

TECHNOLOGY 471 - Digital and Data Communications

2007-08 Catalog Data: TECH 471 Digital and Data Communications (3 Credits)

Course Description: Coverage of modulation techniques, transmitters, and receivers in digital communication systems. Study of data communication codes, hardware, protocols, and error detection and correction techniques.

Prerequisite: Tech 378

Co-requisites: None

Textbook:

- Tomasi, Wayne, (2002). *Electronic Communications Systems: Fundamentals Through Advanced*, Prentice Hall.

References:

- Young, Paul, H., (1999) *Electronic Communication Techniques*, Fourth Edition, Prentice-Hall.

Instructor: Dr. Abul K. M. Azad

Office: Still Hall 203E

Office hours: *Tue*-9:00-10:00am; *Thu*- 9:00-10:00am; and *Fri*-11:00am to 1:00pm.

Phone: (815) 753-0386;

Email: azad@ceet.niu.edu

Course Meetings:

Objectives with relationship to ABET Outcomes:

1. Understanding of modulation techniques commonly used for digital communication area and their features. (A, B, C, and F)
2. Understanding of standards of data communication and communication hardware and their application. (A, B, C, F, and N)
3. Understanding of error control, synchronization and interfacing techniques along with their use in different application situations. (A, B, C, D, F, and N)
4. Understanding of commonly used digital transmission methods and their significance in digital communication systems. (A, B, C, D, F, and N)

Course Outcome Guideline:

- A. An appropriate mastery of the knowledge, techniques, skills and modern tools of their disciplines.

- B. An ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering, and technology.
- C. An ability to conduct, analyze and interpret experiments and apply experimental results to improve processes.
- D. An ability to apply creativity in the design of systems, components or processes appropriate to program objectives.
- E. An ability to function effectively on teams.
- F. An ability to identify, analyze and solve technical problems.
- G. An ability to communicate effectively in writing.
- H. An ability to communicate effectively orally.
- I. Recognition of the need for, and an ability to engage in lifelong learning.
- J. An ability to understand professional, ethical and social responsibilities.
- K. A respect for diversity and knowledge of contemporary professional, societal and global issues.
- L. A commitment to quality, timeliness, and continuous improvement.
- M. An ability to program computers and/or utilize computer applications effectively.
- N. An ability to use modern laboratory techniques, skills, and/or equipment effectively.
- O. An ability to manage projects effectively.
- P. An ability to design manipulate and managing industrial systems.
- Q. An ability to manage or lead personnel effectively.

Topics:

1. Digital communication methods;
2. Modulation techniques used for digital communication;
3. Data communication standards and systems;
4. Error control and synchronization;
5. Data communication hardware and interface methods;
6. Digital transmission methods and their significance.

Computer Usage:

Students will make use of MSWord and Power Points in the preparation of homeworks and reports during the period of this course.

Laboratory Projects:

There is no formal laboratory course associated with this. However, there will be couple of experiments students are going to perform within the course. The exercises will focus on the experimentation with modulation techniques they have learned though the lecture class.

Evaluation: The overall grading will be based on the following percentages

Attendance	5% (at least 60% attendance is necessary)
Incourse Exam 1	20%
Incourse Exam 2	20%
Homeworks and projects	30%
Final Exam	25%

Apart from the final examination all the examination and homework dates will be announced one to two weeks prior to the due date.

Detailed Course Outline

I Digital Communication

- Introduction
- Shanon limit for information capacity
- Digital amplitude modulation
- Frequency shift keying
- Phase shift keying
- Quadratic amplitude modulation
- Bandwidth efficiency
- Carrier recovery
- Differential phase shift keying
- Clock recovery
- Probability of error and bit error rate

II Data Communication

- Introduction
- History of data communication
- Standards organizations for data communication
- Data communication circuits
- Data communication codes
- Error control
- Synchronization
- Data communication hardware
- Serial and parallel interfaces

III Digital Transmission

- Introduction
- Pulse transmission
- Pulse code modulation
- Delta modulation PCM
- Adaptive delta modulation PCM
- Differential pulse code modulation
- Pulse transmission
- Signal power in binary digital signals

- SSB Transmitters and Receivers
- FM Demodulators
- Phase-Locked-Loop FM Demodulators
- Quadrature FM Demodulators
- FM Noise Suppression
- Linear Integrated Circuit FM Receivers

Course Policies:

Attendance will be recorded in every class. Late arrival in the class will not be allowed. If a student is absent it is his/her responsibility to obtain lecture notes, homework and any other information given during that absence.

Homeworks are expected to be completed and handed in “*on or before*” the due date. Late submission will not be accepted.

Academic Misconduct:

This is usually defined as “*Receipt or transmission of unauthorized aid on homeworks or examinations, plagiarism, unauthorized use of examination materials, or other forms of dishonesty in academic matters.*” Misconduct may also include inappropriate or disruptive behavior during the class meetings. This will NOT be tolerated and would affect your grade. For details please consult your student handbook.

If you have any question(s) related to academic matters and/or anything which effecting your performance in the class please do not hesitate to contact the instructor.

Grading Criteria:

<u>Marks obtained</u>	<u>Grade</u>
100 - 90%	A
89% - 80%	B
79% - 70%	C
69% - 60%	D

Final Exam date: Wednesday, December 10th 2003, 6:00 to 7:50pm (consult your Fall 2003 Class Schedule Book).