ECE Technical Elective: Introduction to Wireless Communication

FALL, 2025

COURSE DESCRIPTION

This course provides a comprehensive introduction to the fundamental principles of wireless communication systems. It covers key concepts such as wireless channel characteristics, modulation and demodulation, multiple access schemes, channel modeling, propagation mechanisms, fading, and diversity techniques. The course also introduces cellular systems, Wi-Fi, and emerging wireless technologies such as 5G and IoT. Upon completion, students will understand the architecture and operation of modern wireless communication systems, and develop the ability to analyze and solve practical communication problems.

INSTRUCTOR

Hao Qin, Room 527
Email: hao.qin@scupi.cn
Office Hours: Wednesday 9:00-11:00 am, Wednesday 1:30-4:30 pm, or by appointment

TEACHING ASSISTANT

TBA

LECTURES

Tuesday 8:15-11:00, SCUPI Building S104. In-person attendance is required for all class meetings.

RECITATION

TBA

TEXTBOOK

Andreas F. Molisch, "Wireless Communications", ISBN: 047084888X Wiley/IEEE press, 2005. (Not Required)

COURSE OBJECTS AND LEARNING OUTCOMES

In this course, you will be expected to:

- Explain the fundamental concepts and principles of wireless communication, including propagation, modulation, and multiple access techniques.
- Apply mathematical and analytical tools to model and evaluate wireless communication systems.
- Demonstrate an understanding of key wireless technologies such as cellular networks, Wi-Fi, and emerging 5G/6G systems.
- Analyze the performance of wireless channels under various propagation conditions.
- Design and evaluate simple wireless communication systems and link budgets.
- Critically assess challenges and future directions in wireless communication research and applications.

COURSE REQUIREMENTS AND GRADING

- Attendance: 5%
- Homework: 30%
- Project: 65%

ATTENDANCE

Regular class attendance and active participation are essential to the learning process. Students are expected to attend lectures on time, engage in discussions, and contribute to group activities. Attendance will be recorded, and repeated absences without valid reasons will negatively affect the grade.

HOMEWORK

Homework assignments and their due dates will be given in the lectures. All work should be clearly presented, showing all steps to demonstrate your understanding of the process. While collaboration with classmates is encouraged, the final submission must be your own independent work, and plagiarism is strictly prohibited. **No late homework** will be accepted.

PROJECTS

Projects and their due dates will be given in the lectures. All work should be clearly presented. While collaboration with classmates is encouraged, the final submission must be your own independent work, and plagiarism is strictly prohibited.

ACADEMIC INTEGRITY

Maintaining academic integrity is essential in this course. All work submitted must be your own, whether individual or group assignments. Plagiarism, cheating, or any form of dishonesty will not be tolerated and will result in disciplinary action as per the institution's policies. You are encouraged to collaborate with classmates on understanding concepts, but all submitted work must reflect your independent effort. Properly cite any sources or assistance received and uphold the highest standards of academic honesty in all your work.

TENTATIVE PROGRESS

The course will be distributed as follows:

- Weeks 1–2: Introduction and history of wireless communication (4 hrs);
- Weeks 3–4: Wireless channel characteristics (4 hrs);
- Weeks 5–6: Fading and propagation mechanisms (4 hrs);
- Weeks 7–8: Modulation and demodulation (6 hrs);
- Weeks 9–10: Multiple access schemes (6 hrs);
- Weeks 11–12: Channel modeling and diversity techniques (6 hrs);
- Week 13: Cellular systems (4 hrs);
- Week 14: Wi-Fi and WLAN (4 hrs);
- Week 15: 5G and IoT emerging technologies (6 hrs);
- Week 16: Review and course summary (4 hrs).