UNC - Charlotte, Department of Electrical and Computer Eng.

Syllabus for ECGR 4161/5196
Introduction to Robotics – Summer 2010
EXTENDED SUMMER SESSION (5/24 to 8/11/2010)

Note: The class will meet 7/5/2010 even though the University is closed. In place of attending this day, class is cancelled on 6/14.

Instructor: James M. Conrad, Associate Professor of ECE, Woodward 210C

Register for: ECE4161, Section 001 (undergraduates) or ECE5196, Section 001 (graduate students)

Lecture: Mon/Wed 3:00 pm - 4:45 p.m. Woodward 140 (may change to Woodward 237).

Office hours: TTh 3:00 pm – 4:00 pm and whenever the door is open.

Email: jmconrad@uncc.edu

Lab Assistant: TBD.

Prerequisite

Grade of C or better in a programming course.

Textbook and Class Materials

Required: Autonomous Robots by George Bekey.

Required: Note that you will be required to read articles off of the class website.

To Be Determined: microprocessor evaluation boards.

Optional: Class notes are available only online. Since tests are open book, open notes, it is recommended you obtain a copy.

Catalog Description

Introduction to the broad field of robotics, including industrial assembly robots, autonomous vehicles, and entertainment robots. Emphasis on the basic technologies and integration of mechanical, electrical, and software sub-systems into a complete device.

Purpose of Course

The goal of this course is introduce the field of robotics to students who have a good foundation of electrical engineering and a beginner or higher level in computer engineering. Students will further investigate microcontrollers/microprocessors control of hardware. Students will also examine a few sensors and actuators that are used in robotics and learn how to integrate them into a robotics system. Students will:

- Identify general Concepts of System Engineering.

- Program a modern microcontroller in C and operate its peripheral devices.
- Design robotic power sub-systems and integrate them in a robot.
- Identify sensors and integrate them in a robot.
- Design motion sub-systems (DC motors, servos, steppers, linear actuators) and integrate them in a robot.
- Design a motion trajectory planning algorithm and implement it in a robot.

Labs

The laboratory projects are an integral part of the course and are intended to provide experience in the application of the design techniques discussed in lecture. These projects will utilize microprocessor hardware evaluation boards and mechanical platforms (i.e. wheeled vehicles). There will be six to ten lab exercises assigned.

Lab exercises can be done in the Embedded Systems Teaching Lab or on your own laptop PC. Robotic platforms may not be taken home.

Because almost all of us learn by doing, the laboratory will probably be the most effective method for learning the material, and will help you on exams. Also, ask yourself questions while preparing for the lab and during the lab. Do not just passively and monotonously follow the lab write-up-- ask some of your own questions and then find out the answers with your computer. To learn, you need to do it and you need to creatively think about what you are doing! Lab grades will be based on lab write-ups and demonstrated functionality of problem requirements. One lab report per lab group is due at the specified time.

Homework

Homework is another example of learning by doing. Although not as exciting as a lab, homework is essential to learning the concepts in this course. Homework will be in the form of reading assignments and problem sets, with a due date 1-2 lectures after it is assigned. **No late homework will be accepted.** Homework must be turned in at **the beginning of lecture (before I begin lecturing)**. Homework must be done individually (you will learn the most from this). Any evidence of group participation will be interpreted as academic dishonesty. There will be six to seven assignments, of which the highest six will be used in your final grade. Here are some guidelines for homework assignments:

- You will typically get better grades on homework if they are typed
- Do not repeat the question on the homework sheet.
- Do not put a printout of the assignment sheet anywhere in your turned-in homework.
- Staple all pages together
- Do not fold the assignment when you turn it in.
- Hand in a hard copy of your homework
- Check the class web site for a MS Word file which is a template for homework. Replace the information in the header with your particular information.

Grading

If you have a dispute with how an assignment is graded, you should follow this procedure:

1. Get the solution to the assignment off the class web site and examine it. You may have just worked the problem incorrectly.
2. If you really believe that your answer is correct (matches the answer given in the solution), contact the TA who graded your assignment and discuss it with them. He/She will listen to your concern, and act on it, at his/her discretion. In any case, they will sign the assignment verifying that they saw it again.
3. If you are still not satisfied with the resolution, you may bring the assignment to me for review. I will not review homework that has not been seen and signed by the TA.

We record all "disputed" points in a separate column. We contend that "disputed" points never add up to a change in your final grade, and we will examine this when final grades are assigned. Note that TA addition errors should follow the above procedure, but will not be figured in the "disputed" column.

Quizzes

There will be several "pop" quizzes given throughout the semester. These will be to reward students who consistently show up to class and are prepared. The points will be used more than for "attendance points." If a reading is assigned for discussion for a class, then that reading will be the subject of the quiz. If more than fourteen quizzes are given, then only the highest fourteen quiz scores will be used in your final course grade calculation.

Exams

There will be two mid-semester exams and one final. Exams will be open-book and open notes. Exams will include material from the lecture, the readings, homework, and laboratories.

Exam dates (preliminary):

- Mid-semester exam 1: June 23, class time in regular classroom

- Mid-semester exam 2: July 21, class time in regular classroom

- Final exam: August 11, class time in regular classroom

Missed exams: <u>Attendance at all exams is mandatory.</u> Only legal or debilitating medical excuses will be accepted (read: prison time, major blood loss, etc.), provided that they are accompanied by the appropriate official documentation. Makeup exams are more difficult than the exams they replace; few have passed. Failure to satisfy these criteria will result in a zero grade for the exam.

Missing Class/Assignments

Throughout the semester, a student may miss classes/assignments/quizzes/exams due to many reasons. Most of the reasons ***will not*** be accepted as an "excused" absence. For example:

- ECGR or other class exam review sessions: All class and exam times take precedence over any review sessions.

- University sponsored activity: All class and exam times take precedence over any University-sponsored activity.

- Business trips: If you miss an assignment/quiz because you were on a business trip, you miss

out on the assignment/quiz points.

- Illness: If you miss an assignment/quiz because were ill, you miss out on the assignment/quiz points.

Course Lectures.

We will use transparencies to teach this class. You can download them and print them from the web. See the web for the course lecture outline. Also, there will be many lectures which are not from transparencies.

Grad Students: Project for ECGR5196

It is expected that students registered for ECGR5196 will help identify one lab assignment for the class and mentor undergraduate students.

Course Calendar

Refer to the web page: http://www.registrar.uncc.edu/calendar.htm for the academic calendar.

The course calendar will be posted on the course website.

Grading Percentages and Grade distribution

Lab assignments	25% (250 points)
Quizzes	14% (140 points)
Midterm Exam 1	15% (150 points)
Midterm Exam 2	15% (150 points)
Final Exam	25% (250 points)
Homework	6% (60 points)
Total	100% (1000 points)

Academic Dishonesty

All the provisions of the University code of academic integrity apply to this course. In addition, it is my understanding and expectation that your signature on any test or assignment means that you neither gave nor received unauthorized aid.

Please read the discourse on cheating and ECGR 4101/5101 on the web page. For homework and laboratory projects, while discussion is allowed, direct copying is not and students must turn in individual submissions. Realize that mastery of the material in the homework and lab assignments will be essential for a good performance on the exams! The only exception is that lab partners work closely on the lab assignment and turn in one lab report.

All UNC Charlotte students have the responsibility to be familiar with and to observe the requirements of The UNC Charlotte Code of Student Academic Integrity (see the Catalog). This Code forbids cheating, fabrication or falsification of information, multiple submission of academic work, plagiarism, abuse of academic materials (such as Library books on reserve), and complicity in academic dishonesty (helping others to violate the Code). Any further specific requirements or permission regarding academic integrity in this course will be stated by the instructor, and are also binding on the students in this course. Students who violate the Code can be punished to the extent of being permanently expelled from UNC Charlotte and having this fact recorded on their official transcripts. The normal penalty is zero credit on the work involving dishonesty and further substantial reduction of the course grade. In almost all cases, the course grade is reduced to "F." If you do not have a copy of the Code, you can obtain one from the Dean of Students Office or access it online at www.legal.uncc.edu/policies/ps-105.html . Standards of academic integrity will be enforced in this course. Students are expected to report cases of academic dishonesty they become aware of to the course instructor who is responsible for dealing with them.

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Instructor and Student Conduct

Syllabus Revisions: The standards and requirements set forth in this syllabus may be modified at any time by the course instructor. Notice of such changes will be by announcement in class and/or by email to your UNCC email address.

Disability Services/Special Needs: If you have a documented disability and require accommodation in this course, contact the Disability Services office, located in Fretwell building, room 230. Phone 704/687.4355 (voice/TDD). Information about available services can be found at: http://www.ds.uncc.edu . Students in this course seeking accommodations to disabilities must first consult with the Office of Disability Services and follow the instructions of that office for obtaining accommodations. Please initiate this process and inform me during the first two weeks of class.

Diversity: UNC Charlotte strives to create an academic climate in which the dignity of all individuals is respected and maintained. Therefore, we celebrate diversity that includes, but is not limited to ability/disability, age, culture, ethnicity, gender, language, race, religion, sexual orientation, and socioeconomic status.

Communication: I will try and answer emails and phone calls received during the hours of Monday – Friday, 9 am to 4 pm within 24 hours. If you email and/or call at any other times, it is strictly a random chance that I'll respond in a timely manner. You should check your UNCC email every day as that is the primary way that I will communicate with you when not in class. When communicating with me via email, please put in the subject line the course number so I can readily identify who you are. *If your communication via email is rude, has grammatical, and/or spelling mistakes, I will not respond at all.* If I have not responded to your email within 24 hours as stated within the conditions above, perhaps you need to resend it and/or reword it. You are to conduct yourselves in a professional manner at all times.

Turnitin.com: As a condition of taking this course, some required assignments maybe subject to submission for textual similarity review to Turnitin.com for the detection of plagiarism. All

submitted papers will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such papers. No student papers will be submitted to Turnitin.com without a student's written consent (http://www.legal.uncc.edu/turnitinconsentform.pdf) and permission. If a student does not provide such written consent and permission, the instructor may: (i) require a short reflection paper on research methodology; (ii) require a draft bibliography prior to submission of the final paper; or (iii) require the cover page and first cited page of each reference source to be photocopied and submitted with the final paper.