EE 4505 - Communications Systems Lab  
Fall 2011

Location & Time:
Pre-lab meeting (for all sections): Friday, 3:35pm - 4:25pm, AkerH 225
Lab Sections:
  - Monday, 10:10am - 12:05pm, KHKH 2-164
  - Tuesday, 11:15am - 1:10pm, KHKH 2-164
  - Thursday, 12:20pm - 2:15pm, KHKH 2-164

Class Webpage: On Moodle, or http://tinyurl.com/ee4505-fall2011
Prerequisites: Concurrent or past enrollment in EE 4501 (Communications Systems)

Instructor: Niranjay Ravindran, KHKH 6-124, ravi0022@umn.edu, 612-626-7174
Office Hours: (at KHKH 6-124)
  - Monday, 2:00pm - 4:00pm
  - After EE 4501 theory class on Tuesday & Thursday, 9:30am - 10:30am
  - Don’t hesitate to make email appointments if these times don’t work for you

TA: Nasim Yahyasoltani, yahya015@umn.edu


Tentative list of experiments:
EE 4501 discusses many ideas and examples of communications systems, but it is often easy to get buried under all the math, spectrum plots and block diagrams. This lab is intended to enable students to get a feel for how the theory applies in the real world, which can make it a lot more fun. We will put together communication systems based on EE 4501 concepts, first using a few hardware modules and later using software radios, and see how they function in wired/wireless channels.

Each experiment will typically consist of communicating information from one point to another, and investigating the factors and phenomena that affect this. You can use standard waveforms from function generators as your analog information source, or use the audio output from a laptop. You should be able to use any media or data file as a digital information source, or generate a bunch of random bits.

Based on time and the topics covered in the concurrent EE 4501 theory class, the list experiments might change.

1. AM modulation, transmission and multiplexing
2. AM demodulation and spectrum
3. FM modulation and demodulation
4. Quadrature modulation and recovery
5. Sampling and quantization effects
6. Wireless experiments based on digital communications (carrier modulation, constellation diagrams) and software radio
7. Reliability and coding

Suggestions and ideas for new experiments from students are more than welcome.

**Pre-lab meeting:**
There will be a pre-lab discussion for all sections on Friday (unless otherwise announced), where we will discuss the details of the experiment for the following week. A few topics will be suggested as reading for each pre-lab, and based on this, you might answer a few questions and design your experiment in class on Friday. Your designs are to be turned in at the end of the Friday class, and graded pre-lab designs/assignments will be returned to you when you attend your lab section the following week. Solutions to the pre-lab and suggested designs will be handed out at the end of the pre-lab section, and posted on the course website. Unless you make specific arrangements in advance, attending the Friday pre-lab session is required for you to attend the lab the following Monday/Tuesday/Thursday.

**Lab work and report:**
During the lab, you can build a communications system based on your pre-lab design (or on a suggested design posted on the course website), run a few basic experiments using your setup, and record your observations. Additionally, you can extend the experiment by trying out some of the suggested extensions, or trying something of your own. The lab instructor or TA will be available during each lab to help with any implementation questions. You are expected to keep the TA or lab instructor reasonably informed about what you are doing in each lab.

Your lab report is expected to consist of a record of your observations and the resulting conclusions, and may include any extensions you tried out (if you used a design different from the one you proposed in the pre-lab, you might need to include that). Guidelines for the lab report will be posted on the course website. The reports will typically be due a week after you finish an experiment. Reports for some closely-related experiments completed over multiple lab meetings can be made together (and will be worth more than a regular report in terms of grading), the details of which will be discussed in the pre-lab. There will be no lab class or reports due during the weeks of the EE 4501 mid-term exam.

**Grading:**
The grade for each lab will be a combination of your pre-lab activities (30%) as well as your in-lab performance and your post-lab report (70%). If you design a reasonable system during
the pre-lab, manage to build a functional communications system and run main basic experiments during the lab class, and make reasonable observations based on your experiment in the post-lab report, you should get a “B”. Extending the experiments and trying out things of your own (several suggestions on doing this will be provided), will earn you additional credit to get an “A”.

Background knowledge:
The hardware modules will be built using the TIMS-301 kit, as well as using function generators, oscilloscopes, spectrum analyzers, radio receivers and laptops. The wireless software radio will be based on the USRP2 radio, which you can control using a laptop running MATLAB. Knowledge (or the willingness to learn, on your own time) of basic MATLAB commands is required (plot commands, generating waveforms, manipulating complex-valued vectors, if/then, for, vector notation, indexing, calling functions, and so on). Based on need and interest, some background material might be reviewed during the pre-lab session.

Staying Informed: Check Moodle and your UMN email account regularly for course-related updates. You can subscribe to the “Announcements” forum on Moodle to receive email updates of important announcements (enabled by default).

Student Academic Integrity and Scholastic Dishonesty: Academic integrity is essential to a positive teaching and learning environment. All students enrolled in University courses are expected to complete coursework responsibilities with fairness and honesty. Failure to do so by seeking unfair advantage over others or misrepresenting someone else’s work as your own, can result in disciplinary action. The University Student Conduct Code defines scholastic dishonesty as follows: Scholastic dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis. Within this course, a student responsible for scholastic dishonesty can be assigned a penalty up to and including an F or N for the course. If you have any questions regarding the expectations for a specific assignment or exam, ask the instructor.

Other Policies: Please visit http://www政策.umn.edu/