Addis Ababa Institute of Technology
Department of Electrical & Computer Engineering
Digital Communications (ECEG-6302)

<u>COURSE OUTLINE</u>

A. COURSE OUTLINE

1. **Introduction:** Course overview; Essential elements of digital communication systems; Communication channels.
2. **Source Coding**: Information & measure of information; Coding for analog and discrete sources.
3. **Characterization of communication signals and systems:** Representation of baseband and bandpass signals and systems; Signal space representation: Orthogonal expansion of signals, Modulated waveforms and their vector-space representation; Spectral representation of modulated signals: power spectra of modulated signals.
4. **Discrete data detection (Receivers for AWGN Channels):** Correlation Demodulators, Matched filters; The optimum detector, Maximum likelihood(ML) detector, MAP detector; Performance of optimum receivers for memoryless modulation; Probability of error for binary, M-ary orthogonal signals, PAM, PSK and QAM; Performance analysis of Communication systems. Regenerators and link budget analysis.
5. **Carrier and symbol Synchronization**: Signal parameter estimation, the likelihood function, carrier phase and symbol timing estimation; Performance characteristics of ML estimators.
6. **Channel Capacity and Channel Coding**: Introduction and survey of Block and Convolutional codes.
7. ~~**Signal Design for Band-limited Channels**: Characterization of band-limited channels. Signal design: Design for no Intersymbol Interference (ISI) and for controlled ISI.~~
8. **Communication through band-limited channels:** Optimum maximum likelihood receivers: the inter-symbol interference (ISI) channel model. Linear equalization: mean square error (MSE) equalizer and decision-feedback equalization (DFE).

B. Text: John G. Proakis, *Digital communications*, 4th or 3rd edition

C. References:

1. E.A Lee & D.G Messerschmitt, *Digital Communications*, 2nd edition
2. J.M Wozencraft & I.M Jacobs, *Principles of communication Engineering*.
3. J.G Proakis and M. Salehi. *Communication systems Engineering*.
4. Bernard Sklar, *Digital Communications: Fundamentals and Applications*, 2nd Edition
5. MIT OCW course materials for the course 6.450: available at ocwmit@aau.edu.et.; relevant sections will be announced in class from time to time