approval is required.

Modern theories of diffraction and Fourier optics for imaging, optical communications, and networking. Imaging techniques involving diffraction and/or Fourier analysis with application to tomography, magnetic resonance imaging, synthetic aperture radar, and confocal microscopy. Additional topics in optical communications and networking, including wave propagation in free space, fiber, integrated optics, and related design issues. Simulation studies, using Matlab and other software packages for analysis and design. Offered every third semester.

To: **ECE 513 – Diffraction, Fourier Optics and Imaging**
Sem. 1 of odd years. Class 3, cr. 3
Prerequisite: EE301, EE311, or equivalents standing

Modern theories of diffraction and Fourier optics for imaging, optical communications and networking, micro/nano technologies and related devices and systems. Imaging techniques involving diffraction and/or Fourier analysis such as tomography, magnetic resonance imaging, synthetic aperture radar and confocal microscopy. Topics in optical communications and networking including wave propagation in free space, fiber, and integrated optics, and related design issues. Micro/nano technologies involving diffraction and/or Fourier analysis. simulation studies using Matlab and other professional software packages for analysis and design.

Reason: The course content, description and text have been changed to reflect the updated content of the course.

M. J. T. Smith
Head, Electrical and Computer Engineering

Supporting Documentation

ECE 513 – Diffraction, Fourier Optics and Imaging

Required Text: Okan K. Ersoy, *Diffraction, Fourier Optics and Imaging*, J. Wiley, 2007. ISBN-10: 0-471-23816-3

Recommended References:

1. J. W. Goodman, Introduction to Fourier Optics, McGraw Hill, second edition, 1996.
2. E. Wolf, editor, Progress in Optics, Vols. XIV, XVI, XXI.
3. R.G. Wilson, Fourier Series and Optical Transform Techniques in Contemporary Optics, J. Wiley, 1995.
4. H. Stark, Applications of Optical Fourier Transforms, Academic Press, 1982.
5. B. E. Saleh, M. C. Teich, Fundamentals of Photonics, J. Wiley, 1991.
6. M.V. Klein, T.E. Furtak, Optics, J. Wiley, 2nd edition, 1986.
7. D. Marcuse, Theory of Dielectric Optical Waveguides, Academic Press, 1991.
8. J.P. Fitch, Synthetic Aperture Radar, Springer-Verlag, 1988.
9. T. Wilson, editor, Confocal Microscopy, Academic Press, 1990.
10. M. A. Brown, MRI: Basic Principles and Applications, Wiley-Liss, 1995.
11. D. W. Chakeres, P. Schmalbrock , Fundamentals of Magnetic Resonance Imaging, Williams & Wilkins, 1992.
12. A. C. Kak, Malcolm Slaney., Principles of Computerized Tomographic Imaging, IEEE Press, New York , 1988.
13. J. J. Stamnes, Waves in Focal Regions, Adam Hilger, 1986.
14. V. A. Fock, Electromagnetic Diffraction and Propagation Problems, Pergamon Press, 1965.
15. M. Kline and I. W. Kay, Electromagnetic Theory and Geometrical Optics, Interscience Publishers, 1965.
16. G. P. Agrawal, Fiber-Optic Communication Systems, J. Wiley, 1992, 1997.

Week No.	***Principal Topics***
1	Foundations of Diffraction Theory
2	Angular Spectrum Method
3	Fresnel and Fraunhofer Diffraction
4	Fourier Analysis of Optical Systems and Image Formation
5	Spatial Filtering and Optical Information Processing
6	Tomography and Synthetic Aperture Radar
7	Magnetic Resonance Imaging
8	Optimization Techniques
9	Wavefront Reconstruction (Holography)
10	Diffractive Optical Elements
11	Diffraction Gratings and Zone PlatesI
12	Micro/Nano Devices and Rigorous Diffraction Theory
13	Numerical Methods
14	Wavelength Division Multiplexing and Demultiplexing
15	exams