



THE UNIVERSITY OF
NEW SOUTH WALES

SCHOOL OF ELECTRICAL ENGINEERING
AND TELECOMMUNICATIONS

TELE4651

Wireless Communication Technologies

S2, 2008

Lecturer:

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Course information

This is an advanced course in telecommunications, providing detailed knowledge of the fundamental concepts in wireless communications and in-depth discussions on several selected areas, namely, error control methods, antenna diversity techniques, wideband transmissions. This course is a professional elective offered in the Telecommunication option. It assumes basic competency in the second year electronics and systems courses and the third year TELE3113 Introduction of Analogue and Digital Communications, and requires a mathematical ability of at least up to second year.

Course Objectives

At the end of this course the student:

- be familiar with wireless channel models and the effects of fading on the transmitted signals.
- have developed an understanding of various diversity techniques.
- have developed an understanding of error control methods for wireless channels.
- have developed an understanding of wideband transmission technologies.

Lecture Times

Friday 13-15, EEG25

Tutorials

A tutorial must be attended every second week. Please come to your enrolled tutorial, as room sizes are restricted. The tutorial sheets will be distributed by the lecturer. Tutorials begin in week 2.

Monday 16-18, MechEng402
Wednesday 13-15, MechEng403

Laboratory

The laboratories are all in EE322, performed on PCs with MATLAB. Preparation is essential before each laboratory, and there will be an assessment for your preparation at the start of each lab, mainly to check whether you have prepared your programs for each lab.

Lab Times can be found in school website:

Please come to the lab time you are enrolled in.

The Labs must be attended every second week starting from week 2. There are 5 labs to complete in total, and students must get marked by a demonstrator before the end of each lab session. A satisfactory performance in the lab component is a requirement of passing this course.

Laboratory Experiments:

Lab No	Week	Experiment
0	2,3	Matlab warm up
1	4,5	Communication System Simulation
2	6,7	Wireless System simulation
3	8,9	Diversity Techniques
4	11,12	Space-Time Coding

Assessment

Labs:	20%	(at 4 marks for each of labs 0-4)
Lab preparation:	5%	(at 1 mark for each of labs 1-4)
One Class Test:	25%	(In the lecture, TBA)
Project 1:	25%	(MIMO Receiver, TBA)
Project 2:	25%	(OFDM system, TBA)

Academic honesty and plagiarism

Plagiarism is a serious issue at UNSW. Students should all be familiar with the university wide policy for plagiarism and academic honesty. This can be found at www.lc.unsw.edu.au/plagiarism.

Syllabus

Wireless Communications Channels: time-variant multipath fading, Doppler shift, fade rate, shadowing effect, time selective channel, frequency selective channel, the effects of fading on wireless transmission, performance analysis. Digital Transmission over Fading Channels: performance analysis, burst-error correcting codes for fading channels, convolutional codes, soft output Viterbi algorithm, coded modulation, turbo principles, iterative processing, space diversity, time diversity and frequency diversity techniques. Wideband Transmissions: spread-spectrum communications, DS-CDMA, frequency hopping, OFDM techniques, their applications.

Resources for students

- Comprehensive lecture and tutorial notes on all material will be distributed.

Reference Textbook:

[1] Simon Haykin and Michael Moher, "Modern Wireless Communications", Pearson Prentice Hall, 2005

[2] M. D. Yacoub, *Foundations of Mobile Radio Engineering*, CRC Press, 1993.

[3] Simon Haykin, *Communication Systems*, 4th Edition John Wiley & Sons, 2001.

[4] Gordon L. Stuber, *Principles of Mobile Communication*, Boston, MA: Kluwer Academic Publishers, 1996.

[5] Theodore S. Rappaport, *Wireless Communications: Principles and Practice*. Upper Saddle River, NJ: Prentice-Hall, 1996.

Attendance

Above 75%

Special consideration:

Following the university policy, but if attendance is below 75%, the lecturer in charge may not consider your application.

Consultation Times

A/Prof Jinhong Yuan (the subject coordinator) will be the lecturer for this subject. In addition, I am also the subject coordinator and lecturer in another subject. As a result,

I will generally be available for consultation during and for the one hour, between 15 and 16, just after the lectures. Please confine your consultation needs to these time slots.

There will usually be a number of students who want to know the answer to your question. Hence, all consultation sessions will be open.

Email communication should be restricted to individual personal issues relating to assessment. Eg., I have been involved in an accident and cannot make today's quiz.

I will not reply to inappropriate questions such as "What is in the exam?"

Possible project topics

CDMA (Rake receiver, interference cancellation)

OFDM

Multipath channels

MIMO BLAST compare with Alamouti scheme