

Stevens Institute of Technology
Department of Electrical and Computer Engineering
Course Outline

EE510WS **Introduction to Radar Systems: A DSP Perspective** **Spring 2009**

- Texts:** Mark A. Richards, *Fundamentals of Radar Signal Processing*, McGraw-Hill, 2005 (ISBN: 0-07-144474-2)
- References:** Merrill I. Skolnik, *Introduction to Radar Systems*, 3rd edition, McGraw-Hill, 2001 (ISBN: 0-07-290980-3)
Byron edde, *Radar: Principles, Technology, Applications*, Prentice Hall, 1995 (ISBN: 0-13-752346-7)
Peyton Z. Peebles, Jr., *Radar Principles*, Wiley, 1998 (ISBN: 0-471-25205-0)
Merrill I. Skolnik (editor), *Radar Handbook*, McGraw-Hill, 1990 (ISBN: 0-07-057913-x)
H.L. Van Trees, *Detection, Estimation and Modulation Theory, Part I*, Wiley, 1968
S.M. Kay, *Fundamentals of Statistical Signal Processing: Detection Theory*, Prentice Hall, 1998 (ISBN:0-13-504135-X)
S.M. Kay, *Fundamentals of Statistical Signal Processing: Estimation Theory*, Prentice Hall, 1993 (ISBN: 0-13-345711-7)
- Instructor:** Dr. Hongbin Li, Department of Electrical and Computer Engineering, Stevens Institute of Tech, Hoboken, NJ 07030. Tel: (201) 216-5604; Fax: (201) 216-8246; E-mail: Hongbin.Li@stevens.edu
- Website:** WebCT
- Prerequisites:** Undergraduate-level understanding of probability, random variables, and DSP
- Contents:** Propagation of EM waves, range equations, and system structure. Signal models, radar cross section of targets and clutter, multipath, statistical models; Swerling models. Ambiguity function, radar waveforms including LFM and coded waveforms. Sampling in range, angle, Doppler, and space. Doppler processing, moving target indicator (MTI), and pulse Doppler processing. Spatial filtering, data-independent beamforming, and adaptive beamforming. Neyman-Pearson detection and likelihood ratio test, coherent and noncoherent integration, Albersheim's equation. CFAR detection, cell averaging and extensions, order statistics CFAR, and adaptive CFAR. Advanced radar topics including synthetic aperture radar (SAR) and space-time adaptive processing (STAP)
- Grading:** Homework and projects: 60%; Matlab projects: 40%. No exams.
- Miscellaneous:** Homework will be assigned and collected on a regular basis; certain of these problems will be graded and/or discussed. **No late work will be accepted.** You are responsible for all assignments, changes of assignments, announcements of exam dates, and other course-related events announced via WebCT or e-mail.