



Course:	Selected Topics in Communications and Electronics – 0903529 Simulating Wireless Networks (3 Cr. – Elective Course)
Instructor:	Dr. Mohammed Hawa Office: E306, Telephone: 5355000 ext 22857, Email: hawa@ju.edu.jo Office Hours: will be posted soon
Course Website:	http://www.hawa.work/529
Catalog Data:	<p>This course will guide you through the fundamental principles and main concepts in the area of wireless system modeling and simulation. The first part discusses main concepts in cognitive radio systems, after which the course refreshes your programming skills in C/C++, followed by discussing the basics of discrete-event system simulation, simulation design, scenario development, and interpretation of the results.</p> <p>The course will be project-driven, and you will be learning by example. The example that we will work on is cognitive radio networks, which represents an important paradigm in the world of wireless communication networks. We will use C/C++ to build our own simulation framework.</p>
Prerequisites by Course:	EE 0903421 – Communications I (pre-requisite), and EE 1931102 – Computer Skills for Scientific Faculties (pre-requisite), and EE 0903426 – Communication Networks (helps but not required)
Prerequisites By Topic:	Students are assumed to have a background in the following topics: <ul style="list-style-type: none">• Basic programming skills in C/C++.• Basic ideas of communication engineering.
Textbook:	C++ Programming: From Problem Analysis to Program Design by D. S. Malik , Cengage Learning, 8th edition, 2017.
References:	<ul style="list-style-type: none">• <i>The C++ Programming Language</i> by Bjarne Stroustrup, Addison-Wesley Professional, 4th Edition, 2013.• <i>Effective Modern C++: 42 Specific Ways to Improve Your Use of C++11 and C++14</i> by Scott Meyers, O'Reilly Media, 1st edition, 2014.• <i>Effective C++: 55 Specific Ways to Improve Your Programs and Designs</i> by Scott Meyers, Addison-Wesley Professional, 3rd edition, 2005.• <i>C++ Coding Standards: 101 Rules, Guidelines, and Best Practices</i> by Herb Sutter and Andrei Alexandrescu, Addison-Wesley Professional, 1st edition, 2004.• <i>Exceptional C++: 47 Engineering Puzzles, Programming Problems, and Solutions</i> by Herb Sutter, Addison-Wesley Professional, 1st edition, 1999.• <i>C++ Primer</i> by Stanley B. Lippman, Josée Lajoie, Barbara E. Moo, Addison-Wesley Professional, 5th edition, 2012.• <i>C++ How to Program</i> by Paul Deitel and Harvey Deitel, Prentice Hall, 10th edition, 2016.• YouTube: You can watch many useful presentations recorded from recent C++ conferences such as: CppCon, Meeting C++, C++Now, BoostCon, code::dive, Going Native, etc.

Schedule & Duration:	16 Weeks, 41 lectures (50 minutes each) plus exams.
Minimum Student Material:	Textbook, class handouts, scientific calculator, and an access to a personal computer.
Minimum College Facilities:	Classroom with whiteboard and projection display facilities, library, computational facilities with Microsoft Visual Studio program.

Course Topics:

Topic Description

1. Preparing the required tools: Microsoft Visual Studio VS2017. Writing your first program.
2. Introduction to cognitive radio networks: opportunistic spectrum access.
3. C/C++ crash course: data types, syntax, lists, control structures, classes, vectors, etc.
4. Discrete-event network simulation tools: OPNET, ns-2, ns-3, OMNeT++, etc.
5. **(Assignment)** Building a simulation framework for cognitive radio networks using C/C++.
6. Communication networks primer and OSI Layered architecture.
7. Cognitive radio details: channel sensing methods.
8. Cognitive radio details: channel assignment (centralized versus distributed).
9. Communication network performance parameters.
10. Cognitive radio assigned papers (self-reading).
11. Cognitive radio extra paper.
12. **(Assignment)** Improvement ideas for cognitive radio systems.
13. Project statement.
14. Project progress presentations.
15. Project submission.
16. **Final Exam**

- Who should take this course?**
- Those who are good in C/C++ programming or are willing to learn.
 - Those with problem-solving skills.
 - Those that have team-work spirit.
 - Those who are considering continuing their graduate studies and want to experience research.

- Who should NOT take this course?**
- Those who fear programming or find it boring/hard.
 - Those who do not function very well within teams.
 - Those who just want exams but not a project.
 - Those who do not have the time for this course (as this course is demanding).
 - Those who think copy/paste is a good idea to do a project!

Ground Rules: **Attendance is required** and highly encouraged. To that end, attendance will be taken every lecture. All exams (including the final exam) should be considered **cumulative**. Exams are closed book. No scratch paper is allowed. You will be held responsible for all reading material assigned, even if it is not explicitly covered in lecture notes.

You will be required to do a **presentation** of your project, so you will need to brush up on your communication skills.

Assessments: Exams, Quizzes, Projects, and Assignments.

Grading policy:

Simulation Framework	15 %
First Exam	15 %
New Protocol Simulation	30 %
Final Exam	40 %
Total	100%

Last Updated: September 2018