

**ECE 414 Wireless Communications**  
**ECE 614 Communications over Fading Dispersive Channels**  
Spring 2024

**Instructor:** Prof. Liang-Liang Xie (EIT-4173, ext.33697, llxie@uwaterloo.ca)

**Textbook:**

D. Tse and P. Viswanath, *Fundamentals of Wireless Communications*, Cambridge University Press, 2005. Free online: [https://web.stanford.edu/~dntse/wireless\\_book.html](https://web.stanford.edu/~dntse/wireless_book.html)

**Grading:** Projects (40%) + Final exam (60%)

**Audit option:** Projects only

**Homework Assignments**

Homework assignments and solutions will be posted on LEARN. Homework assignments are not graded, but are helpful for the final exam.

**Projects**

The project includes a review and a presentation on a selected publication. First, select a published paper from a list posted on LEARN, or choose one related to the topics of this course by yourself (needing the approval of the instructor). Write a review of the paper, summarizing its main contributions, and also evaluating its quality including both its strengths and weaknesses. Discussions on different solutions with your own ideas are highly encouraged. The deadline to submit the review on LEARN is July 30, the last day of classes. Besides the review, you will also give a 15 minutes presentation on the same paper, and questions may be asked. Evaluation will be based on the quality of your presentation and the demonstration of your understanding of the paper. The exact time of presentations will be determined later depending on the total number. For this project, you can either work on your own, or work with a partner, i.e., form a team of two.

**Calendar Description**

Overview of mobile communications, characterization and modeling of wireless fading dispersive channels, optimum receiver structure, transmission performance in fading channels, diversity and performance improvement, co-channel interference, spread spectrum and multiple access, capacity analysis in cellular environments.

## Main Contents:

1. The wireless channel
2. Point-to-point communication: detection, diversity and channel uncertainty
3. Cellular systems: multiple access and interference management
4. Capacity of wireless channels
5. Multiuser capacity and opportunistic communication

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Academic integrity, grievance, discipline, appeals and note for students with disabilities: see [www.uwaterloo.ca/accountability/documents/courseoutlinestmts.pdf](http://www.uwaterloo.ca/accountability/documents/courseoutlinestmts.pdf). The text for this web site is listed below.

Academic integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility.

[Check [www.uwaterloo.ca/academicintegrity/](http://www.uwaterloo.ca/academicintegrity/) for more information.]

Grievance: A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70, Student Petitions and Grievances, Section 4, [www.adm.uwaterloo.ca/infosec/Policies/policy70.htm](http://www.adm.uwaterloo.ca/infosec/Policies/policy70.htm). When in doubt please be certain to contact the departments administrative assistant who will provide further assistance.

Discipline: A student is expected to know what constitutes academic integrity [check [www.uwaterloo.ca/academicintegrity/](http://www.uwaterloo.ca/academicintegrity/)] to avoid committing an academic offence, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about rules for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate Associate Dean. For information on categories of offences and types of penalties, students should refer to Policy 71, Student Discipline, [www.adm.uwaterloo.ca/infosec/Policies/policy71.htm](http://www.adm.uwaterloo.ca/infosec/Policies/policy71.htm). For typical penalties check Guidelines for the Assessment of Penalties, [www.adm.uwaterloo.ca/infosec/guidelines/penaltyguidelines.htm](http://www.adm.uwaterloo.ca/infosec/guidelines/penaltyguidelines.htm).

Appeals: A decision made or penalty imposed under Policy 70 (Student Petitions and Grievances) (other than a petition) or Policy 71 (Student Discipline) may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72 (Student Appeals) [www.adm.uwaterloo.ca/infosec/Policies/policy72.htm](http://www.adm.uwaterloo.ca/infosec/Policies/policy72.htm).

Note for students with disabilities: The Office for persons with Disabilities (OPD), located in Needles Hall, Room 1132, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of

the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with the OPD at the beginning of each academic term.