

BME 590 – Rehabilitation Robotics

Course Instructor: Derek Kamper, Ph.D.
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4402C, Engineering Building III
Office hours: M, 12:00-1:30
T, 1:00 – 2:00

Location: 4155 Engineering Building III

Catalog Description: This course explores the use of robotic and mechatronic technology to restore function in individuals with sensorimotor impairment. The theoretical framework will be introduced for assessment and design of both assistive and therapeutic applications. Students will create a computer model of movement of limb in conjunction with a mechatronic device.

Topics Covered: Kinematics and dynamics of multi-link systems, Jacobian matrices, feedback control, actuators, sensors, physiology of movement impairment.

Prerequisites: Graduate student standing; MAE 206/CE 214 or equivalent

Textbook: *Introduction to Robotics: Mechanics and Control*, John J. Craig

Course Schedule: M,W
10:15-11:30

Student Learning Outcomes

1. Perform forward kinematics
2. Compute Jacobian matrices for inverse kinematics
3. Use dynamics to describe the conversion of joint torques into link or limb movement
4. Design feedback controllers
5. Employ simulation software to model dynamic movement

Late Policy

- If your assignment is late by less than 24 hours, a 20% deduction will be applied to your grade.
- If it is more than 24 hours late but less than 48 hours late, then a 50% deduction will be applied to your grade.
- If it is more than 48 hours late, the work will NOT be accepted.

Evaluation

Homework	20%
Midterm	25%
Project	25%
Final	30%

Academic Integrity

Students are required to comply with the university policy on academic integrity found in the Student Code of Conduct at: <http://policies.ncsu.edu/policy/pol-11-35-01> and the BME Academic Integrity Policy. It is the instructor's understanding and expectation that the student's name on any test or assignment means that the student neither gave nor received unauthorized aid. Authorized aid on an individual assignment includes discussing the interpretation of the problem statement, sharing ideas or approaches for solving the problem, and explaining concepts involved in the problem. Any other aid would be unauthorized and a violation of the academic integrity policy. Any computer work submitted must be completed on your own personal computer or from your own eos account to avoid confusion about the origin of the file, and no sharing of files in any way is allowed. No course materials other than those provided by the instructor are allowed. Possession of other course material will result in an "F" for the course. Plagiarism is defined as representing someone else's work as your own. All cases of academic misconduct, cheating and plagiarism will be submitted to the Office of Student Conduct. Students found guilty of academic misconduct will be subject to, at a minimum, a zero on the assignment in question, up to a zero for that course component (e.g. a zero for the homework portion of the final grade), or a failing grade in the course, depending on the nature of the violation. In addition, if you are found guilty of academic misconduct in the course, you will be on academic integrity probation for the remainder NCSU career.

Specific Tips (from Dr. Jacqueline Cole)

- Each student should complete his/her work independently of other students. You are welcome to discuss strategies with each other on homework problems, but you should not share solutions. Collaborations on test problems are not allowed.
- Any material derived from others (e.g., figures, quotes, data, ideas) must be cited, or it can be considered plagiarism.
- For group work, everyone is responsible for the final product's academic integrity. Be sure that everyone looks over the final product before it is submitted.

Electronically-Hosted Course Components

Students may be required to disclose personally identifiable information to other students in the course, via electronic tools like email or web-postings, where relevant to the course. Examples include online discussions of class topics and posting of student coursework. All

students are expected to respect everyone's privacy by not sharing or using such information outside the course.

Accommodations for Disabilities

Reasonable accommodations will be made for students with verifiable disabilities. To take advantage of available accommodations, students must register with the Disability Services Office (<http://www.ncsu.edu/dso>, 919-515-7653). For more information on NCSU's policy on working with students with disabilities, please see the Academic Accommodations for Students with Disabilities Regulation at <http://policies.ncsu.edu/regulation/reg-02-20-01>.

Non-Discrimination Policy

NCSU provides equality of opportunity in education and employment for all students and employees. Accordingly, NCSU affirms its commitment to maintain a work environment for all employees and an academic environment for all students that is free from all forms of discrimination. The role of all employees and students is to create and maintain a supportive and harassment-free working environment for all members of the campus community. All faculty, staff and students are responsible for understanding and complying with harassment policies: these policies can be viewed at: http://www.ncsu.edu/equal_op.

Also, all faculty, staff and students are responsible for knowing where to obtain assistance for resolving concerns. Members of the campus community are encouraged and should feel free to seek assistance, information, and guidance from their department head, supervisor, the Office for Equal Opportunity (OEO, 513-3148), Human Resources (515-4300) or the Office for Student Conduct (515-2963). All harassment of any person (either in the form of quid pro quo or creation of a hostile environment) based on race, color, religion, creed, sex, national origin, age, disability, veteran status or sexual orientation also is a violation of state, federal law and/or NC State University policy and will not be tolerated. Retaliation against any person who complains about discrimination is also prohibited. NC State's policies and regulations covering discrimination, harassment, and retaliation may be accessed at http://www.ncsu.edu/policies/campus_environ or http://ncsu.edu/equal_op.

Any person who feels that he or she has been the subject of prohibited discrimination, harassment, or retaliation should contact the OEO.