UNIVERSITY OF CALIFORNIA, RIVERSIDE

EE 150 Digital Communication

Winter 2004

Lecture:	TR	12:40pm-2pm	HMNSS 1407		
Instructor:	Ilya Dumer		Office:	A257 Bourns Hall	Hours: W 3:30-4:30
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TA:	Arun Rangarajan		Office:	B236 Bourns Hall	Hours: MW 6:30-7:30
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Prerequisite EE115

Course Objective: Introduction to Digital Communication and data transmission.

Textbook: B.P. Lathi. Modern Digital and Analog Communication Systems, 3rd ed., Oxford Uni. Press, 1998 (ISBN 0-19-511009-9).

References:

1. Simon Haykin, Communication Systems, Wiley, 4th Edition, 2001 (ISBN 0-471-17869-1).

2. Leon W. Couch, Digital and Analog Communication Systems, 4th ed. Macmillan Publ. Co., 1993.

Course Outline: (Below section numbers are from the textbook. Sections marked **BOLD** give the most important basic material. Sections marked *italic* represent auxiliary or advanced material; this is mostly for extra reading)**.**

Introduction and Review: Overview of Communication systems (Ch. 1,2). **Fourier transform and series.** (2.4, 2.8-2.10, 3.1-3.3). **Energy - and Power Spectral Density (3.6-3.8).** Time-Bandwidth product. **Sampling theorem (6.1). Bandwidth and transmission rate.**

Pulse Code modulation.: **Sampling and Quantizing. Quantization Noise. Signal-to-noise ratio (SNR) and the Bandwidth.** μ-law and A-law**.** Digital multiplexing (6.2). **Line Coding. Polar, Unipolar, Bipolar, Duobinary, and Manchester Signaling (7.2).**

Intersymbol interference (ISI). Pulse shaping. Nyquist criteria for Zero ISI (7.4). *Differential Coding, Delta modulation and overloading . (6.3, 6.4). Eye diagrams (7.5).* Detection error probability (7.6). M-ary Communication (7.7, 7.8).

Probability Theory as a Tool for analysis in Noisy Communications: **Events, Venn diagrams. Conditional Probability and Independent Events (10.1). Random Variables, Cumulative Distribution Function, Probability Density Function.** Channel models. Threshold detection **(10.2).**

Statistical Averages (Means). Variance. Binomial, Gaussian, and Poisson Distributions. The mean error of the Quantization Noise and the Channel Noise (10.3). *Chebyshev inequality and the Central Limit Theorem (10.4,10.5). Introduction to matched filter.*

Discussions : one-hour discussion on home assignments held by TA.

Exams: Open book.

Midterm:	12:40 pm -2:00 pm	February 17, 2004
Final:	8:00 am -11 am	March 18, 2004

Homework

Home assignments and solutions will be posted on http://www.ilearn.ucr.edu/

Grading

Homework: **10%,** Midterm: **30%,** Final: **60%.**