

## **ENTS 653: AWS/PCS System Implementation Syllabus**

### **Course Description**

This course will examine engineering issues associated with designing and deploying an AWS/PCS cellular wireless communications system in the current world environment. The course will focus on implementation issues such as the impact of real world concerns on the deployment strategy and the use of good engineering practice to overcome obstacles. Students will create and modify mock deployments using professional tools for cell planning and interference analysis. Students will also be exposed to drivetesting tools and concepts for migration to future technologies.

### **Instructor Contact Information**

Dr. Michael Dellomo  
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#### Office hours:

1363 AV Williams Building  
Days and times will be announced during the first and third class each semester and will be posted on my website. See  
<http://www.ece.umd.edu/~mdellomo/advising.php>

### **Required Books**

None (yet...).

### **Course Policies**

#### Attendance & participation

Attendance and participation are not required and students will not be graded on it. However, it is highly recommended that students attend lectures to ask questions about the course.

#### Assignments

All assignments must be submitted by deadlines given in class. Since the assignments are group-based, it is each member's responsibility that the assignments are submitted in a timely manner so the professor can assess the assignment. In any event, all work must be completed by the end of the course.

#### Academic Integrity

The University of Maryland has a nationally recognized Honor Code, administered by the Student Honor Council. This code sets standards for academic integrity for all undergraduate and graduate students, and you are responsible for upholding these standards in this course. It is very important for you to be aware of the consequences for cheating, fabrication, facilitation and plagiarism. For more information please visit: <http://www.shc.umd.edu>. Students who engage in academic dishonesty in this course will receive no points for the assignments and will be reported to the Honor Council and the Office of Judicial Programs for further action. There will be no warnings! Remember, it is not worth it!

#### Persons with disabilities

Students with a documented disability should inform the instructor as soon as possible if academic accommodations are needed. Accommodations for individuals with disabilities can be arranged through the Disability Support Service (DSS), a division of the University Counseling Center. Please call 301.314.7682, email [dissup@umd.edu](mailto:dissup@umd.edu), or visit Shoemaker Building for more information.

### Cell phones

Any use of cell phones is not permitted during class time. Please turn off all cell phones prior to the start of class.

### Video Taping, Recording and Photographing

It is against University and Program policy to video tape, record, or photograph lectures unless done in accordance with the procedures for Persons with Disabilities. Lecture material is considered to be copyrighted by the University and unauthorized reproduction is considered to be copyright infringement. The instructor will make available and distribute any necessary material which is too detailed for conventional note taking. Please stow all electronic recording devices (such as cell phones) before the start of class.

### Class Cancellation

In the event of inclement weather or emergency, the university may be forced to cancel classes or close entirely. In this case, class is cancelled. Otherwise, unless some other announcement is made via email or in class, you should expect to have class as scheduled. Please see the university website or local radio and television for information on weather related closures.

### **Grading**

The course will consist of 4 assignments, one midterm and one final exam. The point breakdown is given below.

Homework	100 points	4 assignments, 25 points each
Midterm	100 points	Date Announced in Class
Final	<u>200 points</u>	Date Announced in Class
<b>Total</b>	400 points	

### **Class assignments**

The assignment will consist of 4 parts, each worth 25 points. Each part will be given in more detail as the course progresses. The assignment consists of creating and analyzing a cellular deployment where students work in groups of 4 to complete each part. Each part of the assignment is dependent on the previous parts so it is important that groups keep up with the assignments and do not wait until the end of the semester to complete them!

### **Tentative Course Schedule (will be adjusted as the course progresses)**

1. Introduction (~1 week)
  - General Overview
  - History (ordinary cellular, 2G, 2.5G, 3G,4G)
  - PCS Frequency Bands/Land division
  - AWS Frequency Bands/Land division
  - License issues
2. Technologies (~2 weeks)
  - Technology review (Encoding, design, ...)
  - Cellular channel issues
  - PCS/AWS Technologies (IS136, IS95, GSM, EVDO, UMTS, WIMAX,LTE)
  - Handovers (TDMA vs CDMA, voice vs data)

3. Radio Propagation (~2 weeks)
  - Units (dB, dBm)
  - Propagation equation
  - Lines and antenna basics (EIRP)
  - Free Space Loss and Flat Earth Loss
  - Okamura-Hata/Cost 231/extensions (+modifications)
  - Signal Strength and clutter
  - Link budgets (forward and back)
4. Equipment and Processing (~1 weeks)
  - Setup
  - System states
  - Turn on, call setup, handover
5. Coverage and Capacity(~2 weeks)
  - Maps, parameters
  - Using planning tools
  - Erlang computations
  - Spreading pops
6. Deployment in the real world (~2 weeks)
  - Preliminary deployments, SARs, candidates
  - Leasing, zoning, FCC, FAA
  - Design, Civil Eng, surveys, geology
  - Building
  - Deployment meetings
7. Interference (~2 weeks)
  - Microwave Relocation Overview
  - FCC regulations/Industry standards
  - Interference Calculations
  - Working around obstacles and pitfalls
  - Using software
8. Drive testing and Model Tuning (~1 weeks)
9. Frequency Planning and Reuse (~1 weeks)
  - AWS/PCS are different
  - Frequency plans
  - CDMA planning
  - LTE planning
10. Advanced topics (~1 week) (optional topics pending time)
  - Model tuning
  - Overlaying new technologies on old
  - System parameter settings