Course Objectives
The objective of this course is to give an introduction to the fundamentals of the wireless communications systems, the wireless network architectures, protocols, and applications. Topics of study include an overview of wireless communications and mobile computing systems, signal propagation characteristics of wireless channels, wireless channel modelling, frequency reuse/cellular/microcellular concepts, spread-spectrum modulation for wireless systems, multiple access techniques, and wireless networking standards (e.g., 2.5G, 3G, IEEE 802.11, IEEE 802.15, IEEE 802.16/WiMAX).

Prerequisites
ECE 3700 Telecommunication Network Engineering
ECE 3780 Signal Processing 1

Course Content
The following topics will be covered:
1. Overview of Wireless Communication Networking and Mobile Computing
2. Wireless Channel Modelling
3. Modulation, Coding, Diversity Techniques
4. Cellular Concept
5. Multiple Access Techniques
6. Wireless Networking Standards

Accreditation Units
Mathematics: 0%
Natural Science: 0%
Complementary Studies: 0%
Engineering Science: 70%
Engineering Design: 30%

Web Page
http://ece.eng.umanitoba.ca/undergraduate/ECE4540/

Textbook

Other References

Evaluation Details
The final course grade is determined by the student’s performance in laboratories, and on examinations. Students must complete all the laboratories in order to be eligible to receive a passing grade.

Mid-Term
Wednesday, October 29, 2014, 6:00-8:00 PM (location TBA)
**Instructor**
Prof. Jun Cai
Room: E1-554 EITC
Telephone: (204) 474-6419
Email: Jun.Cai@umanitoba.ca

**Office Hours**
By appointment.

**Teaching Assistants**
TBA

**Voluntary Withdrawal Date**
Wednesday, November 12th, 2014

**Requirements/Regulations**
- Attendance at lectures and laboratories is essential for successful completion of this course. Students must satisfy each evaluation component in the course to receive a final grade.
- It is the responsibility of each student to contact the instructor *in a timely manner* if he or she is uncertain about his or her standing in the course and about his or her potential for receiving a failing grade. Students should also familiarize themselves with Sections 4 and 6 of the Regulations dealing with incomplete term work, deferred examinations, attendance and withdrawal.
- No programmable devices or systems (such as calculators, PDAs, iPods, iPads, cell phones, wireless communication or data storage devices) are allowed in examinations unless approved by the course instructor.

**Academic Integrity**
Students are expected to conduct themselves in accordance with the highest ethical standards of the Profession of Engineering and evince academic integrity in all their pursuits and activities at the university. As such, in accordance with the General Academic Regulations and Requirements of the University of Manitoba, Section 7.1, students are reminded that plagiarism or any other form of cheating in examinations, assignments, laboratory reports or term tests is subject to serious academic penalty (e.g. suspension or expulsion from the faculty or university). A student found guilty of contributing to cheating in examinations or term assignments is also subject to serious academic penalty.

**Learning Outcomes**
1. Understanding wireless channel modeling.
2. Understanding different digital modulation, channel coding, and diversity techniques for wireless communications.
3. Learning design and analysis of cellular wireless systems.
4. Learning and understanding multiple access techniques for wireless networks.
5. Learning and understanding different wireless networking standards.

**Expected Competency Level**

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<th>Learning Outcome</th>
<th>Attribute*</th>
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**Attributes:**
A1  A knowledge base for engineering  
A2  Problem analysis  
A3  Investigation  
A4  Design  
A5  Use of engineering tools  
A6  Individual and team work  
A7  Communication skills  
A8  Professionalism  
A9  Impact of engineering on society/environment  
A10  Ethics and equity  
A11  Economics and project management  
A12  Life-long learning  

**Competency Levels:**
1 - Knowledge (Able to recall information)  
2 - Comprehension (Able to rephrase information)  
3 - Application (Able to apply knowledge in a new situation)  
4 - Analysis (Able to break problem into its components and establish relationships)  
5 - Synthesis (Able to combine separate elements into whole)  
6 - Evaluation (Able to judge of the worth of something)  

**Student Contact Time (Hrs)**
Lectures: 3 hrs lecture/week × 13 weeks/term = 39 hrs  
Laboratories: 3 hrs laboratory × 5 weeks = 15 hrs  
Tutorials: 0 hr tutorial × 0 weeks = 0 hrs  

**Evaluation**

<table>
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<th>Component</th>
<th>Value (%)</th>
<th>Methods of Feedback *</th>
<th>Learning Outcomes Evaluated</th>
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<td>Final Examination</td>
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<td>S</td>
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* Methods of Feedback:  
  F - *formative* (written comments and/or oral discussion),  
  S - *summative* (number grades)