

THE UNIVERSITY OF WESTERN ONTARIO
FACULTY OF ENGINEERING
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

ECE 9308/9038 – WIRELESS COMMUNICATIONS: DESIGN AND SIMULATIONS
COURSE OUTLINE – 2023/2024 Winter

OBJECTIVE:

The objective of this course is to provide the students an in-depth understanding of the fundamental techniques, design principles and simulation skills for wireless communications. Upon completion of the course, students should be able to design, analyze and simulate advanced communication systems, and expand knowledge and skills for their future careers.

CONTACT HOURS: 3 lecture hours per week, half course

ANTIREQUISITE: None

PREREQUISITES: ECE4433/ECE4437 or equivalent. Background in probability & random processes, signal processing and MATLAB are required.

COURSE CONTENT:

- Introduction to wireless communications (Week 1)
- Wireless system designs and simulations (Week 2)
- Radio propagation and channel models (Week 3)
- Small scale fading, Rayleigh and Rician fading (Week 4)
- Statistical distribution of fading and network planning (Week 5)
- Cellular mobile communications and frequency reuse (Week 6)
- Multiple access in wireless networks (Week 7)
- Digital Modulation techniques (Week 8)
- OFDM and broadband wireless communications (Week 9)
- Selective Topics: Error control in wireless communications (Week 10)
- Selective Topics: Diversity, antenna techniques and MIMO (Week 11)
- Project presentations and discussions

SPECIFIC LEARNING OBJECTIVES:

1. To learn the principles for wireless communication system design.
2. To understand the characteristics of wireless channel, including fading and various interferences.
3. To understand the techniques for efficient wireless system design.
4. To analyze and evaluate the performance of communication systems.
5. To develop the simulation skills for communication system design.
6. To explore most recent advancements in wireless communications

REFERENCE BOOK:

- [1] A. F. Molisch "Wireless Communications", Wiley, 2006.
- [2] J.G. Proakis and M. Salehi, "Digital Communications", 5th edition, 2008.
- [3] A set of class notes/slides.

OTHER REFERENCES:

A list of published papers and related wireless communication standards.

PROJECT AND ORAL PRESENTATION:

The students in the course will be required to perform a design and simulation project on an assigned topic related to communication system. An oral presentation along with the project-report submission is also required.

EVALUATION:

For the purpose of evaluation, the course has the following four components, namely

- a. assignment
- b. project report
- c. project presentation
- d. participation

In order to pass the course, a student must obtain a passing grade in each component. A student who fails either component shall receive a final grade not greater than 48%. The weighting of each of these components will be as follows:

M.E.Sc./Ph.D. (ECE9308)

Component	Value	Maximum Penalties*	
		English	Presentation
Assignment	20%	10%	10%
Project Report	40%	10%	10%
Project Presentation	20%	10%	10%
Participation	20%	N/A	N/A

M.Eng. (ECE9038)

Component	Value	Maximum Penalties*	
		English	Presentation
Assignment	30%	10%	10%
Project Report	30%	10%	10%
Project Presentation	20%	10%	10%
Participation	20%	N/A	N/A

*In accordance with the policy of the University, the grade assigned to all written and oral work presented in English shall take into account syntax, diction, grammar and spelling. In the professional life of an engineer, the manner in which oral and written communications are presented is extremely important. An engineering student must develop these skills as an integral part of the undergraduate program. To encourage the student to do so, the grades assigned to all written and oral work will take into account all aspects of presentation including conciseness, organization, neatness, use of headings, and the preparation and use of tables and figures.

All work will be marked first for content after which a penalty not to exceed the maximum shown above may be applied for lack of proficiency in English and/or presentation.

COURSE CONTENT

The lecture notes and online lecture videos are copyrighted to the instructor and legally protected. Do not post these videos and lecture notes on any other website or online forums. The recording of the live/synchronous sessions of the course without the permission from the instructor is prohibited. The illegal posting and sharing of the copyrighted course content could be subjected to legal actions.

CHEATING, PLAGIARISM/ACADEMIC OFFENCES

Academic integrity is an essential component of learning activities. Students must have a clear understanding of the course activities in which they are expected to work alone (and what working alone implies) and the activities in which they can collaborate or seek help; see information above under "Assessments" and ask instructor for clarification if needed. Any unauthorized forms of help-seeking or collaboration will be considered an academic offense. University policy states that cheating is an academic offence. If you are caught cheating, there will be no second warning. Students must write their essays and assignments in their own words. Whenever students take an idea or a passage of text from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. Plagiarism is a major academic offence. Academic offences are taken seriously and attended by academic penalties which may include expulsion from the program. Students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence (see Western's scholastic discipline regulations for graduate students).

SYNCHRONOUS LEARNING ACTIVITIES

Students are expected to participate in synchronous learning activities as outlined in the course syllabus and/or described by the instructor. If you have issues that will impede your ability to participate in synchronous activities, please discuss with the course instructor at the beginning of the course.

CONDUCT

Students are expected to follow proper etiquette during synchronous and asynchronous activities to maintain an appropriate and respectful academic environment. Any student who, in the opinion of the instructor, is not appropriately participating in the synchronous and asynchronous learning activities and/or is not following the rules and responsibilities associated with the online learning activities, will be reported to the Associate Dean (Graduate) (after due warning has been given). On the recommendation of the Department concerned, and with the permission of the Associate Dean (Graduate), the student could be debarred from completing the assessment activities in the course as appropriate.

HEALTH/WELLNESS

As part of a successful graduate student experience at Western, we encourage students to make their health and wellness a priority. Western provides several health and wellness related services (remotely accessible) to help you achieve optimum health and engage in healthy living while pursuing your graduate degree. Information regarding health- and wellness-related services available to students may be found at <http://www.health.uwo.ca/>.

Students seeking help regarding mental health concerns are advised to speak to someone they feel comfortable confiding in, such as their faculty supervisor, their program director (graduate chair), or other relevant administrators in their unit. Campus mental health resources may be found at http://www.health.uwo.ca/mental_health/resources.html
<https://www.uwo.ca/health/psych/index.html>

SICKNESS

Students should immediately consult with the Instructor (for a particular course) or Associate Chair (Graduate) (for a range of courses) if they have problems that could affect their performance. The student should seek advice from the Instructor or Associate Chair (Graduate) regarding how best to deal with the problem. Failure to notify the Instructor or the Associate Chair (Graduate) immediately (or as soon as possible thereafter) will have a negative effect on any appeal. Obtaining appropriate documentation (e.g., a note from the doctor) is valuable when asking for accommodation due to illness.

ACCESSIBILITY

Please contact the course instructor if you require material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Accessible Education at 661-2111 x 82147 or http://academicsupport.uwo.ca/accessible_education/index.html, for any specific question regarding an accommodation.

ATTENDANCE:

Any student, who in the opinion of the instructor is absent too frequently from class in this course, will be reported to the Dean (after due warning has been given). On the recommendation of the Department concerned, and with the permission of the Dean, the student will be debarred from the course.

INTERNET/EMAIL/BULLETIN BOARD POLICY:

Students are responsible for regularly checking their Western e mail and the course web site (<https://owl.uwo.ca/portal/>) and making themselves aware of any information that is posted about the course. It is the student's responsibility to read the course website and/or bulletin board and be aware of any information that is posted about the course. If the student fails to act on information that has been posted on these sites and does so without a legitimate explanation (i.e., those covered under the illness/compassionate form), then there are NO grounds for an appeal.

SUBMISSION POLICY:

Assignments/Project Reports: all submissions are due by 5:00PM on the due dates. Failure to submit on due dates will attract a penalty at the rate of 20% per day.

SUPPORT SERVICES:

Office of the Registrar, <http://www.registrar.uwo.ca/>
Student Development Centre, <http://www.sdc.uwo.ca/>
Engineering Undergraduate Services, <http://www.eng.uwo.ca/undergraduate/>
USC Student Support Services, <http://westernusc.ca/services/>

Students who are in emotional/mental distress should refer to Mental Health @ Western, http://www.health.uwo.ca/mental_health/, for a complete list of options about how to obtain help.