Course Objectives:

By the end of this course, you will be able to:

- Understand the practical context of the concepts that you will study in more detail in later classes.
- Explain typical problems and tradeoffs encountered in electronic and computer engineering systems.
- Analyze simple approaches to deal with these problems and tradeoffs.
- Use software tools, such as MATLAB to investigate potential solutions to these problems and tradeoffs in order to validate the above analysis, as well as to handle cases not amenable to simple analysis.

Course Outline:

Week	Release Dates	Weekly Learning Objectives	Topics / Subtopics	Quiz and Lab Exercise Due Dates
1	23 Sep 2014 09:00 (GMT+8)	By the end of this week, you will be able to: • understand a simple communication system. • convert text messages and numbers into bit sequences. • perform simple communication over a simulated channel.	**Topic 1: Introduction** 1.1 Course Overview 1.2 Basic Communication System 1.3 Encoding Information with Bits 1.4 Lab Overview **Topic 2: Representing Bit Sequences** 2.1 Continuous vs Discrete Time Waveforms 2.2 Discrete Time Bit Waveforms 2.3 Representing Bit Waveforms 2.4 Lab 1 - A Communication Example	29 Sep 2014 23:59 (GMT+8)

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2	30 Sep 2014 09:00 (GMT+8)	By the end of this week, you will be able to: • model the response of a communication channel. • understand the role of and need for protocols in communication. • implement a simple communication protocol.	**Topic 3: Discrete Time Channel** 3.1 The Discrete Time Channel 3.2 Effects of the Channel 3.3 Linear Time Invariant Systems 3.4 Modeling the Channel 3.5 Lab 2 - Step Response **Topic 4: Data Communication Protocols** 4.1 Communication Protocols 4.2 Thresholding 4.3 Asynchronous Serial Communication 4.4 A Simple Protocol 4.5 Lab 3 - Communication Protocol 4.6 Lab 4 - Performance Evaluation	6 Oct 2014 23:59 (GMT+8)
3	7 Oct 2014 09:00 (GMT+8)	By the end of this week, you will be able to: • understand the relationship between the bit error rate and the bit rate. • visualize the effect of intersymbol interference using an eye diagram. • use recursive equations to model a communication channel.	**Topic 5: Intersymbol Interference** 5.1 Trade-off between Bit Rate and Bit Error Rate (BER) 5.2 Intersymbol Interference 5.3 Eye Diagrams 5.4 Lab 5 - Eye Diagram **Topic 6: Recursive Channel Model** 6.1 Equalization 6.2 Developing the Equalizer 6.3 Recursive Channel Model 6.4 Proof of Equivalence	13 Oct 2014 23:59 (GMT+8)
4	14 Oct 2014 09:00 (GMT+8)	By the end of this week, you will be able to: • understand the role of an equalizer in reducing the bit error rate. • visualize the effect of an equalizer using eye diagrams. • use an equalizer to decrease the bit error rate at high bit rates. • predict the bit error rate of a binary channel.	**Topic 7: Equalization** 7.1 Intuition for Equalizer 7.2 Derivation of Equalizer 7.3 Effect of Equalization on the Eye Diagram 7.4 Lab 6 - Equalization **Topic 8: Noise** 8.1 Noise 8.2 Additive Noise and Its Effect 8.3 The Binary Channel and Calculating BER 8.4 Examples	20 Oct 2014 23:59 (GMT+8)

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5	21 Oct 2014 09:00 (GMT+8)	By the end of this week, you will be able to: • understand the relationship between the signal to noise ratio and the bit error rate. • analyze the effect of choosing different threshold values on the bit error rate. • summarize the role of channel coding. • implement a repetition code for error detection and/or correction.	**Topic 9: Bit Errors** 9.1 Average Power in Signals 9.2 Gaussian Noise Model 9.3 Lab 7 - Additive Noise 9.4 Calculating the BER 9.5 The Effect of Signal to Noise Ratio 9.6 An expression for BER with Gaussian Noise 9.7 Lab 8 - Bit Error Rate **Topic 10: Channel Coding** 10.1 Channel Coding 10.2 Block Codes 10.3 Repetition Codes 10.4 Lab 9 - Repetition Code	27 Oct 2014 23:59 (GMT+8)
6	28 Oct 2014 09:00 (GMT+8)	By the end of this week, you will be able to: • explain the way parity bit codes can be used for error detection/correction. • understand how to deal with bursts of errors. • compare the bit rate and bit error rate of different channel coding methods.	**Topic 11: Parity Bit Codes** 11.1 Parity Bit Based Codes 11.2 Lab 10 - Parity Bit Code 11.3 (9,4,4) Code 11.4 Burst Error Correction **Topic 12: Summary and Review** 12.1 Communication Protocols 12.2 Equivalent Representations and Models 12.3 Noise and Bit Errors 12.4 Lab Summary	3 Nov 2014 23:59 (GMT+8)
7	4 Nov 2014 09:00 (GMT+8)		**Final Exam**	10 Nov 2014 23:59 (GMT+8)

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