

**UCI EECS**  
**EECS 241B - Digital Communication II**  
**Winter Quarter 2009**

**Meets:** TTh 3:30-4:50 PM ELH 110  
**Instructor:** Prof. Ender Ayanoglu (*pronounced A-ya-no-lu*)  
**Office Hour:** W 3-4 PM (Engineering Tower 408B)

**Recommended Text:**

J. G. Proakis, M. Salehi, *Digital Communications*, 5<sup>th</sup> Edition, McGraw-Hill, 2008 (four former editions by Proakis). Copies of the 4<sup>th</sup> and 5<sup>th</sup> editions are on reserve at the Science Library Course Reserves Section.

**Useful Texts:**

1. J. Barry, E. A Lee, D. G. Messerschmitt, *Digital Communication*, 3<sup>rd</sup> Ed., Kluwer, 2004 (two former editions by Lee and Messerschmitt).
2. S. Haykin, *Adaptive Filter Theory*, 4<sup>th</sup> Ed., Prentice-Hall, 2001 (or three former editions).
3. U. Madhow, *Fundamentals of Digital Communication*, Cambridge, 2008.
4. R. D. Gitlin, J. F. Hayes, S. B. Weinstein, *Data Communications Principles*, Plenum, 1992.
5. J. A. C. Bingham, *The Theory and Practice of Modem Design*, Wiley Interscience, 1988.
6. R. W. Lucky, J. Salz, E. J. Weldon, *Principles of Data Communication*, McGraw-Hill, 1968.

**Covers:** Signaling for Bandlimited Channels, Wiener Filtering, Linear Equalization, Adaptive Linear Equalization, Maximum Likelihood Sequence Estimation for Equalization, Synchronization, Multi-Carrier Modulation, Spread Spectrum

**Grading:** 15% Homework (Problem sets, extra credit), 35% Midterm, 50% Final. (Bonus project.)

**Policies:** Midterm and final are open book and notes. Homeworks will be graded randomly and on the basis of a mixture of effort and correctness. It is recommended that you turn in every homework and make it your own effort.

### Course Schedule

Lecture	Date	Subject	Pages (Notes)	Pages (Proakis 4th Ed.)	Pages (Proakis 5th Ed.)	Due
1	1/6	Introduction				
2	1/8	Signaling for BL Channels, Nyquist Criterion	1.1-1.5	548-561	597-609	
3	1/13	Whitened Matched Filter for Channel with ISI	1.6-1.13	601-604	625-628	
4	1/15	Wiener Filtering, Orthogonality, Wiener-Hopf Eq.	2.1-2.8			
5	1/20	Linear Equalization, Zero-Forcing Equalizer	3.1-3.7	616-622	640-645	
6	1/22	Linear Equalization, MMSE Equalizer	3.8-3.13	623-627	645-651	
7	1/27	Adaptive Linear Equalization, LMS Algorithm	4.1-4.7			<b>HW1</b>
8	1/29	Adaptive Linear Equalization, RLS Algorithm	4.8-4.14			
9	2/3	Fractionally Spaced Equalization	5.1-5.7	631-637	655-660	
10	2/5	Decision Feedback Equalization	5.8-5.14	638-642	661-665	<b>HW2</b>
11	2/10	<b>MIDTERM</b>				
12	2/12	Maximum Likelihood Sequence Estimation (MLSE)	5.15-5.21			
13	2/17	MLSE for Equalization	5.22-5.27			
14	2/19	Synchronization, Carrier Phase Estimation	6.1-6.7	333-346	290-303	
15	2/24	Costas Loop, Decision Directed Phase Estimation	6.8-6.14	347-359	303-314	
16	2/26	Synchronization, Timing Estimation	6.15-6.19	359-365	315-321	
17	3/3	Orthogonal Frequency Division Multiplexing (OFDM)	7.1-7.7			<b>HW3</b>
18	3/5	OFDM: Cyclic Prefix, Capacity, Water Pouring	7.8-7.16			
19	3/10	Spread Spectrum	8.1-8.8			
20	3/12	Direct Sequence Spread Spectrum	8.9-8.17			

3/17 **FINAL 4-6 PM**

**HW4** will be assigned but will not be collected. Its solutions will be available 3/14/2009.