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: APRIL, 1991

Author: TYCHO BLACK

New:____ Revision:__X_

APPROVED: L P Chaput 91/04/30

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, communications software and terminal emulators, telephone system fundamentals, local area networks and wide area network concepts and the OSI 7-layer model for computer networks are studied with many areas reenforced with practical lab activities.

METHOD OF ASSESSMENT:

3 WRITTEN TESTS (20% each)	60%
LAB REPORTS (6 at 5% each)	30%
QUIZZES/ASSIGNMENTS	10%

[Some modification to this evaluation scheme may be required]

TEXTBOOK :

"DATA NETWORKS: CONCEPTS, THEORY AND PRACTICE"

by Uyless Black

(Prentice Hall)

COURSE DURATION:

6 HOURS PER WEEK FOR 1 SEMESTER (15 WEEKS)

EACH WEEK: 3 HOURS - LECTURE
3 HOURS - LAB

GRADING SCHEME
CET222

1. TESTS

Three written tests will be given at approximately 5 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 10% for each week late. All lab reports must be individually submitted by each member of lab groups. A minimum of 5 lab reports must be satisfactorily completed.

3. LAB ATTENDANCE

Satisfactory performance in regularly scheduled lab classes is essential for successful completion of this course. As a result, attendance will be taken and will be a factor in your lab evaluation. Unauthorized absence from scheduled lab periods should be discussed with your instructor.

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. This situation would apply if all tests were failed and an overall average of less than 40% has been achieved.

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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 1,9,12)

1. Basic components of a Data Communications system. (Chap.1)
2. The nature of Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE).
3. Serial vs. parallel communications.
4. The nature of asynchronous and synchronous transmission.
5. Simplex, Half duplex and Full duplex communication.
6. The nature of the EIA-232-C and -D serial interface standard: its interchange circuits, electrical and functional characteristics. (Chap. 9: pp. 307-329)
7. The Intel 8250 UART (Universal Asynchronous Receiver/ Transmitter), its registers, operation and programming as a component in a PC COM port. (This topic is covered in depth in a practical lab exercise.) (Chap. 12: pp.424-430)

BLOCK 2 THE DATA COMMUNICATIONS ENVIRONMENT (Chap.1,2,3,4)

1. Common carriers in Canada and data communications standards organizations. (Chap.1)
2. Signal bandwidth and the nature of a "voice" channel. (Chap.2)
3. Frequency domain description of signals. (Chap. 2)
4. The use of decibels to measure signal gain and loss; SNR (signal to noise ration) (Chap. 2)
5. Modulation techniques: Amplitude modulation, frequency modulation, phase modulation, multilevel modulation techniques such as QAM. (Chap. 3)
6. Digital communications: advantages, sampling theorem, digital coding schemes (NRZ, RZ, Manchester, AMI), and Pulse Code Modulation (PCM). (chap.3)
7. Communications media and their characteristics: twisted-wire pairs, coaxial cable, microwave, satellite links and fibre-optics. (Chap. 4)

BLOCK 3: THE TELEPHONE SYSTEM, IMPAIRMENTS, MULTIPLEXING AND DATA COMPRESSION, ERROR DETECTION AND MODEMS (Chap. 5,6,7,9)

1. The telephone system, the standard telephone and the nature of telephone lines. (Chap. 5)
2. Data Compression and encryption techniques. (Chap. 6)
3. Multiplexing techniques: frequency-division multiplexing (FDM) and time-division multiplexing (TDM). Multiplexing examples: The basic FDM group of voice channels; T1 1.544 Mbps TDM systems for voice and data. (Chap.6)
4. Statistical multiplexers and concentrators. (Chap. 6)
5. The nature of noise and transmission impairments, their measurement, and some cures. (Chap. 7)
6. Error detection and correction techniques: Echoplex, Horizontal and vertical redundancy checking (HRC and VRC or parity), Cyclic Redundancy Checking (CRC), Forward Error Correction techniques and TCM. (Chap. 7)
7. Modem operation and the specific characteristics of the following Bell modem types: Bell 103, Bell 212, Bell 202, Bell 209 and the CCITT V-series Modems. (Chap.9)
8. Physical layer interface standards: RS-423, RS-422, RS-449, X-series interfaces. (Chap. 9)
9. The 20 mA current loop.

BLOCK 4 NETWORK ARCHITECTURES AND LAYERED PROTOCOLS (Chap. 8,10,11)

1. The ISO OSI (Open System Interconnect) 7-layer Model for networks. The use of interfaces and protocols to enable orderly communication in a network. (Chap. 8)
2. Digital's Decnet 7-layer model. (Chap. 8)
3. Data Link layer Concepts and Functions. (Chap. 10)
4. Flow control, error control and sequencing techniques in data links. (Chap. 10)
5. Three examples of data link protocols: (Chap. 11)

   a) Bisync or BSC: a half-duplex character-oriented IBM protocol. This will include a study of the use of ASCII control codes.

   b) HDLC (High-Level Data Link Control) ISO's bit-oriented protocol.

   c) DDCMP (Digital Data Communications Message Protocol) DEC's byte-count oriented protocol.

BLOCK 5: LOCAL AREA NETWORKS:LANs (Chap. 20, 22)

1. The nature of Local Area Networks.
2. Broadband vs. Baseband LANs
3. LAN Topologies.
4. Network access control methods for LANs and their protocols: CSMA/CD, Token Ring, Token Bus.
5. Ethernet LANs.
6. IBM Token Ring LAN.
7. FDDI (Fiber Distributed Data Interface): high speed fiber optic networks.
8. Other LAN products and LAN hardware alternatives.
9. Novell Netware Networks: Overview, capabilities, utilities and configuration and management.

BLOCK 6: RELATED TECHNOLOGIES

[Time limitations may require this block to be deferred until CET314 in 6th semester.]

1. ISDN: An overview of Integrated Services Digital Network services. (Chap. 19)
2. PBX's: Private Branch Exchanges and their role in data communications. (Chap. 23)
3. Packet switching and the X.25 standard. (Chap. 13)