

## ECE740-102: Advanced Digital Signal Processing -- H. Ge

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TIME & PLACE	Tuesday, 6:00pm -- 9:05pm, Spring 2007, KUPF-207
INSTRUCTOR	Dr. Hongya Ge, Room 333, ECE. Office Hours: 2:00pm --3:30pm, Wed. and Fri. Phone: (973) 642-4990, Fax: (973) 596-5680, Email: ge@njit.edu
PREREQUISITES	<b>EE601</b> (Linear Systems), <b>EE640</b> (Digital Signal Processing), and <b>EE673</b> (Random Signal Analysis).
TEXT BOOKS	<ul style="list-style-type: none"><li>• S. Haykin, <i>Adaptive Filter Theory</i>, Prentice Hall, 4<sup>th</sup> Ed., 2002.</li><li>• A. H. Sayed, <i>Fundamentals of Adaptive Filtering</i>, IEEE Press and John Wiley &amp; Sons, 2003.</li><li>• M. G. Bellanger, <i>Adaptive Digital Filters</i>, Marcel Dekker, Inc., 2<sup>nd</sup> Ed., 2001.</li><li>• Selected Research Papers from the IEEE/IEE Publications.</li></ul>
REFERENCES	<ul style="list-style-type: none"><li>• S. M. Kay, <i>Modern Spectral Estimation: Theory &amp; Application</i>, Prentice Hall, 1987.</li><li>• D. G. Manolakis, V. K. Ingle, and S. M. Kogon, <i>Statistical and Adaptive Signal Processing: Spectral Estimation, Signal Modeling, Adaptive Filtering and Array Processing</i>, McGraw Hill, 2000.</li><li>• C. Nikias, and A. P. Petropulu, <i>High Order Spectra Analysis: A Non-linear Signal Processing Framework</i>, Prentice Hall, 1993.</li><li>• Course Handouts and Research Papers from the IEEE Transactions and IEEE Conference Proceedings.</li></ul>
GRADING	HW & Presentation on Readings (30%), Midterm (30%), Project (40%)
ABSTRACT	Emphasis will be placed on advanced techniques of processing discrete-time stochastic signals. Topics include time series modeling and spectral analysis, linear prediction and subspace approach, adaptive filtering and processing on time-varying random signals, as well as high order statistics based non-linear signal processing approaches. Application examples related to statistical and array signal processing, communications, and control system will be provided.  Note: To encourage active participation of students, a major practice component of this course is to carry out mini course projects (assigned from time to time) based on research papers.
OUTLINE	<ul style="list-style-type: none"><li>• Week 1: Introduction, Important Concepts and Topics in Discrete-Time Stochastic Processes (ACF, PSD, PDF, CF, Moments, Cumulants, Polyspectra, DTFT, and DFT)</li><li>• Week 2-4: Linear Prediction, Spectral Analysis, and Associated Topics</li><li>• Week 5-6: Wiener Filtering: Interpretations and Application Examples</li><li>• Week 7-8: Implementing Linear Adaptive Filters: LMS, RLS, and others</li><li>• Week 9: Midterm Exam</li><li>• Week 10-12: Subspace Signal Processing and Applications,</li><li>• Week 13: Time-varying Signal Modeling/Processing, and Kalman Filtering</li><li>• Week 14: High Order Statistics and Non-linear Signal Processing</li></ul>