



Course Outline (W2019)

ELE815: Cellular Mobile Communications

Instructor(s)	Alagan Anpalagan [Coordinator] Office: ENG447 Phone: (416) 979-5000 x 6079 Email: alagan@ryerson.ca Office Hours: TBA
Calendar Description	This course provides a comprehensive introduction to basic principles and techniques in cellular mobile communications. The topics include: communication overview and frequency reuse, the cellular concept, radio propagation environments, techniques of modulation and equalization, multiple access wireless systems: TDMA/FDMA systems, CDMA systems, etc.
Prerequisites	ELE 745
Antirequisites	None
Corerequisites	None
Compulsory Text(s):	1. T.S. Rappaport, Wireless Communications: Principles and Practice, 2nd Edition, Prentice Hall, 2002.
Reference Text(s):	
Learning Objectives (Indicators)	<p>At the end of this course, the successful student will be able to:</p> <ol style="list-style-type: none">1. Uses engineering knowledge to solve real world open-ended engineering problems. Use appropriate channel and traffic models to evaluate the impact of wireless service quality and capacity. (1c)2. Uses judgement in solving problems with uncertainty and imprecise information (2a)3. Generate solutions for complex design problems via proper choice of system parameters, analyse the results and make recommendations. Overall wireless system knowledge and the role of various sub components will be used in obtaining solutions. (4b)4. Designs and develops software tools to perform the tasks required by the project. Identifies the limitations and enhancements of the tools with respect to the project needs. (5a) <p>NOTE: Numbers in parentheses refer to the graduate attributes required by the Canadian Engineering Accreditation Board (CEAB).</p>
Course Organization	3.0 hours of lecture per week for 13 weeks 1.0 hours of lab/tutorial per week for 12 weeks
Teaching Assistants	TBA

Course Evaluation	Theory
	Midterm Exam 25 %
	Project 20 %
	Final Exam 45 %
	Laboratory
	Simulation and Demo 10 %
	TOTAL: 100 %
	<p>Note: In order for a student to pass a course with "Theory and Laboratory" components, in addition to earning a minimum overall course mark of 50%, the student must pass the Laboratory and Theory portions separately by achieving a minimum of 50% in the combined Laboratory components and 50% in the combined Theory components. Please refer to the "Course Evaluation" section for details on the Theory and Laboratory components.</p>
Examinations	<p>Midterm exam in Week 7, two hours, during the lecture, closed book with one 8x11 double sided aid sheet will be allowed (covers Weeks 1-6)</p> <p>Final exam, during exam period, three hours, closed book with two 8x11 double sided aid sheets allowed (covers Weeks 1-13).</p>
Other Evaluation Information	<p>Students will practice on Matlab/Simulink exercises. Lab exercises will not be marked. However, the project includes simulation of wireless system component(s) and the labs will be useful for the project.</p> <p>Project marks are distributed as: Proposal (2.5%), Presentation (5%), Simulation (10%), Report (12.5%). Each group will submit one proposal and one report, and do one presentation. More information is available as part of the course notes and it will be discussed.</p>
Other Information	None

Course Content

Week	Hours	Chapters / Section	Topic, description
1	3		Introduction and Fundamental Concepts (Chapter 1 Sections 1.2-1.5)
2-3	4		Wireless Communication Systems (Chapters 2 and 11 Sections 2.1-2.3 11.1 11.3 and 11.4)
3-5	8		Mobile Radio Channels (Chapters 4 and 5 Sections 4.1-4.12 5.1-5.6)
6-7	6		Cellular Concepts (Chapter 3 Sections 3.1-3.7)
8-9	6		Multiple Access Techniques (Chapter 9 Sections 9.1-9.5 and 9.7)

10-11	6	Modulation for Radio Systems (Chapter 6 Sections 6.1-6.4 6.8 and 6.11)
12	3	Wireless Networks (Chapters 2 and 10 Sections 2.4 2.5 10.1-10.5)

Laboratory/Tutorials/Activity Schedule

Week	Lab	Description
1-2	ENG412	Introduction Matlab/Simulink for system level simulation
3	ENG412	BER of fading channel with BPSK modulation with single path
4	ENG412	BER of fading channel with BPSK modulation with six multi-paths
5	ENG412	Power control in uplink wireless communications
6	ENG412	Power allocation in downlink wireless communications
7-12	ENG412	Simulation work for the course project

Policies & Important Information:

1. Students are required to obtain and maintain a Ryerson e-mail account for timely communications between the instructor and the students;
2. Any changes in the course outline, test dates, marking or evaluation will be discussed in class prior to being implemented;
3. Assignments, projects, reports and other deadline-bound course assessment components handed in past the due date will receive a mark of ZERO, unless otherwise stated. Marking information will be made available at the time when such course assessment components are announced.
4. Refer to our **Departmental FAQ** page for information on common questions and issues at the following link:
<https://www.ee.ryerson.ca/guides/Student.Academic.FAQ.html>.

Missed Classes and/or Evaluations

When possible, students are required to inform their instructors of any situation which arises during the semester which may have an adverse effect upon their academic performance, and must request any consideration and accommodation according to the relevant policies as far in advance as possible. Failure to do so may jeopardize any academic appeals.

1. **Health certificates** - If a student misses the deadline for submitting an assignment, or the date of an exam or other evaluation component for health reasons, they should notify their instructor as soon as possible, and submit a Ryerson Student Health Certificate AND an Academic Consideration Request form within 3 working days of the missed date. Both documents are available at <https://www.ryerson.ca/senate/forms/medical.pdf>. **If you are a full-time or part-time degree student, then you submit your forms to your own program department or school;**
2. **Religious, Aboriginal and Spiritual observance** - If a student needs accommodation because of religious, Aboriginal or spiritual observance, they must submit a Request for Accommodation of Student Religious, Aboriginal and Spiritual Observance AND an Academic Consideration Request form within the first 2 weeks of the class or, for a final examination, within 2 weeks of the posting of the examination schedule. If the requested absence occurs within the first 2 weeks of classes, or the dates are not known well in advance as they are linked to other conditions, these forms should be submitted with as much lead time as possible in advance of the absence. Both documents are available at www.ryerson.ca/senate/forms/reobservforminstr.pdf. **If you are a full-time or part-time degree student, then you submit the forms to your own program department or school;**
3. **Academic Accommodation Support** - Before the first graded work is due, students registered with the [Academic Accommodation Support office](http://www.ryerson.ca/studentlearningsupport/academic-accommodation-support) (AAS - www.ryerson.ca/studentlearningsupport/academic-accommodation-support) should provide their instructors with an Academic Accommodation letter that describes their academic accommodation plan.

Academic Integrity

Ryerson's [Policy 60 \(the Academic Integrity policy\)](#) applies to all students at the University. Forms of academic misconduct include plagiarism, cheating, supplying false information to the University, and other acts. The most common form of academic misconduct is plagiarism - a serious academic offence, with potentially severe penalties and other consequences. It is expected, therefore, that all examinations and work submitted for evaluation and course credit

will be the product of each student's individual effort (or an authorized group of students). Submitting the same work for credit to more than one course, without instructor approval, can also be considered a form of plagiarism.

Suspicious of academic misconduct may be referred to the Academic Integrity Office (AIO). Students who are found to have committed academic misconduct will have a Disciplinary Notation (DN) placed on their academic record (not on their transcript) and will normally be assigned one or more of the following penalties:

1. A grade reduction for the work, ranging up to and including a zero on the work (minimum penalty for graduate work is a zero on the work);
2. A grade reduction in the course greater than a zero on the work. (Note that this penalty can only be applied to course components worth 10% or less, and any additional penalty cannot exceed 10% of the final course grade. Students must be given prior notice that such a penalty will be assigned (e.g. in the course outline or on the assignment handout);
3. An F in the course;
4. More serious penalties up to and including expulsion from the University.

The unauthorized use of intellectual property of others, including your professor, for distribution, sale, or profit is expressly prohibited, in accordance with Policy 60 (Sections 2.8 and 2.10). Intellectual property includes, but is not limited to:

1. Slides
2. Lecture notes
3. Presentation materials used in and outside of class
4. Lab manuals
5. Course packs
6. Exams

For more detailed information on these issues, please refer to the [Academic Integrity policy](https://www.ryerson.ca/senate/policies/pol60.pdf) (https://www.ryerson.ca/senate/policies/pol60.pdf) and to the Academic Integrity Office website (https://www.ryerson.ca/academicintegrity/).

Important Resources Available at Ryerson

1. [The Library](https://library.ryerson.ca/) (https://library.ryerson.ca/) provides research workshops and individual assistance. Inquire at the Reference Desk on the second floor of the library, or go to library.ryerson.ca/guides/workshops
2. [Student Learning Support](https://www.ryerson.ca/studentlearningsupport) (https://www.ryerson.ca/studentlearningsupport) offers group-based and individual help with writing, math, study skills and transition support, and other issues.