CALIFORNIA STATE POLYTECHNIC UNIVERSITY, POMONA

ETE 442

COURSE OUTLINE

Course Information		**ABET Unit Classification** (4 Quarter Units)	
Department:	Engineering Technology	Math:	
Course Number:	ETE 442/442L	Basic Science:	
Course Title:	Data Communication and Networking/Lab	Engineering Topics:	4
Revision Date:	3/18/05	*Contains significant design content:*	Yes
Revised by:	Massoud Moussavi	Other:	
Compliant:	Catalog 2004/05	Curriculum Designation:	Required

I. Catalog Description

The signal conversion methods, sampling, quantization, pulse modulation techniques, error analysis, digital modulation, encoding schemes, data transmission methods, Open System Interconnection (OSI) model, frame transmission methods, multiplexing low-speed channels, Local Area Network (LAN), Transmission Control Protocol, Internet Protocol (TCP/IT), Ethernet, IEEE 802 networking technology. Computer methods utilized. 3 lectures/problem-solving and 1 three-hour laboratory Prerequisites: ETE 335, 315

II. Prerequisites and Co-requisites

ETE 335/335 and ETE 315/315L; Students are expected to have a good theoretical, analytical, and practical knowledge of analog signal and analog modulations, signal transmission, transmitter and receiver, Parity generator and checker, flip-flops, shift registers, timing and clock signaling.

III. Textbook and/or other Required Material

Michael A. Miller, Data & Network Communications, Delamr Pub. Co. ISBN: 0-7668-1100-X

IV. Course Objectives

Upon successful completion of this course, each student should be able to:

1. Understanding of conversion of analog to digital signals, sampling, and quantizations.
2. Understanding of Pulse-Code-Modulations and Delta modulation
3. Understanding of transmission of digital signal over analog media
4. Explain the error analysis in data communication, error detection and correction.
5. Understanding of Open System network models and OSI layers.
6. Explain the network architecture and protocol and data link protocols.
7. Understanding of Local Area Network devices, switching, and technology.

V. Expanded Course Description

A. Expanded Description of the Course

1. Signal conversion and pulse modulation
Study of analog-to-digital signal conversion; sampling and hold, quantization, encoding/decoding, Nyquist theorem, signal-to-quantization noise ratio, Pulse code

modulation (PAM, PWM, and PPM), Delta modulation, information capacity, bit and bud rates, bit-rate-error (2 weeks)

2. **Modulation techniques and signal transmission**
Study of the modulation of digital signal; frequency-shift-keying, amplitude-shfirst-keying, phase-shift-keying, QPSK, 8-PSK, and QAM, serial and parallel transmissions, synchronous and asynchronous transmissions, multiplexing (TDM and FDM), communication modes; simplex, half-duplex, and ful-duplex. (2 weeks)

3. **Digital signal encoding and error detection and correction methods**
Study of the digital signal encoding; unipolar, polar, bipolar, NRZ, NRZ-I, Manchester, differential Manchester, 3bz8,….., error detection and correction methods; parity, block check character (BCC), one's complement of sum, CRC, CRC-16, and Hamming code (2 weeks)

4. **Network models and Open System Interconnections**
Study of network models, OSI and OSI layers, Data Link protocols, network architecture and protocols, frame transmission methods, ISDN, DSL, and TCP/IP (2 weeks)

5. **Local Area Network devices, switching, and technology**
Characteristics of network devices; repeaters, bridges, routers, gateways, CSU/DSU, Ethernet LAN switching (classification, operations, and architecture), token ring and token bus networking, Ethernet, fast Ethernet, and frame relay. (2 weeks)

B. Typical Laboratory Experiments

Lab 1. Design, analyze, test, and simulation of PAM/PWM and PCM.

Lab 2. Design, analyze, test, and simulation of shift registers and bit splitting.

. Lab 3. Design, analyze, test, and simulation of FSK.

Lab 4. Design, analyze, test, and simulation of CRC.

Lab 5. Design, analyze, test, and simulation of Hamming code.

Lab 6. Design, analyze, test, and simulation TDM or FDM.

Lab 7. Demonstration of BER analysis and project presentation on networking related topics.

Lab 8. Demonstration of PCM using TIMS system and project presentation on networking related topics.

Lab 9. Final project presentation on networking related topics.

VI. Class/Laboratory Schedule

Lecture: Two 75 minute sessions per week.
Lab: One 3 hour session per week.

VII. Contribution of Course to Professional Component

Lecture: Students learn about signal conversion and digital signal transmission, digital signal modulation techniques, networking devices, switching, and technology, Ethernet, OSI layers, and TCP/I.

Lab: Students learn how to design, build, simulate, test, and troubleshoot the variety of circuits related to data communication topics such PCM, PWM, FSK, and CRC. They also learn how to write a technical report based on collected data. A wide range of measurement techniques is used in lab exercises including B2Spice, PSPICE, and TIMS system.

VIII. Evaluation of Students

The instructor evaluates outcomes using the following methods: homework assignment submittals, midterm and final exams, one-on-one discussions during office hours, laboratory experiments, and laboratory reports.

The student grades are typically based on the following factors: quizzes, homework, midterm exam and final Exam.

IX. Relationship of Course Objectives to Program Outcomes

	Program Outcomes										
Crse Obj	***(a)*** **Use of modern tools of discipl**	***(b)*** **Use of math, science, Engg & Tech**	***(c)*** **Do experi-ments**	***(d)*** **Dsn of sys & components**	***(e)*** **Work on teams**	***(f)*** **Do Tech probs**	***(g)*** **Eff Com**	***(h)*** **Life-long learn**	***(i)*** **Prof, ethics, social resps**	***(j)*** **Prof, soc, globl, diversity**	***(k)*** **Qual, Cont impr, timeliness**
1		X	X	X		X					
2		X	X	X		X					
3		X	X	X		X					
4	X	X	X	X		X					
5	X	X	X	X	X	X	X	X			