

Mobile Communications

TCS 455

Dr. Prapun Suksompong

prapun@siit.tu.ac.th

Lecture 1

Office Hours:

BKD 3601-7

Tuesday 14:00-16:00

Thursday 9:30-11:30

Course Organization

- **Course Web Site:**

<http://www.siit.tu.ac.th/prapun/ecs455/>

- **Lectures:**

- **Tuesday 10:40-12:00 BKD 2601**
- **Thursday 13:00-14:20 BKD 3215**

- **Textbook:**

- **Wireless Communications: Principles and Practice**

- By Theodore S. Rappaport
- 2nd Edition, Prentice Hall PTR, 2002.
- ISBN-13: 978-0130422323.
- Call No. TK5103.2 R37 2002
- Companion Site:

<http://authors.phptr.com/rappaport/>

Wireless Communications: Principles and Practice, 2nd Edition

about | [downloads](#) | [updates](#) | [more info](#)



Theodore Rappaport
Cloth, 736 pp.
ISBN: 0130422320
Published: DEC 31, 2001
[Purchase Online](#)

About the Site

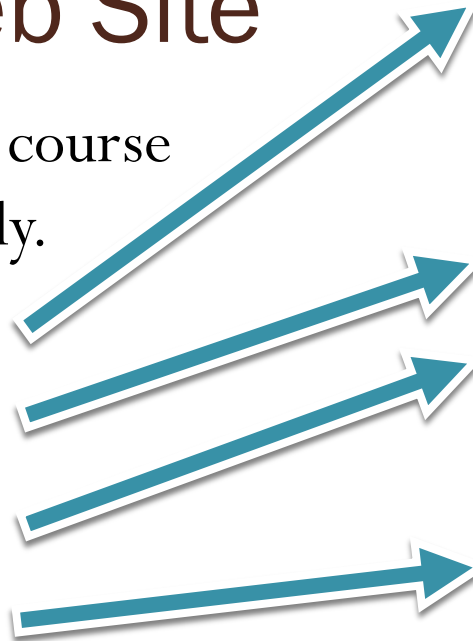
This site contains material supplemental to *Wireless Communications: Principles and Practice, 2nd Edition*, including:

- [downloadable PowerPoint slide presentations](#) for use in classroom instruction
- [updates for the several printings](#) of this title
- [links to related books and newsletters](#), including links specially selected by Dr. Rappaport

If you do not currently own *Wireless Communications: Principles and Practice, 2nd Edition*, you can [purchase a copy](#) through our online catalog.

Course Web Site

- Please check the course Web site regularly.
- Announcement
- References
- Handouts/Slides
- Calendar
 - Exams
 - HW due dates



www.siiit.tu.ac.th/prapun/ecs455/

TCS455: Mobile Communications

Synopsis
The course provides an introduction to mobile communications system principles, design and technology.

Announcements

- Welcome to TCS455! Feel free to look around this site. However, please keep in mind that it is still **under construction**. All posted information and documents are subject to change. [Posted @ 11 AM on Oct 22]

General Information

- **Instructor:** [Dr. Prapun Suksompong](mailto:prapun@siit.tu.ac.th) (prapun@siit.tu.ac.th)
- [Course Syllabus](#).
- [Class information](#)
- **Office Hours**
 - TEA
Room: BKD3601-7
 - **Please feel free to ask any question or express any concern after class.**
- **Required Textbook:** Theodore S. Rappaport, *Wireless Communications- Principles and Practice*, 2nd Edition, Prentice Hall PTR, 2002. ISBN-13: 978-0130422323. Call No. TK5103.2 R37 2002
- **References**
 - G. L. Stueber, *Principles of Mobile Communication*, 2nd Ed., Norwell, MA: Kluwer, 2001.
 - John G. Proakis, *Digital communications*, 4th ed., Boston : McGraw-Hill, c2001.

Handouts and Course Material

- [Fourier Transform and Communication Systems](#).

Problem Set

-

Calendar

Today	Mon	Tue	Wed	Thu	Fri	Sat	Sun
	28	29	30	Oct 1	2	3	4
	5	6	7	8	9	10	11
	12	13	14	15	16	17	18
	19	20	21	22	23	24	25
	26	27	28	29	30	31	Nov 1

Events shown in time zone: Bangkok

Reading Assignment

- Chapter 1:
-

Course Outline

- Basic communication systems (review)
- Multiple access schemes: FDMA, TDMA, CDMA
- Cellular communications, Principles of cellular radio
- Duplexing: TDD vs FDD
- Multi-carrier and OFDM systems
- **MIDTERM:** 24 Dec 2009 TIME 13:30 - 16:30
- Application: Spread Spectrum Communications (DSSS, FHSS, GPS)
- Application: WIMAX and 802.11n
- Application: GSM, UMTS (W-CDMA)
- Mobile radio propagation and channel modelling, Diversity, Equalization, Channel coding
- If time permitted: Multiuser detection, space time coding
- **FINAL:** 4 Mar 2010 TIME 13:30 - 16:30

Misc. Links

-

Grading System

- Coursework will be weighted as follows:

Assignments	5%
Class Participation and Quizzes	15%
Midterm Examination •09:00 - 12:00 on Dec 22, 2009	40%
Final Examination (comprehensive) •09:00 - 12:00 on Mar 9, 2010	40%

- Mark your calendars now!
- Late HW submission will be rejected.
- All quizzes and exams will be closed book.
- For grad. student, this is 2/3 of your final score.

Class Participation

- NOT the same as class attendance!
- If you come only to **receive**, you will fall **asleep**.
- Need **interaction** between lecturer and students.
- **Ask question** when there is something that you don't understand.
 - It is very likely that your friends don't understand it as well.
- If you already understand what I'm presenting, **SHOW ME!**
 - Point out the errors/typos.
 - I will raise many issues/questions in class. Try to comment on them.
- Don't be shy!

Policy

- We will start the class **on time** and will finish **on time**.
 - 7 min late = absence.
 - Raise your hand and tell me immediately if I go over the time limit.
 - Does NOT mean that I will leave the room immediately after lecture.
 - I will stay and answer questions.
- Mobile phones *must* be set to the silent mode.
- We may have some pop quizzes (without prior warning or announcement) and many in-class activities.
- Attendance and pop quizzes will be taken/given irregularly and randomly.
- Cheating will not be tolerated.

Policy (con't)

- Class participation is highly encouraged.
 - It does not mean simply sitting quietly in the class.
 - Feel free to stop me when I talk too fast or too slow.
 - Ask question! Don't be shy!
 - If you don't understand something, there is a good chance that your friends do not understand as well.
- You may be called upon to complete exercises in front of the class at any time.
 - Emphasis on EFFORT and METHODOLOGY, not right or wrong answers.
- I will surely make some mistakes in lectures / HWs / exams
 - Some amount of class participation scores will be reserved to reward the first student who inform me about each of these mistakes.

More Policy

- Get some help!
 - Do not wait until the final exam time or after the grade is out
- Office Hours (BKD-3601)
 - **Tuesday 14:00-16:00**
 - **Thursday 9:30-11:30**
 - Appointment can be made if needed.
 - Feel free to come to my office and chat!
 - Don't be shy
- You may also ask question(s) after class.
- Points on quizzes/ exercises/ exams are generally based on your entire solution, not your final answer.
 - You can get full credit even when you have the wrong final answer.
 - You may get zero even when you write down a right answer without justification.

Warning

- This class can be difficult if you don't keep up with the lectures
- I will **evaluate** your understanding of the course **regularly** through
 - In class problems/activities where you (or your group) are asked to answer short questions in front of the class
 - Quizzes
 - Exams



Calendar

Lecture

M	T	W	R	F		
			29-Oct-09	30-Oct-09	31-Oct-09	1-Nov-09
2-Nov-09	3-Nov-09	4-Nov-09	5-Nov-09	6-Nov-09	7-Nov-09	8-Nov-09
9-Nov-09	10-Nov-09	11-Nov-09	12-Nov-09	13-Nov-09	14-Nov-09	15-Nov-09
16-Nov-09	17-Nov-09	18-Nov-09	19-Nov-09	20-Nov-09	21-Nov-09	22-Nov-09
23-Nov-09	24-Nov-09	25-Nov-09	26-Nov-09	27-Nov-09	28-Nov-09	29-Nov-09
30-Nov-09	1-Dec-09	2-Dec-09	3-Dec-09	4-Dec-09	5-Dec-09	6-Dec-09
7-Dec-09	8-Dec-09	9-Dec-09	10-Dec-09	11-Dec-09	12-Dec-09	13-Dec-09
14-Dec-09	15-Dec-09	16-Dec-09	17-Dec-09	18-Dec-09	19-Dec-09	20-Dec-09
21-Dec-09	22-Dec-09	23-Dec-09	24-Dec-09	25-Dec-09	26-Dec-09	27-Dec-09
28-Dec-09	29-Dec-09	30-Dec-09	31-Dec-09	1-Jan-10	2-Jan-10	3-Jan-10
4-Jan-10	5-Jan-10	6-Jan-10	7-Jan-10	8-Jan-10	9-Jan-10	10-Jan-10
11-Jan-10	12-Jan-10	13-Jan-10	14-Jan-10	15-Jan-10	16-Jan-10	17-Jan-10
18-Jan-10	19-Jan-10	20-Jan-10	21-Jan-10	22-Jan-10	23-Jan-10	24-Jan-10
25-Jan-10	26-Jan-10	27-Jan-10	28-Jan-10	29-Jan-10	30-Jan-10	31-Jan-10
1-Feb-10	2-Feb-10	3-Feb-10	4-Feb-10	5-Feb-10	6-Feb-10	7-Feb-10
8-Feb-10	9-Feb-10	10-Feb-10	11-Feb-10	12-Feb-10	13-Feb-10	14-Feb-10
15-Feb-10	16-Feb-10	17-Feb-10	18-Feb-10	19-Feb-10	20-Feb-10	21-Feb-10
22-Feb-10	23-Feb-10	24-Feb-10	25-Feb-10	26-Feb-10	27-Feb-10	28-Feb-10
1-Mar-10	2-Mar-10	3-Mar-10	4-Mar-10	5-Mar-10	6-Mar-10	7-Mar-10
8-Mar-10	9-Mar-10	10-Mar-10	11-Mar-10	12-Mar-10	13-Mar-10	14-Mar-10
15-Mar-10	16-Mar-10	17-Mar-10	18-Mar-10	19-Mar-10	20-Mar-10	21-Mar-10
22-Mar-10	23-Mar-10	24-Mar-10	25-Mar-10	26-Mar-10	27-Mar-10	28-Mar-10

Exam

Our Methodology

- Use **simple** models to understand ideas.
- Engineering deals with approximations and judgment calls based on multiple simple models.
- By now, you may notice that the problems that we work on everywhere in engineering are toy problems.
 - We work on them because we want to understand some aspects of the real problems.
 - We study one aspect, then we study another aspect, and so on.
 - It's a way to understand little piece of reality.
 - After you have all of the pieces in your mind, you then start to study the real engineering problems.

Simple?

- What do I mean by something being simple?
- I will sometimes say that something is very simple and I may offend many of you to whom it's not simple.
- The point is something becomes simple after you understand it.
 - Nothing is simple before you understand it.
- So, when I say that something is simple, what I mean is if you think about it long enough it will become simple.
 - It's not simple to start with.
 - Other things are just messy.

Course Outline

1. Basic communication systems (review)
2. Multiple access schemes: FDMA, TDMA, CDMA
3. Cellular communications, Principles of cellular radio
4. Duplexing: TDD vs FDD
5. Multi-carrier and OFDM systems
6. **MIDTERM:** 22 Dec 2009 TIME 09:00 - 12:00
7. Application: Spread Spectrum Communications (DSSS, FHSS, GPS)
8. Application: GSM, UMTS (W-CDMA)
9. Application: WiMAX and 802.11n
10. Mobile radio propagation and channel modelling, Diversity, Equalization, Channel coding
11. MIMO/SDMA
12. If time permitted: Multiuser detection, space time coding
13. **FINAL:** 9 Mar 2010 TIME 09:00 - 12:00

Mobile?

- The term “mobile” has historically been used to classify all radio terminal that could be moved during operation.
- More recently,
 - the term mobile is used to describe a radio terminal that is attached to a high speed mobile platform
 - e.g., a cellular telephone in a fast moving vehicle
 - the term portable is used to describes a radio terminal that can be hand-held and used by someone at walking speed
 - e.g., a walkie-talkie or cordless telephone inside a home.
 - 802.11?

Reading Assignment

- Read Chapter 1 of Rappaport.
- Don't pay too much attention to details

Prerequisite

- Frequency domain analysis (Fourier transform)
- Principles of Communications (TCS332)
- Probability
- MATLAB

Class Exercise

- Separate into groups of 5 persons.
- Each group will present what you have learned and still remember from TCS332.
- First, you have 6 minutes of group discussion.
- The presentation is 3 minutes for each group.
- Note: the groups that present later can't present the same material that earlier groups have already presented.