

ME 735 – Advanced Topics in Robotics

Instructor: Dr. Zhiming Ji

Office: MEC 318

Phone/Email: 973-596-3341/ji@njit.edu

Course Description: Subjects covered include differential kinematics, calibration and accuracy, trajectory control, and compliant motion control as well as an in-depth treatment of topics discussed in ME 625. **Prerequisites:** ME 625 or permission of the instructor.

Course Objectives:

Students are expected to:

1. Learn various approaches to perform spatial transformations.
2. Perform spatial transformations associated with rigid body motions.
3. Perform kinematics analysis and understand singularity issues associated with robot operation.
4. Perform basic calculation associated with trajectory planning.
5. Understand basic issues associated with robot control.

Required Text: None

Additional Readings: Introduction to Robotics: Mechanics and Control, by John J. Craig, 3rd Ed. 2005, Prentice Hall, ISBN 0-201-54361-3. Selected research publications from journals and online resources.

Grading Policy: Grades will be determined by performance on assignments, projects, and presentations. The homework assignments will be worth 30% of total points. Project report will be worth 40% of total points. The project presentation will be worth 30% of total points.

Academic Integrity: The university's academic integrity policy, which can be found at <http://www.njit.edu/academics/pdf/academic-integrity-code.pdf>, will be enforced.

COURSE OUTLINE:

Week	Topic	Reading
1	Review: Spatial Transformations: Rotation matrix & Rotation Vector	
2	Review: Spatial Transformations: Cardon & Euler angles, Euler parameters	
3	Review: Spatial Transformations: Helical angles, and Angle-axis	
4	Review: Forward and Inverse Kinematics, Jacobian and Singularities	
5	Review: Calibration and accuracy, trajectory control, and compliant motion	
6	Project Kickoff	Research papers
7, 8	Critical Review of selected research papers	Research papers
9	Midterm Exam	
10-12	Review of Project Progress	
13	Project report due	
14, 15	Project Presentation	