EE 763

Course Title : Classical and Modern Spectral Estimation.

Pre-requisite : EE 761 or equivalent background in Random Processes.

Description : Fundamentals of spectrum analysis is useful for designing systems for passive detection and estimation of the direction and location of stationary or moving targets from data received by an array of sensors in a radar or sonar environment. Over the last decade, many advanced techniques that can achieve high resolution at low SNR situation have been developed. In this course, many of these modern algorithms will be developed and analyzed. The text is written by one of the well known researchers in this field and it includes a large number of programs and data for the students to test and compare the effectiveness of the methods covered in the course.

Topics : Non-parametric/Classical Spectrum Analysis methods : Periodogram, Windowing and Blackman-Tukey; Parametric and Model based methods : Moving Average, Auto-regressive and Auto-regressive Moving Average Methods; Fast Techniques; Statistics of the parametric and spectral estimators; Information theoretic criterions for model order selection; Minimum variance spectral estimation, High resolution narrowband spectral estimation and topics related to sonar and radar target detection and tracking.

Note : Computer programming would be necessary for implementing the course projects. The codes of several matlab subroutines are available from Prentice Hall's webpage (`www.prenhall.com`). Computer Exercises at end of each Chapter can be done using these matlab codes. If any student has a problem downloading, the programs can be made available by the Instructor.

Text : "Introduction to Spectral Analysis", by P. Stoica and R. Moses.

Grading Procedure :

- 6-8 sets of homework problems/projects, will include usage of the software package provided with the text for detailed comparison of *all* the Spectrum Estimation methods covered in the course. 50%

- Course project (individual) : topics may be selected by the student or the instructor, will involve comprehensive and up-to-date literature study on the chosen topic, computer simulation work for verification of most effective of the available methods. Preparation of a Technical Report and in-class presentation will be required. 50%

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Office Hours : Monday - 5:00-6:00 PM; Wednesday - 1:30-2:30 PM; and by appointment.