

MECH ENG 4K03: ROBOTICS

Lecture: Tue, Wed, and Friday 3:30pm-4:20pm in HH 302

Office hour:

Tue 2:00am-3:00am ITB 161

Dropbox (Assignment):

Dropbox #6 in JHE

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Teaching Assistants:

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For any questions regarding the assignments, please contact Reza Sadeghi;

For any questions regarding the mid term tests, please contact Mohame Hammouda.

Prerequisite:

There is no formal prerequisite. However, prior knowledge of kinematics, trigonometry, algebra, calculus and Matlab will be helpful.

Textbook:

Course notes by Dr. Bone will be posted on avenue.mcmaster.ca.

Other References:

1. S.B. Niku, "Introduction to Robotics", Pearson Education, 2001.
2. J.J. Craig, "Introduction to Robotics", Addison Wesley Longman, 1989.
3. Internet and recently published research literature

Lecture Content:

1. INTRODUCTION

2. FORWARD KINEMATICS
3. VELOCITIES, JACOBIANS AND SINGULARITIES
4. INVERSE KINEMATICS
5. DYNAMICS
6. STATICS
7. TRAJECTORY PLANNING
8. MACHINE VISION
9. MOBILE ROBOTS
10. SENSORS AND ACTUATORS
11. INTRODUCTION TO ROBOT PROGRAMMING
12. OTHER TOPICS IN ROBOTICS (TIME PERMITTING)

The above is a tentative list of topics. Depending on the progress with the course, additional topics may be covered or some topics may have to be left out.

Grading Criteria

Five assignments will be provided. The full mark for each assignment is 10 points. The average marks of the assignments will count as 10% of the overall score.

Test #1 (in-class)*+: 10%
Test #2 (in-class)*+: 10%
Test #3 (in-class)*+: 10%
Final Exam (2.5 hrs)*: 60%

*Closed Book, McMaster Standard Calculator (CASIO FX-991).

+Only tests written in pen will be remarked.

Time and location for the term tests: 3:30pm to 4:20pm, September 27th (JHE 264), October 29th (T13 123), and November 15th (JHE 264).

Learning Outcomes:

Upon successful completion of the course the student will be expected to have demonstrated the ability to:

1. Interpret and derive the forward kinematics of robot arms.
2. Derive the inverse kinematics of robot arms.

3. Understand, derive and draw singular configurations of robot arms.
4. Derive the dynamics of robot arms.

Graduate Attributes:

This course provides the students opportunity to develop the following measures of graduate attributes

Graduate Attributes	Learning Objectives where it is measured
Knowledge base for Engineering (Indicator 4)	1,2,3,4
Problem Analysis (Indicator 2)	3

Policy Reminders:

Students are reminded of the following Policies, which could be relevant to activities in this course.

Adverse Discrimination "The Faculty of Engineering is concerned with ensuring an environment that is free of all adverse discrimination. If there is a problem that cannot be resolved by discussion among the persons concerned, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Officer or the Human Rights Consultant, as soon as possible."

Academic Integrity (Ethics and Dishonesty) "Academic dishonesty consists of misrepresentation by deception or by other fraudulent means and can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university. It is your responsibility to understand what constitutes academic dishonesty. For information on the various kinds of academic dishonesty please refer to the Academic Integrity Policy, specifically Appendix 3, located at: http://www.mcmaster.ca/senate/academic/ac_integrity.htm

The following illustrates only two forms of academic dishonesty:

1. Plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
2. Copying or using unauthorized aids in tests and examinations.

The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.