The Legal House – International Business College
School of Electrical and Computer Engineering

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Digital Communication Engineering
SECE 106

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Aim of Unit:

This unit present the basic principles of classical communication theory as applied to digital communication systems, especially to develop an understanding of the mathematical principles underlying such systems.

Unit Outline:

- Detection: Model of a digital communication system, Gram-Schmidt orthogonalization procedure, Geometric interpretation of signals, Response of bank of correlators to noisy input, Coherent detection of signals in noise, Probability of error, Correlation Receiver, Matched filter receiver, Detection of signals with unknown phase in noise.
- Baseband Pulse Transmission: Discrete PAM signals, Intersymbol Interference (ISI), Nyquist criterion for distortionless baseband binary transmission, Pulse Shaping, Correlative Level Coding, Baseband M-ary PAM Transmission.
- Digital Modulation Techniques: Coherent Binary PSK, Coherent Binary FSK, Coherent Quadrature PSK (QPSK), Coherent Minimum Shift Keying (MSK), Differential PSK, Comparison of Binary and Quaternary Modulation Schemes, M-ary Modulation Techniques, Power Spectra, Bandwidth Efficiency.
- Spread Spectrum Modulation: Pseudo-noise sequences, Direct Sequence Spread Spectrum, Frequency-hop Spread Spectrum, Code Division Multiplexing.

Mode of Delivery:

Two hours lecture per week.
One hour tutorial per week.

Unit Assessment:

Attendance at Lectures and Tutorials	20 %
Assignments, Laboratories	40 %
Final Presentation	40 %

Assessment Requirements:

Students must receive 50% or more for each component of Unit Assessment in order to pass the subject.

Student Workload:

Students will have 3 hours per week face-to-face learning during semester. Students are expected to work at least 5 hours per week out of class.

Text Book:

1. Simon Haykin, "Communication Systems", 4th edition, John Wiley, 2001

Recommended References:

1. John G. Proakis and Masoud Salehi, "Communication Systems Engineering", 2nd edition, Prentice Hall, 2002
2. Harold P.E. Stern and Samy A. Mahmoud**,** "Communication Systems: Analysis and Design", Prentice Hall, 2004

Subject Schedule

Weeks	Lecture/Tutorial Topics	Assignments/ Laboratories	Reading from Text Book
1	Introduction to Digital Communication Systems	Lab #1	Background and Preview
2	Random Processes	Lab #1	Chapter 1
3	Continuous-Wave Modulation	Assignment #1	Chapters 2.1 to 2.9
4	Noise in CW Modulation Systems	Lab #1, Assignment #1	Chapters 2.10 to 2.15
5	Baseband Pulse Transmission	Lab #1, Assignment #1	Chapter 3
6	Baseband Pulse Transmission	Collect Lab #1	Chapter 4
7	Signal-Space Analysis	Collect Assignment #1	Chapter 5
8	Passband Digital Transmission	Lab #2	Chapter 6
9	Spread-Spectrum Modulation	Assignment #2	Chapter 7
10	Multiuser Radio Communications	Lab #2, Assignment #2	Chapter 8
11	Fundamental Limits in Information Theory	Collect Lab #2	Chapter 9
12	Error-Control Coding	Collect Assignment #2	Chapter 10
13	Preparing for Final Presentation		
14	Final Presentation		

Subject Description

UNIT	SECE106 Digital Communications Engineering

FIELD	Analyse and Design

DESCRIPTION	This unit describes the competency required to ensure the client requirements are developed as a strategy to comprehending and designing the digital communications systems.

RELATED COMPETENCY STANDARDS	The project lifecycle, Computer Systems and Telecommunications methodologies employed will determine which particular units of competency are relevant to this unit. Some include SECE101, SECE112, SECE105, SECE108, SECE111.

	ELEMENT	PERFORMANCE CRITERIA
1	Detection	• Model of a digital communication system, Gram-Schmidt orthogonalization procedure, Geometric interpretation of signals, Response of bank of correlators to noisy input, Coherent detection of signals in noise, Probability of error, Correlation Receiver, Matched filter receiver, Detection of signals with unknown phase in noise.
2	Baseband Pulse Transmission	• Implementation of Discrete PAM signals, Intersymbol Interference (ISI), Nyquist criterion for distortionless baseband binary transmission, Pulse Shaping, Correlative Level Coding, Baseband M-ary PAM Transmission.
3	Digital Modulation Techniques	• Comprehensive treatment of Coherent Binary PSK, Coherent Binary FSK, Coherent Quadrature PSK (QPSK), Coherent Minimum Shift Keying (MSK), Differential PSK, Comparison of Binary and Quaternary Modulation Schemes, M-ary Modulation Techniques, Power Spectra, Bandwidth Efficiency.
4	Spread Spectrum Modulation	• Coverage of essential elements of Pseudo-noise sequences, Direct Sequence Spread Spectrum, Frequency-hop Spread Spectrum, Code Division Multiplexing.