

# MECH 4710 Introduction to Robotics

Spring 2024/25

## Course Description:

Introduce the mechanical structure of industrial robots as well as the spatial description and transforms of the robot, forward kinematic and inverse kinematic equations for different robotic structures, and dynamic of the robot manipulator.

Prerequisite: MECH 2030

Instructor: Wenqi HU (TBD) TA: Hong WANG

Grading Policy: Homework, Computer Assignment and Lab. 15%

Midterm Exam: 40%

Final Exam: 45%

Textbook: *Introduction to Robotics*, by John J. Craig 3 Edition

Supplementary Texts: *Introduction to Robotics*, by Phillip John McKerrow.

Laboratory Work: Kinematics and control of the robotic arm (TBD).

## Contents in the lecture

1. Introduction to robotics (1 weeks Chapter 1)
  - \* Background
  - \* The mechanics and control mechanical manipulator
  - \* Notation
2. Spatial Descriptions and Transformations (2 weeks Chapter 2)
  - \* Object location, frame, and transformation
3. Manipulator Kinematics and Static Force (4 weeks Chapter 3-4)
  - \* Manipulator position, forward and inverse kinematics
  - \* Manipulator motion, velocity
  - \* Manipulator Jacobian, singularities, and static force
4. Manipulator Jacobian and Dynamics (5 weeks Chapter 5-6)
  - \* Manipulator motion, velocity, and acceleration
  - \* Manipulator Jacobian, singularities, and static force
  - \* Dynamics of robots Newton-Euler formulation
  - \* Lagrange formulation.