E9251 Bi-annually, Typically Jan. 3:0

Signal processing for data recording channels

Instructor

Shayan Srinivasa Garani
Email: shayangs@iisc.ac.in

Teaching Assistant

Chaitanya Matcha
Email: chaitanya@iisc.ac.in

Department: Electronic Systems Engg.

Course Time: Typically. 11:30 to 1 pm (Is variable sometimes)

Lecture venue: Auditorium, Old conference room,

Detailed Course Page: http://pnsil.dese.iisc.ac.in/signal-processing-for-data-recording-channels-e9-251-spring-2016/

Announcements

Brief description of the course

To introduce graduate level students with foundations into channels engineering for data storage. Emphasis is on physics, math. foundations into read write channels engineering (physics of recording, modeling, coding, signal processing, system architectures), architectures.

Prerequisites

A strong undergraduate foundation in electrical sciences/electronics engineering or consent of the instructor.

M.Sc students in physics/mathematics are strongly encouraged to enroll.

Syllabus

This course is a comprehensive treatment of signal processing and coding for data recording channels.

Introduction: Review of basic principles behind the physics of magnetic recording, super paramagnetic limits, technological trends in magnetic storage/optical systems, recording schemes in magnetic and optical devices.

Signal Modeling: Communication theoretic framework of read/write channels. Models for analog read back signal with inter-symbol interference, noise and distortion sources, notion of channel and user bit densities towards SNR definition.

Signal Processing Methods: Equalization and timing recovery, PLLs, ML based timing recovery methods, Detection techniques based on the BCJR algorithm and its low complexity variations, turbo-equalization methods.

Coding Techniques: Introduction to constrained modulation codes, review of algebraic and graphical coding techniques, interleaving mechanisms and analysis of the code performance.

Some hardware related aspects for realizing signal processing algorithms towards high speed Silicon will be covered towards the end of the course.

Course outcomes

Students will get a firm foundation towards advanced research by building upon known things at a foundational level in physical data storage. This is very useful for advanced research in the field, as well as, translational work for practicing engineers/scientists.

Grading policy

Homeworks (30%), Mid Term Exam (20%), Project (30%), Final Exam (20%).

Assignments

Please refer to the last three years under the course pages.

http://pnsil.dese.iisc.ac.in/teaching-activities/

Resources

There is no text book for this course. Lecture notes, papers and any on-line materials will be supplied in the class.

Reference Materials:

[1] J. W. M. Bergmans, Digital Baseband Transmission and Recording, Kluwer Academic Press, 1996

[2] B. Vasic and E. Kurtas, Coding and Signal Processing for Magnetic Recording Systems, CRC Press, 2004.