

Course Outline: MECH ENG 4K03 – Robotics

Lecture time & location: Tuesdays, 7:00-10:00pm in HH109

Instructor: Dr. Bin Wei

Office: JHE A410

Email: weib7@mcmaster.ca

Office hours: Tuesdays, 1:00-6:00pm in JHE A410 (held by me)

Office hours held by TAs:

Sohpia Deng (anytime during the week in JHE 326C)

Parisa Mahvelatishamsabadi (Thursdays 9-10am, please email TA regarding the location)

TAs:

Mohamed Abdelhafiz, abdelm44@mcmaster.ca

Parisa Mahvelatishamsabadi, mahvelap@mcmaster.ca

Sohpia Deng, dengb2@mcmaster.ca

Textbook: John J. Craig, “Introduction to robotics: mechanics and control”, 3rd edition or 4th edition

(can be downloaded from internet)

Reference books:

Lung-Wen Tsai, “Robot Analysis: The Mechanics of Serial and Parallel Manipulators”

Bruno Siciliano, etc., “Robotics: Modelling, Planning and Control”

Lecture Contents

1. Introduction
2. Spatial descriptions and transformations

3. Manipulator kinematics
4. Jacobians: velocities and static forces
5. Motion planning
6. Manipulator dynamics
7. Linear control of manipulators
8. Non-linear control of manipulators
9. Force control of manipulators
10. Introduction to robot programming
11. Mobile robots

The above is a preliminary list of topics, and additional topics may be covered.

Grading Criteria

5 assignments: 6%/each

Midterm: 30%

Final: 40%

Learning outcomes:

1. Derive forward kinematics of robotic manipulators
2. Determine Jacobian matrix of robotic manipulators
3. Determine coefficients of cubic polynomials and plan trajectories for robots
4. Derive dynamic equations of robotic manipulators
5. Understand fundamental control theory and its application in robotics

Graduate Attributes

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

Graduate Attributes	Learning outcomes
A01 Knowledge Base for Engineering Competence in Engineering Fundamentals	1, 2, 3, 4, 5
A02 Problem Analysis Ability to determine Jacobian matrix and forward kinematics; robotic trajectories planning; Derive dynamic equations of robotic manipulators	2, 4, 5
A03 Design Control system design for robotic arms/manipulators	5

Policy Reminders:

1. ACADEMIC INTEGRITY

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour 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 types of academic dishonesty please refer to the Academic Integrity Policy, located at www.mcmaster.ca/academicintegrity.

The following illustrates only three forms of academic dishonesty:

- Plagiarism, e.g. the submission of work that is not one’s own or for which other credit has been obtained.
- Improper collaboration in group work.
- Copying or using unauthorized aids in tests and examinations.

2. ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Student Accessibility Services can be contacted by phone 905-525-9140 ext. 28652 or e-mail sas@mcmaster.ca. For further information, consult McMaster University's Academic Accommodation of Students with Disabilities policy.

3. REQUESTS FOR RELIEF FOR MISSED ACADEMIC TERM WORK

McMaster Student Absence Form (MSAF)

In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar "Requests for Relief for Missed Academic Term Work".

4. ACADEMIC ACCOMMODATION FOR RELIGIOUS, INDIGENOUS OR SPIRITUAL OBSERVANCES (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students requiring a RISO accommodation should submit their request to their Faculty Office normally within 10 working days of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

5. EXTREME CIRCUMSTANCES

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.