University of Victoria Engineering

Faculty of Engineering

COURSE OUTLINE

MECH 430 – Robotics

Term – SUMMER 2015 (201505)

Instructor

Dr. Jooeun Ahn
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Office Hours

Days: Tuesday and Wednesday
Time: 10:30 – 11:30
Location: EOW 533

Course Objectives

- Be able to develop mathematical model of various controlled robotic systems
- Be able to design the proper controller to operate the robotic manipulator in a desired manner

Learning Outcomes

- Develop mathematical model of a general robotic system
- Quantify the dynamics of the robotic system with reasonable accuracy
- Assess the performance of the uncontrolled and controlled robotic system
    - At minimum, evaluate stability
- Design proper controllers to obtain the desired behaviors of robotic devices
- Define the objective of robotic motion mathematically and design optimal controller to achieve that goal
- Relate input command to the output dynamics of a robotic manipulator

Syllabus

Weeks	Tuesday	Wednesday	Friday
May 4 – 10	Introduction, review of Dynamics		
May 11 – 17	Stability of open loop dynamical systems		
May 18 – 24	No class (Victoria Day)	Review of feedback control	
May 25 – 31	Stability of closed loop systems	No class (Conference)	Stability of closed loop systems
June 1 – 7	Actuators **Assignment 1 due**	Actuators and drives	**Quiz 1**

June 8 – 14	Vehicle kinematics and control		Planning
June 15 – 21	Planning, optimization, and optimal control		Optimization **Assignment 2 due**
June 22 – 28	Legged locomotion	**Quiz 2**	Collision dynamics
June 29 – July 5	Return map analysis	No class (Canada Day)	Stability of periodic motion
July 6 – 12	Robot arm manipulator	Robot arm manipulator **Assignment 3 due**	Linkage kinematics
July 13 – 20	**Quiz 3**	Jacobian and singularity	Inverse and forward dynamics
July 21 – 28	Inertia and stiffness matrices	Impedance and interaction control	Estimation
July 28 – 31	Machine learning **Assignment 4 due**	Review and summary	**Quiz 4**

A-Section(s): A01 / CRN 30553
Days: Tuesday, Wednesday, and Friday
Time: 9:30 – 10:20
Location: ECS 104

Required Text

Title: None
Author:
Publisher:
Year:

Optional Text

Title: None
Author:
Publisher:
Year:

References: None

Assessment:

Assignments: 40 % (4 assignments at 10% each) Due Dates: June 2, June 19, July 8, and July 29
Mid-term: 60 % (4 in-class quizzes at 15% each) Dates: June 5, June 24, July 14, and July 31

Note:
Failure to complete and submit all assignments and quizzes will result in a grade of N. The final grade obtained from the above marking scheme for the purpose of GPA calculation will be based on the percentage-to-grade point conversion table as listed in the current Undergraduate Calendar.
There will be no supplemental examination for this course.

Note to Students:

Students who have issues with the conduct of the course should discuss them with the instructor first. If these discussions do not resolve the issue, then students should feel free to contact the Chair of the Department by email or the Chair's Secretary to set up an appointment.

Accommodation of Religious Observance

See entry in current Undergraduate Calendar

Policy on Inclusivity and Diversity

See entry in current Undergraduate Calendar

Standards of Professional Behaviour

You are advised to read the Faculty of Engineering document Standards for Professional Behaviour in current Undergraduate Calendar, which contains important information regarding conduct in courses, labs, and in the general use of facilities.

Cheating, plagiarism and other forms of academic fraud are taken very seriously by both the University and the Department. You should consult entry in current Undergraduate Calendar for the UVic policy on academic integrity.

Course Lecture Notes

Unless otherwise noted, all course materials supplied to students in this course have been prepared by the instructor and are intended for use in this course only. These materials are NOT to be re-circulated digitally, whether by email or by uploading or copying to websites, or to others not enrolled in this course. Violation of this policy may in some cases constitute a breach of academic integrity as defined in the UVic Calendar.