SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

Course Title: DATA COMMUNICATIONS

Course No.: CET222

Program: COMPUTER ENGINEERING

Semester: 4

Date: MAY, 1990

Author: TYCHO BLACK

New:____ Revision:__X_

APPROVED: L. Chrozette 90/05/08.

Chairperson Date

CET222

DATA COMMUNICATIONS

PHILOSOPHY/GOALS:

This course addresses the needs of the computer engineering technician to be well versed in both the practical and theoretical aspects of Data Communications. Asynchronous and synchronous communications, interface standards, protocols, modems, telephone system fundamentals, local area networks and computer network concepts are studied with many areas reenforced with practical lab activities.

METHOD OF ASSESSMENT:

4 WRITTEN TESTS (15% each)	60%
LAB REPORTS (5 at 7% each)	35%
QUIZZES (5 at 1% each)	5%

TEXTBOOK :

"DATA COMMUNICATIONS"

by William Schweber
(McGraw-Hill)

COURSE DURATION:

6 HOURS PER WEEK FOR 1 SEMESTER (15 WEEKS)

3 HOURS - LECTURE
3 HOURS - LAB

GRADING SCHEME
CET222

1. TESTS

Four written tests will be given at approximately 4 week intervals. Generally one week advance warning will be given for tests.

2. LAB REPORTS

The due date for assigned lab reports is one week after the date of completion of the lab. Lab reports not completed by the assigned due-date will be penalized by 25% for each week late. All lab reports must be individually submitted by each member of lab groups.

3. LAB ATTENDANCE

Satisfactory performance in regularly scheduled lab classes is essential for successful completion of this course. As a result, 1% of the final mark in this course will be deducted for each unauthorized absence from a scheduled lab period.

4. GRADING SCHEME

A+	90	-	100%	Outstanding achievement
A	80	-	89%	Above Average achievement
B	70	-	79%	Average Achievement
C	55	-	69%	Satisfactory Achievement

I Incomplete: Course work not complete at Mid-term. Only used at mid-term.

R Repeat

X A temporary grade that is limited to instances where special circumstances have prevented the student from completing objectives by the end of the semester. An X grade must be authorized by the Chairman. It reverts to an R if not upgraded in an agreed-upon time, less than 120 days.

4. UPGRADING OF INCOMPLETES

When a student's course work is incomplete or final grade is below 55%, there is the possibility of upgrading to a pass when the student's performance warrants it. Attendance and assignment completion will have a bearing on whether upgrading will be allowed. A failing grade on all tests will remove the option of any upgrading and an R grade will result. The highest grade on re-written tests or assignments will be 56%.

Where a student's overall performance has been consistently unsatisfactory, an R grade may be assigned without the option of make-up work.

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SPECIFIC OBJECTIVES: DATA COMMUNICATIONS

Students are expected to develop significant understanding of the following topics:

BLOCK 1: INTRODUCTION TO DATA COMMUNICATIONS (CHAP. 1,2)

1. Introduction to Communications concepts. (Chap. 1)
2. The nature of a communications channel. (Chap. 2)
3. Signal bandwidth and the nature of a "voice" channel.
4. Common carriers in Canada and data communications standards organizations.

BLOCK 2 THE DATA COMMUNICATIONS ENVIRONMENT (CHAP. 3,4,5,6)

1. Frequency domain description of signals.
2. Modulation techniques: Amplitude modulation, frequency modulation, phase modulation, multilevel modulation techniques such as QAM.
3. The nature of analog communications.
4. Multiplexing techniques: space-division multiplexing; frequency-division multiplexing and time-division multi-plexing. Multiplexing examples: CCITT standard group of voice channels; T1 1.544 Mbps TDM system.
5. Digital communications: advantages, sampling theorem, encoding schemes and multiplexing.
6. Communications media: twisted-wire pairs, coaxial cable, microwave, satellite links and fibre-optics.
7. The nature of noise, its measurement, and some cures for it.
8. Common-mode vs. differential mode transmission.

BLOCK 3: INTERFACE STANDARDS, THE TELEPHONE SYSTEM & MODEMS (CHAP. 8,9,10)

1. The RS-232C Interface standard.
2. The Intel 8250 UART, its registers, pins, operation and programming.
3. Other interface standards: RS-423, RS-422, RS-485.
4. The 20 mA current loop.
5. The telephone system, the standard telephone and the nature of telephone lines.
6. Private Branch Exchanges (PBX, PABX).
7. Modem operation and the specific characteristics of the following Bell modem types: Bell 103, Bell 212, Bell 202, Bell 209.
8. Other specialized modems, multiplexers and concentrators.

BLOCK 4 DATA LINK PROTOCOLS (CHAP. 7)

1. Data communications protocol requirements.
2. Asynchronous vs. synchronous systems.
3. Serial vs. parallel communications.
4. Dealing with errors: ARQ, "go-back-n" schemes. (p. 444)
5. Three examples of data link protocols:
   a) Bisync or BSC: a half-duplex character-oriented IBM protocol. This will include a study of the use of ASCII control codes.
   b) SDLC (Synchronous Data Link Control) IBM's full-duplex bit-oriented protocol.
   c) DDCMP (Digital Data Communications Message Protocol) DEC's byte-count oriented protocol.
6. The role of protocol converters.
7. File transfer protocols: Kermit, Xmodem.

BLOCK 5: LOCAL AREA NETWORKS:LANs (CHAP. 11)

1. The nature of Local Area Networks.
2. LAN Topologies.
3. Network access control methods for LANs.
4. Broadband vs. Baseband modulation.
5. ETHERNET LAN.
6. IBM Token Ring LAN.
7. Other LAN products.
8. Novelle Netware Network Operating system: Overview, capabilities, utilities and configuration.
9. The ISO OSI (Open System Interconnect) 7-layer Model for networks.
10. ISDN: An overview of Integrated Services Digital Network.

BLOCK 6: ERROR DETECTION, CORRECTION AND DATA SECURITY (CHAP.12,13)

1. The nature of data errors.
2. Horizontal and vertical parity checking.
3. Cyclic Redundancy Checking: CRC
4. Forward Error Correction techniques.
5. Data encryption and the DES: Data Encryption Standard.
6. Test techniques and equipment for troubleshooting data communications systems.