電工實驗(通信專題) Communication Systems Laboratory

Introduction

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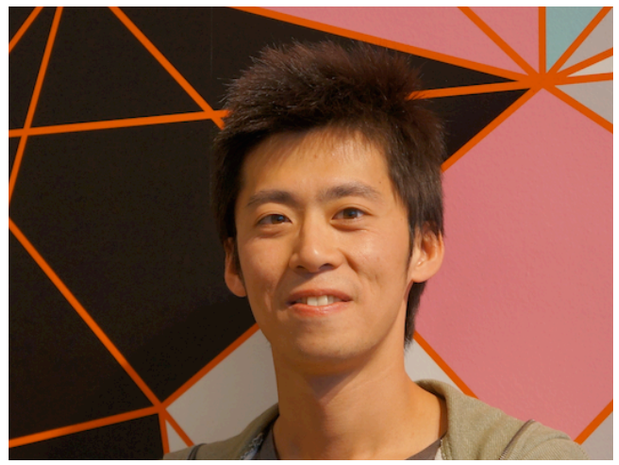
(this presentation will be posted on the course website)

About the Course

Logistics

Lecturer 王奕翔



email ihwang@ntu.edu.tw

office 明達館524室

office hour 週一週二 5 – 6pm

Teaching Assistants

周柏均

email & office hours:

d02942012@ntu.edu.tw

週四 8 – 9pm, MD-331

黃騰輝

email & office hours:

r04942057@ntu.edu.tw

週二 8 – 9pm, MD-331

Time 週三9:10 – 12:10 (234節)

Location 電機二館141室

Textbook N/A. Lecture based on **scribe notes**

This course consists of two major parts

- System and Theory
- Labs and Implementation

Course Overview

- System and Theory – what **we** do **in-lecture**
  - Introduction to digital communication systems
  - Basic digital communications (modulation, synchronization, etc.)
  - Basic information theory and coding theory
  - Introduction to ISI, OFDM, and modern wireless systems
  - Survey a wireless technology and present it to the class

- Labs and Implementation – what **you** do **off-lecture**
  - Simulation using **LabVIEW**
  - Implementation over-the-air using **USRP**
  - Final project: implement a communication system using **USRP**

Grading Policy

- Grading:

Lab ×4	40%	Scribe + Quiz	5% + 5%
Survey	20%	Final Project	30%

- Lab: work on your own! (but share the same **USRP**)
  - **LabVIEW**: work on the lab PC or your own computer
  - **USRP**: share the machine with your partner
- Scribe: work in group
  - Each group has to do the scribe note for one lecture in LaTeX.
- Survey presentation (by group): scheduled in mid-May
- Final project demo (by group): scheduled on the week **before** the final exam week

Course Schedule

週	日期	Lecture	Lab
1	02/22	Introduction to digital communication; Modulation	Lab 1: Basics of **LabVIEW** and **USRP**
2	03/01	Demodulation, Detection	
3	03/08	Hypothesis Testing; Performance Analysis	
4	03/15	Reliable Communication via Coding	Lab 2: Digital Modulation/Demodulation
5	03/22	Linear Codes; Convolutional Codes	
6	03/29	Convolutional Codes: Decoding	
7	**04/05**	**No Class [Proposal of Midterm Survey Topic]**	Lab 3: Coded Transmission (Convolutional Code)
8	04/12	Wireline Channel and ISI	
9	04/19	OFDM	
10	04/26	OFDM **[Proposal of Final Project]**	Lab 4: Wideband System (OFDM Transceiver)
11	05/03	Wireless Communications	
12	05/10	Wireless Communications	
13	05/17	Survey Presentations Part 1	Final Project
14	05/24	Survey Presentations Part 2	
15	05/31	Survey Presentations Part 3	
16	06/07	Survey Presentations Part 4	
17	06/14	Final Project Presentation/Demo	
19	06/28	Final Project Report Due	

Handouts and Website

- Website:

  http://homepage.ntu.edu.tw/~ihwang/Teaching/Sp17/CommLab.html

- Bookmark this page RIGHT AWAY
  - Announcements are posted on the website.
  - Lab handouts are posted on the website.

- **Your obligation** to keep track of the posts!
- Email announcements will be sent to your NTU email

  (you should check your NTU email at least once per day!)

Scribe

- Each group creates one set of scribe notes using LaTeX
- Template can be found on the website
- Due: 6am on the following Tuesday
  - Example: lecture on 03/01, scribe note due on 03/07
- Include all TeX files and a compiled PDF in a .zip
- Send the zip file to the instructor

About the Labs

The LAB: MD Room 331

- Location: 明達館331室
  - Desktop PCs, laptops, oscilloscopes, signal generators, **USRP**
  - 24-hr video surveillance with access control (門禁設定)
- Rules:
  - Food and drink not allowed in the lab
  - No garbage left in the lab – there no garbage can in the lab
  - Do not bring unregistered students to the lab
- Lab session time:
  - No fixed sessions!
  - Free to use the lab at any time to work on lab or project
  - Each TA has 1-hour office hour at the LAB every week
  - **We encourage you to work around that time so that you get help from TA when you are stuck.**

Lab Work Policy (1 of 2)

- If not specified, simulation codes, results, and reports should be written **independently by each person**
  - Caught cheating for the first time ⟹ **final grade -10**
  - Caught cheating more than once ⟹ **Failed**

- **Lab reports are required to be typed** (format: PDF)
  - Handwritten report will not be accepted nor graded

- Lab reports and project reports should be submitted to TA 周柏均 and cc the instructor before the deadline; other kinds of submission will not be accepted

Lab Work Policy (2 of 2)

- Lab reports
  - Due: 9pm on Friday unless specified otherwise
  - Submission: email to TA 周柏均 and cc IHW

- Content of your report:
  - Answer the questions in the handout posted on the website
  - Also, summarize and discuss about what you did and discovered during the lab

- Late report policy
  - 00hr – 24hr grade × 0.8
  - 24hr – 72hr grade × 0.5

Group

- 2-3 people per group, in total ≤ 12 groups

- For Lab 1 to 4, share the lab PC and **USRP** machines
  - Only 12 **USRP** machines so ≤ 12 groups in total
  - **Simulations, experiments, and lab reports on your own**

- Create scribe notes together

- Conduct the survey and presentation together

- Work on the final project together

About the Survey

Overview

- Sample Topics:
  - Internet of Things (Zigbee, Bluetooth, LoRa)
  - WiFi (IEEE 802.11 family)
  - mmWave (IEEE 802.15.3c, 60GHz)
  - Cognitive radio (IEEE 802.19, IEEE 802.22)
  - Body Area Network (IEEE 802.15.6)
  - LTE, LTE-A, 5G

- 40+5 minutes per group (5 minute Q&A)
- Each group should survey different topics.
- Each group should talk to me about the interested topics and get the approval to work on the survey

Presentation

- What to cover:
  - Scenario, Basic Principles
  - Commercial Applications
  - Competitors
  - Current Status and Future Developments
- Grading of the presentation includes
  - My grades
  - Average grades by all other students
- Mandatory for you to participate all presentations
  - Absence will be penalized in grades
- Grade sheet will be posted so that you know what metrics are important to prepare your presentation

Rest of Today

Agenda

- 加簽登記與分組說明
- Determine TA office hours (suggested lab sessions)
- Walk to the LAB (MD-331)
- 分組、實驗室打掃
- Introduction to **LabVIEW** and **USRP**

分組與加簽登記

- 「已選上」的同學進行分組，共分為12組，每組2–3人
- 考量到儀器及教室座位限制，本班「至多」容納33名學生
- 欲加簽者：
  - 向助教登記姓名、學號、系級，我們會透過台大email與你聯繫
  - 尋找可加入的組別並向助教登記，有找到者優先列入加簽考量

Thank You!

Further Questions:

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