Contents
- The course provides advanced knowledge of coding and information theory widely applied in modern wireless systems. It includes the classical information theory (entropy, mutual information, channel coding theorem and channel capacity), channel coding techniques (block coding and convolutional coding), advanced MIMO theory (MIMO capacity, space-time coding, BLAST), OFDM technique (transmitter/receiver design, space-frequency coding), MIMO-OFDM system & applications (Wireless LAN, WiMAX, etc.).

Course staff
- Lecturer: Dr. Wei Zhang
- Office: 325 EE Building
- E-mail: wzhang@ee.unsw.edu.au
- Tel: 9385 4033
- Consultation Time: Thursday, 3pm-4pm
- Other Consultation Time: Available upon an appointment made and confirmed by email.

Course details
- 6 Units of Credit (UoC) value for the course
- 4 hours of expected workload per week

Course aims
- The course aims to make students familiar with the advanced knowledge of coding and information theory used in the modern wireless systems and applications, and to enable them to work on relevant projects in wireless systems with some research skills.

Relation to other courses
- TELE9754 is well complemented by TELE9753 Advanced Wireless Communications, which covers comprehensive knowledge of wideband wireless communication design techniques including diversity techniques, multiple access, wideband CDMA, antenna array, space-time processing, multiuser detection, opportunistic communications and interference management.
- The minimum prerequisite for TELE9754 is TELE3113, Analogue and Digital Communications. TELE4653 Digital Modulation and Coding is highly desirable.

Assumed knowledge
- A good background of mathematics including probability theory.
- Some knowledge of programming language such as MATLAB or C.
- Be familiar with digital communications including fading channels, modulation, signal detection, etc.
Student learning outcomes
Upon completing of the course, students should be able to
- Understand the principles of coding techniques used in digital communication systems
- Evaluate performance of various coding techniques over fading channels
- Recognize advances of coding theory in next generation broadband communication systems
- Perform independent work in wireless system design with some creative problem-solving ability
- Skill in effective communications through presentations, technical writing and research discussion
- Appreciate the benefits of teamwork through collaboration with other professionals

Students are strongly recommended to read UNSW Graduate Attributes (Engineering) [http://www.ltu.unsw.edu.au/content/userDocs/GradAttrEng.pdf](http://www.ltu.unsw.edu.au/content/userDocs/GradAttrEng.pdf)

Assessment
- Research Writing & Presentation 20%
- Project 30%
- Final Examination 50%

- **Research writing & presentation**: Each student will spot a research topic by herself/himself in area of wireless communications, write a research report on the research topic, and give an oral presentation (10~12 minutes) with PPT. The research topic is not limited, but consulting lecture staff is preferred. The writing & presentation will test the abilities of students in locating and evaluating literacy information, engaging in a particular research topic in-depth, writing a technical report and making effective communications to other professionals. The report should be submitted by the end of week 6. The presentation will be given in week 7 and week 13. Students can prepare for them from week 1 and are encouraged to consult lecture staff.

- **Project**: The project in this course requires students to solve some research problem by giving some analysis and performing simulation to validate the analysis. The project will test students the abilities of creative problem-solving, independent critical thinking, and teamwork management. Project details will be given in week 7 and students are required to submit project reports by the end of week 13. Students are encouraged to collaborate with the other student in one group (at most 2 students in one group). Note that the projects vary from different groups. As a penalty, student who is absent in any class without an appropriate excuse must do the project alone.

- **Final Examination**: The exam in the course is a standard closed-book 3 hours written examination, comprising four to six compulsory questions. The final examination will test students’ understanding of the course material and analytical skills.
Course schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topics</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>23/07</td>
<td>Review of Probability Theory</td>
</tr>
<tr>
<td>2</td>
<td>30/07</td>
<td>Introduction to Information Theory</td>
</tr>
<tr>
<td>3</td>
<td>06/08</td>
<td>Channel Capacity</td>
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<tr>
<td>4</td>
<td>13/08</td>
<td>Gaussian Channel</td>
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<tr>
<td>5</td>
<td>20/08</td>
<td>Block Coding</td>
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<tr>
<td>6</td>
<td>27/08</td>
<td>Convolutional Codes</td>
</tr>
<tr>
<td>7</td>
<td>03/09</td>
<td>Research Workshop (Oral Presentation)</td>
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<tr>
<td>5 – 13 September</td>
<td>Mid-semester break</td>
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</tr>
<tr>
<td>8</td>
<td>17/09</td>
<td>MIMO Theory</td>
</tr>
<tr>
<td>9</td>
<td>24/09</td>
<td>Space-time Coding</td>
</tr>
<tr>
<td>10</td>
<td>01/10</td>
<td>OFDM</td>
</tr>
<tr>
<td>11</td>
<td>08/10</td>
<td>MIMO-OFDM</td>
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<td>12</td>
<td>15/10</td>
<td>Space-frequency Coding</td>
</tr>
<tr>
<td>13</td>
<td>22/10</td>
<td>Research Workshop (Oral Presentation)</td>
</tr>
</tbody>
</table>

Resources for students

- Reference books

• Online resources

**Academic honesty and plagiarism**

**What is Plagiarism?**

Plagiarism is the presentation of the thoughts or work of another as one’s own.* Examples include:

- direct duplication of the thoughts or work of another, including by copying material, ideas or concepts from a book, article, report or other written document (whether published or unpublished), composition, artwork, design, drawing, circuitry, computer program or software, web site, Internet, other electronic resource, or another person’s assignment without appropriate acknowledgement;
- paraphrasing another person’s work with very minor changes keeping the meaning, form and/or progression of ideas of the original;
- piecing together sections of the work of others into a new whole;
- presenting an assessment item as independent work when it has been produced in whole or part in collusion with other people, for example, another student or a tutor; and
- claiming credit for a proportion a work contributed to a group assessment item that is greater than that actually contributed.†

For the purposes of this policy, submitting an assessment item that has already been submitted for academic credit elsewhere may be considered plagiarism.

Knowingly permitting your work to be copied by another student may also be considered to be plagiarism.

Note that an assessment item produced in oral, not written, form, or involving live presentation, may similarly contain plagiarised material.

The inclusion of the thoughts or work of another with attribution appropriate to the academic discipline does not amount to plagiarism.

The Learning Centre website is main repository for resources for staff and students on plagiarism and academic honesty. These resources can be located via:
The Learning Centre also provides substantial educational written materials, workshops, and tutorials to aid students, for example, in:

- correct referencing practices;
- paraphrasing, summarising, essay writing, and time management;
- appropriate use of, and attribution for, a range of materials including text, images, formulae and concepts.

Individual assistance is available on request from The Learning Centre.

Students are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting, and the proper referencing of sources in preparing all assessment items.

* Based on that proposed to the University of Newcastle by the St James Ethics Centre. Used with kind permission from the University of Newcastle
† Adapted with kind permission from the University of Melbourne.