

THE UNIVERSITY OF WESTERN ONTARIO
FACULTY OF ENGINEERING

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

ECE 9503 – ROBOT MANIPULATORS

COURSE OUTLINE – Winter 2018

OBJECTIVE:

This course will introduce students to the basic concepts, principles and techniques involved in modeling, simulation and control of rigid-link robot manipulators.

PREREQUISITES: Undergraduate courses in linear algebra, feedback control, and introductory statics and dynamics.

COURSE CONTENT:

- Spatial descriptions and transformations
- Manipulator forward and inverse kinematics
- Jacobians: velocities and static forces
- Manipulator dynamics
- Trajectory generation
- Position control of manipulators
- Force control of manipulators
- Advanced manipulator control techniques

SPECIFIC LEARNING OBJECTIVES

1. To introduce the framework for modelling, simulation and control of robot manipulators.
2. To provide the concepts and mathematical tools needed to describe the kinematics of manipulators.
3. To develop the techniques and computational algorithms for obtaining the dynamic behaviour of rigid-link robot manipulators.
4. To understand the issues involved in planning robot motions and to apply various control techniques to achieve desired position and force controlled motions for robot manipulators.

TEXTBOOK:

J.J. Craig, " Introduction to Robotics: Mechanics and Control", 3rd Edition, Pearson Prentice Hall, Upper Saddle River, NJ, 2004.

PROJECT:

The project involves MATLAB/Simulink based computer simulations and is intended to help students acquire a better understanding of the basic concepts and techniques introduced in the course. It is assumed that students are familiar with MATLAB/Simulink.

EVALUATION:

The final course grade will be determined from students' performance in the project and a final exam (open-book). The weightings for these components will be as follows:

Component	Value	Maximum Penalties*	
		English	Presentation
Project	50%	5%	5%
Final Examination	50%	5%	5%

*In accordance with the policy of the University, the grade assigned to all written and oral work presented in English shall take into account syntax, diction, grammar and spelling. In the professional life of an engineer, the manner in which oral and written communications are presented is extremely important. Engineering students must develop these skills as an integral part of their studies. To encourage students to do so, the grades assigned to all written and oral work will take into account all aspects of presentation including conciseness, organization, neatness, use of headings, and the preparation and use of tables and figures.

All work will be marked first for content after which a penalty not to exceed the maximum shown above may be applied for lack of proficiency in English and/or presentation.

ATTENDANCE

Any student, who in the opinion of the instructor is absent too frequently from class or laboratory periods in any course, will be reported to the Dean (after due warning has been given). On the recommendation of the Department concerned, and with the permission of the Dean, the student will be debarred from taking the regular examination in the course.

CHEATING

University policy states that cheating, including plagiarism, is a scholastic offence. The commission of a scholastic offence is attended by academic penalties that might include expulsion from the program. If you are caught cheating, there will be no second warning.

COURSE INSTRUCTOR: R.V. Patel (TEB379)