



Sirindhorn International Institute of Technology

Thammasat University

School of Information, Computer and Communication Technology

## ECS 452: Course Syllabus

**Semester/Year:** 1/2014

**Course Title:** Digital Communication Systems

**Instructor:** Asst. Prof. Dr.Prapun Suksompong ([prapun@siit.tu.ac.th](mailto:prapun@siit.tu.ac.th))

**Course Web Site:** <http://www2.siiit.tu.ac.th/prapun/ecs452/>

*Please check the course web site regularly* for updated information about this course.

### Lectures

Time and Place:

- Monday 10:40-12:00 BKD 3509
- Wednesday 13:00-14:20 BKD 3511

You are STRONGLY encouraged to attend lectures. (See the grading policy below.)

**Prerequisite:** ECS 332 or consent of Head of School

**Course Description:** The subject of digital communications involves the transmission of information in digital form from a source that generates the information to one or more destinations. This course extends the knowledge gained from ECS332 (Principles of Communications) and ECS315 (Probability and Random Processes). Basic principles that underlie the analysis and design of digital communication systems are covered. This semester, the main focus includes performance analysis (bit error rates), optimal receivers, and limits (information theoretic quantities). These topics are challenging but the presented material are carefully selected to keep the difficulty level appropriate for undergraduate students.

**Textbook:** John Proakis and Masoud Salehi, Digital Communications, 5th Edition, McGraw-Hill, 2007.

### More References:

1. Robert G. Gallager, Principles of Digital Communications, Cambridge University Press, 2008.
2. Bernard Sklar, Digital communications: fundamentals and applications, Prentice Hall, 2001
3. Ha H. Nguyen and Ed Shwedyk, A first course in digital communications, Cambridge University Press, 2009

**Grading Policy:** Coursework will be weighted as follows:

|                                       |            |
|---------------------------------------|------------|
| Assignments                           | 5%         |
| Quizzes and In-Class Exercises        | 5%         |
| <b>Class Discussion/Participation</b> | <b>10%</b> |
| Midterm Examination                   | 40%        |
| Final Examination (comprehensive)     | 40%        |

- No late assignments will be accepted.
- Cheating will not be tolerated
- Copying homework/quiz/exam = cheating
  - Punishment:
    - First time cheater receives zero on that assignment
    - Second time cheater receives zero on all quizzes and/or HWs

**Assignments:** Homework will be assigned throughout the semester. For each assignment, only part(s) of a selected problem will be graded. Of course, you do not know which problem will be selected; so you should work on all of them. The complete solutions to all problems will be posted on the course web site.

### **Quizzes and Exams:**

Exams will be closed book.

Quizzes will test current and previous topics. A quiz may be given at any time during any class period – at the beginning or end of a class, etc. There will be no make-up quizzes. Quizzes will be given only to those students who are present when the quizzes are passed out.

**Students should notify the instructor before missing any exam if at all possible and immediately thereafter when not possible.** The instructor (and/or the fact-finding committee) will determine if the absence from an exam is legitimate. Simply not feeling well is not a reason to miss an exam. In the case of legitimate absence, an oral and/or written make-up exam could be arranged.

**Expectations:** You should expect to spend extra 5-8 hours per week studying outside of class. However, I do expect you to come to class and participate actively in class discussions. If you must miss a class, I expect you to find out and catch up with what happened in lecture, either from me or one of your classmates. You are responsible for all materials that are discussed in class.

### **Academic Integrity**

The work you submit in ECS 452 is expected to be the result of your individual effort. You are free to discuss course material, approaches to problems with your colleagues or the instructor but you should never misrepresent someone else's work as your own.

It is your responsibility to protect your work from unauthorized access. For example, do not discard copies of your codes/assignments in public places.

## **Course Outline**

The following is a tentative list of topics.

1. Elements of a Digital Communication System
2. Source Coding and Entropy
3. Optimal Detection for Discrete Channels
4. Mathematical Models for Physical Communication Channels
5. PAM: A Digital Modulation Scheme
6. Signal Space Representation of Waveforms
7. Constellations for Digital Modulation Schemes
8. Optimal Detection for Additive Noise Channels: 1-D Case
9. Optimal Detection for Additive Noise Channels: K-D Case
10. Random Processes and White Noise
11. Optimal Detection for Waveform Channels
12. Mutual Information and Channel Capacity
13. Channel Coding methods for error detection and correction.
14. An Introduction to Multiple-antenna system

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