

Midterm Exam

- Check the course website regularly for breaking news about the midterm.
- To save time, read the cover page posted on the course website before going into the exam room.
- Closed book. Closed notes.
- One A4 **page** allowed.

ECS 452: Digital Communication Systems

Synopsis

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 (symbol error probability), 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.

Announcements

- **Information regarding the midterm exam** [Posted @ 2:30PM on Mar 6]
 - Check this course website regularly for breaking news about the midterm.
 - Date: March 16, 2017
 - TIME: 9:00-11:00
 - ROOMS: BKD 2506, 2401
 - Information about the midterm exam:
 - 8 pages (including the cover page)
 - To save time, read the cover page posted here before going into the exam room.
 - 9+1 = 10 questions. (10+3+10+7+13+3+9+4+7+1 = 67 pt)
 - Cover all the materials that we discussed in class and practice in the HWs.
 - Material Distribution (score-wise): 30 (CH2) + 20 (CH3) + 16 (CH4)

Grading System

- Coursework will be weighted as follows:

Assignments	5%
Class Discussion	5%
In-Class Exercises	10%
Midterm Examination	35%
Final Examination (comprehensive)	45%

Midterm Exam

- ECS 452
 - Date: March 16, 2018 (Friday)
 - TIME: 9:00-11:00
 - ROOMs: BKD 2506, 2401

Cover page

- Posted
- To save time, read it before going into the exam room.

Name.....ID.....Section.....1.....Seat No.....



Sirindhorn International Institute of Technology
Thammasat University

Midterm Examination: Semester 2 / 2017

Course Title: ECS452 Digital Communication Systems

Instructor: Asst. Prof. Dr.Prapun Suksompong

Date/Time: March 16, 2018 / 9:00-11:00

Instructions:

- This examination has....8....pages (including this cover page).

➤ Conditions of Examination:

<input type="checkbox"/> Open book	<input type="checkbox"/> No dictionary	<input type="checkbox"/> No calculator	<input type="checkbox"/> Calculator allowed
<input type="checkbox"/> Closed book	<input type="checkbox"/> No dictionary	<input type="checkbox"/> No calculator	<input type="checkbox"/> Calculator allowed
<input checked="" type="checkbox"/> Semi-Closed book (.....1.....sheet(s)	<input checked="" type="checkbox"/> 1 page	<input type="checkbox"/> both sides of A4 paper note)	
<small>These sheets must be hand-written. They should be submitted with the exam. Do not modify (e.g., add/underline/highlight) content on the sheet inside the exam room. Indicate your name and ID in the upper-right corner of the sheet (in portrait orientation).</small>			
	<input type="checkbox"/> No dictionary	<input type="checkbox"/> No calculator	<input checked="" type="checkbox"/> Calculator allowed
<input type="checkbox"/> Other:.....			

- **Read these instructions and the questions carefully.**
- Students are not allowed to be out of the examination room during examination. Going to the restroom may result in score deduction.
- Turn off all communication devices (mobile phone, etc.) and place them with other personal belongings in the area designated by the proctors or outside the test room.
- Write your name, student ID, and seat number clearly in the spaces provided on the top of this sheet. Then, write your **first name and the last three digits of your ID** in the spaces provided on the top of each page of your examination paper, starting from page 2.
- The examination paper is not allowed to be taken out of the examination room. Also, do not remove the staple. Violation may result in score deduction.
- Unless instructed otherwise, **write down all the steps** that you have done to obtain your answers.
 - When applying formula(s), state clearly which formula(s) you are applying before plugging-in numerical values.
 - You may not get any credit even when your final answer is correct without showing how you get your answer.
 - Formula(s) not discussed in class can be used. However, derivation must also be provided.
 - **Exceptions:**
 - Problems that are labeled with “ENRPr” (Explanation is not required for this problem.)
 - Parts that are labeled with “ENRPa” (Explanation is not required for this part.)These problems/parts are graded solely on your answers. There is no partial credit and it is not necessary to write down your explanation. Usually, spaces (boxes or cells in a table or rows of dashes) will be provided for your answers. “WACSP” stands for “write your answer(s) in the corresponding space(s) provided”.
- The back of each page will **not** be graded; it can be used for calculations of problems or parts that do not require explanation (indicated by the label ENRPr or ENRPa).
- When not explicitly stated/defined, all notations and definitions follow ones given in lecture.
- Some points are reserved for *accuracy* of the answers and also for reducing answers into their *simplest* forms. Watch out for roundoff error. The error in your final answer should not exceed 0.1%.
- Points marked with * indicate challenging problems.
- Do not cheat. Do not panic. **Allocate your time wisely.**
- Don't forget to submit your first online self-evaluation form by the end of today.

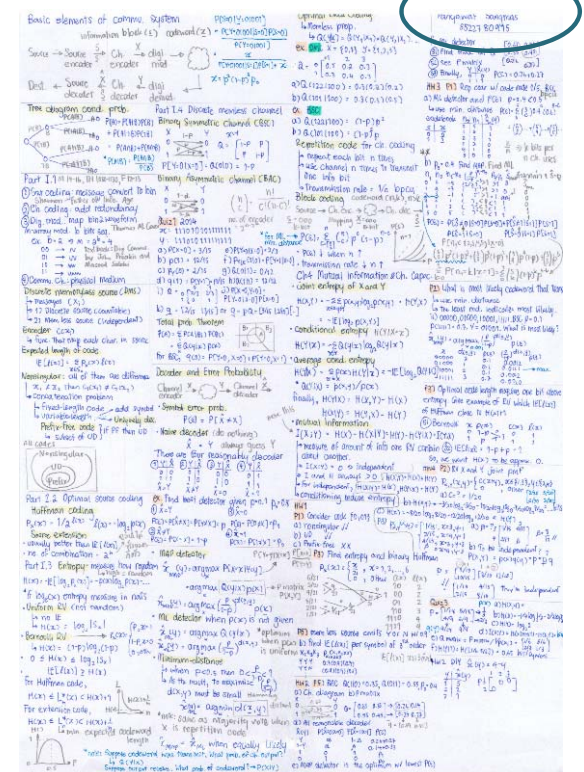
Some Instructions from the cover page

- Unless instructed otherwise, write down all the steps that you have done to obtain your answers.
- When applying formula(s), state clearly which formula(s) you are applying before plugging-in numerical values.
 - You may not get any credit even when your final answer is correct without showing how you get your answer.
 - Formula(s) not discussed in class can be used. However, derivation must also be provided.
 - **Exceptions:**
 - Problems that are labeled with “**ENRPr**” (Explanation is not required for this problem.)
 - Parts that are labeled with “**ENRPa**” (Explanation is not required for this part.)
 - These problems/parts are graded solely on your answers. There is no partial credit and it is not necessary to write down your explanation. Usually, spaces (boxes or cells in a table or rows of dashes) will be provided for your answers. “**WACSP**” stands for “write your answer in the corresponding space provided”.
- Watch out for roundoff error.
In general, the error in your final answer should not exceed 0.1%.

This information is posted on the course website.

Midterm Exam: One A4 page

- Must be hand-written in your own handwriting.
- No extra pieces of paper notes glued/attached on top of it.
- Indicate your name and ID on the upper right corner of the sheet (in portrait orientation).
- Do not modify (, e.g., add/underline/highlight) content on the sheet inside the exam room.
- **Make sure that another side is blank. This will be used for the final exam.**
- Submit your A4 sheet with your exam. (You will get it back before the final exam.)
- Q: I don't need any formulas. What should I do?
A: Bring in and submit a blank sheet of paper with your name and ID. Note that you can still only use one side on the final exam.
- Violating the above instructions will cost you 10 pt.



ECS 452 Midterm Exam: Tentative Info

- 8 pages (including the cover page)
- $9+1 = 10$ questions. ($10+3+10+7+13+3+9+4+7+1 = 67$ pt)
- Cover all the materials that we discussed in class and practice in the HWs.
- Material Distribution (score-wise):
 30 (CH2) + 20 (CH3) + 16 (CH4)

Preparation

- In-class exercises
- 2016 Exam
- HW
 - Don't forget that we have one free HW whose content is still useful for the exam.
- Lecture notes



The First Self-Evaluation Form

- Record what you have done.
- Due: March 16

ECS 452: Self-Evaluation (1)

1. The class participation score for this class is judged by how much you actively participate in the class discussion both inside and outside of the classroom.
2. Please honestly answer the following questions. Please provide as much information as possible.
3. A link is provided after submission so that you can come back and edit your own response later.

Name

Student ID

How many times have you participated (provided comments, asked questions, answered questions, etc) in the lectures? Be specific. Provide some short description for each event. Number alone does not count.

How many times have you correctly informed the instructors the typo or mistake on the whiteboard/slides/hw/etc? Provide short description for each of the issues.

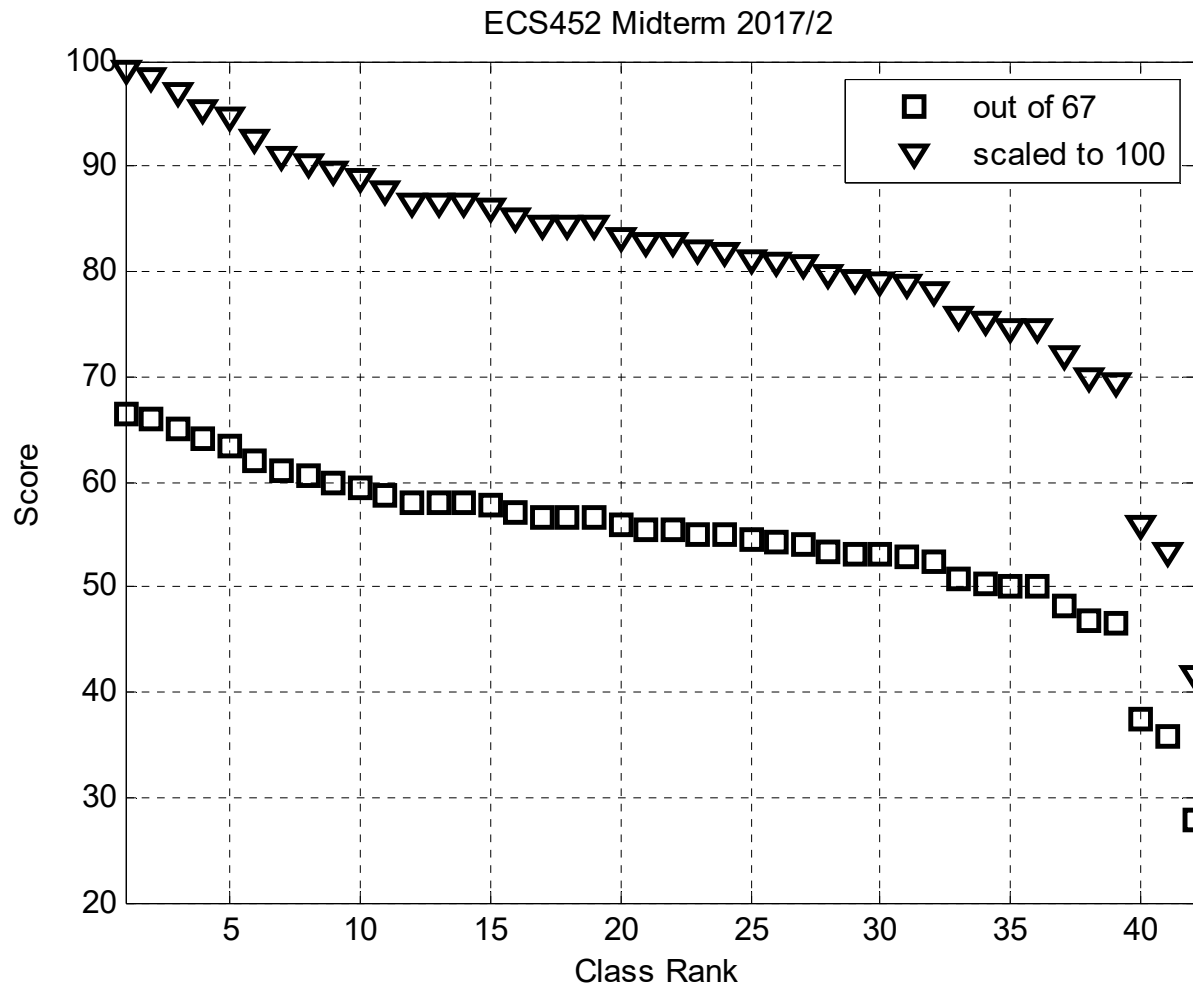
How many times have you discussed with the instructor outside of class? (Ask questions, express concerns, etc.) Be specific. Number alone does not count.

Grading System

- Coursework will be weighted as follows:

Assignments	5%
Class Discussion	5%
In-Class Exercises	10%
Midterm Examination	35%
Final Examination (comprehensive)	45%

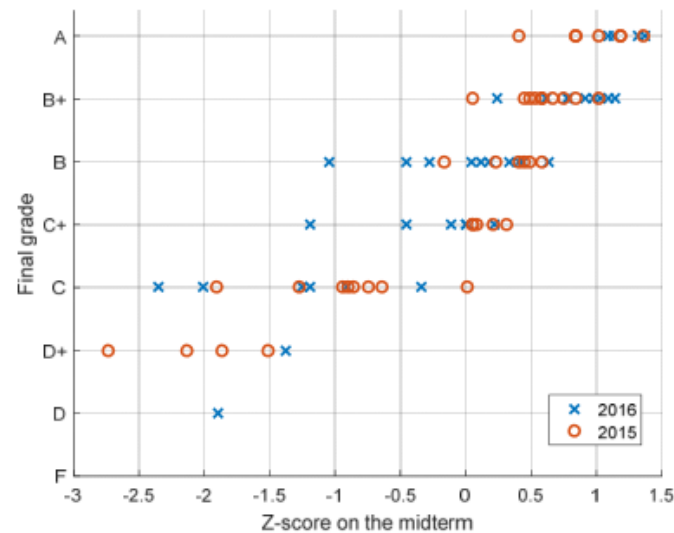
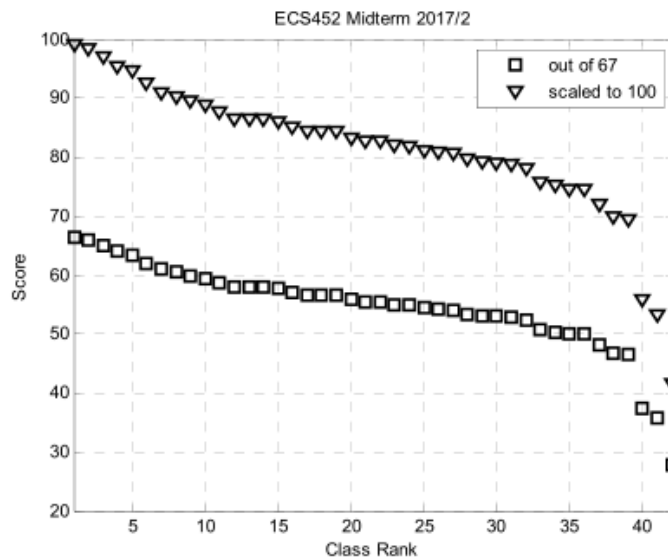
ECS452 Midterm 2017/2



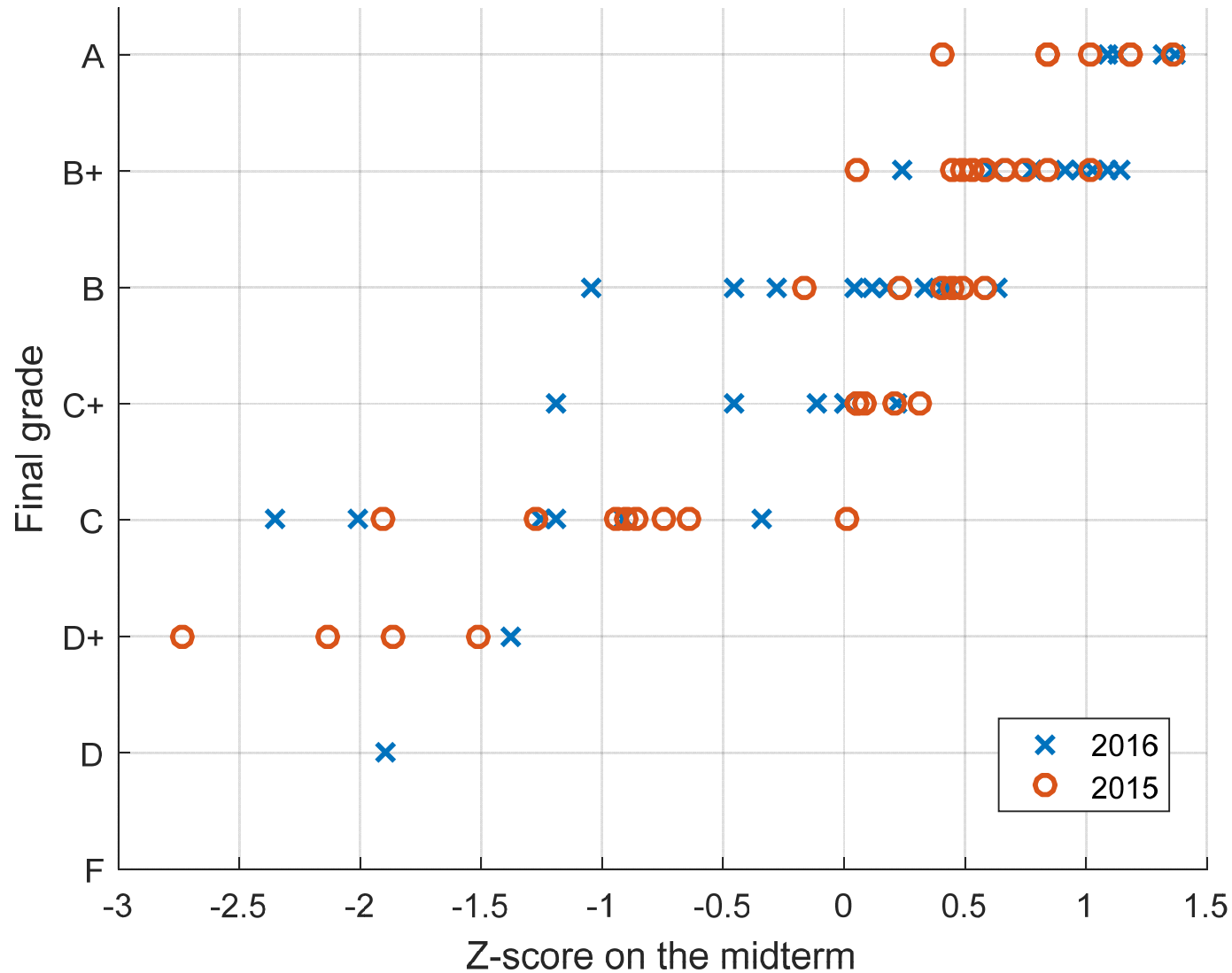
Average	81.5 / 100
Standard Deviation	11.5 / 100

Reading the cover page

Name	
ID	
Score (out of 67)	66.5
Score (out of 100)	99.3
Class Rank	1
Z-score	1.5
Class Average (out of 67)	54.6
Class Average (out of 100)	81.5
Standard Deviation (out of 100)	11.5



2015 and 2016 Information



Reading the graded exam

- Based on subtraction out of the full score (67).
- See the red circled numbers for the subtracted scores on each page.
- “OK” usually means your answer is incorrect but points are not deducted.

Problem 2. (3 pt) Consider two codes (for source coding) below.

Codebook for Code C:						Codebook for Code D:					
x	e	l	m	n	o	x	e	l	m	n	o
$c(x)$	00	01	010	011	1100	$c(x)$	0	001	0101	1101	11

(a) (1* pt) Is code C uniquely decodable? If yes, explain how to decode any encoded string. If no, give an example of an encoded string that is not uniquely decodable.

~~Yes~~ because the start and the next source can be separate to find the string ends.

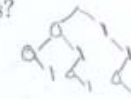
-2

(b) (1 pt) [ENRPa] Is code D uniquely decodable?

NO ~~X~~

(c) (1 pt) [ENRPa] Is code D instantaneous?

~~Not instantaneous~~



Problem 3. (10 pt) Consider a random variable X which has five possible values. Their probabilities are shown in the table below.

x	$p_X(x)$	Codeword $c(x)$	$\ell(x)$
e	0.42	000 OK	3 ✓
l	0.17	0010 OK	4
m	0.08	1011 X	4
n	0.08	01 OK	2
o	0.25	1 OK	1

-3

-1

OK.

1-3