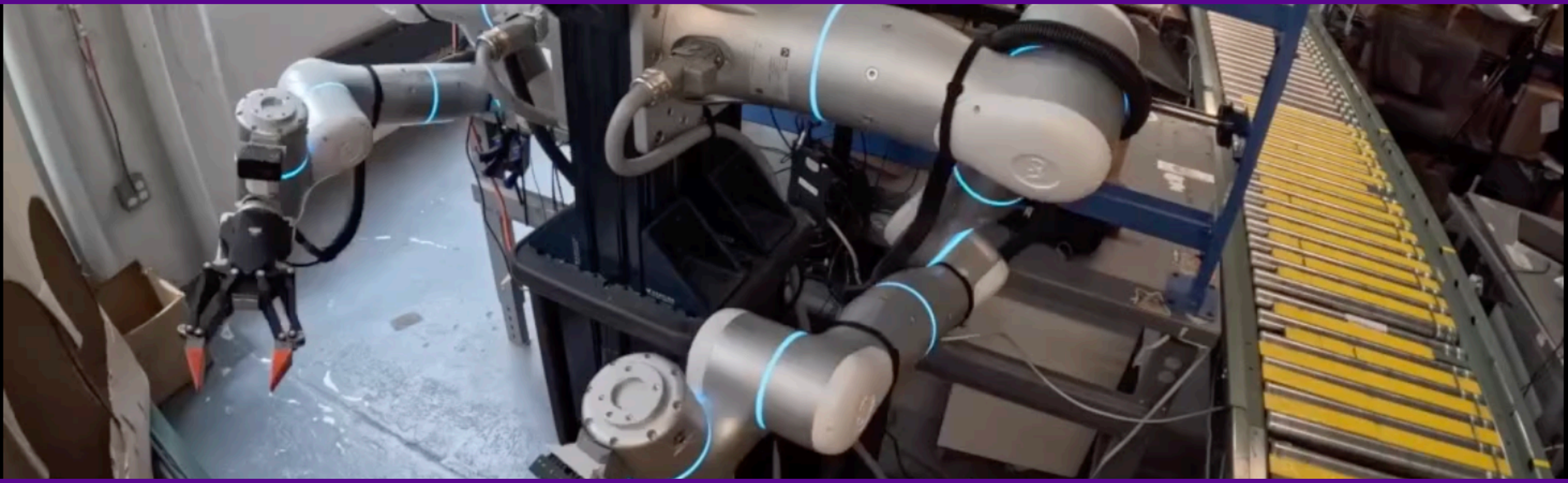
ROB-UY 2004

Robotic Manipulation & Locomotion

Lecture 01A - Course Introduction



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Agenda

1. **Motivation**
2. **People**
3. **Course Objectives**
4. **Lectures**
5. **Labs**
6. **Projects**
7. **Grading**

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Lead Instructor

- **Christopher Clark**
  - Email: c.clark@nyu.edu
  - Office Hours - 9:00-10:30am Mondays

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TEACHING ASSISTANTS

- Rooholla Khorramba - rk4342@nyu.edu
  - Office Hours Location A: Metrotech 5, LC011
  - Office Hours A: 6:30-7:00pm MTW
  - Office Hours Location B: 370 Jay Street, Ground Floor, Center for Robotics and Embodied Intelligence
  - Office Hours B: 11:00am-12:00pm Thursday
- Haizhou Zhao - hz3862@nyu.edu
  - Office Hours Location A: Metrotech 5, LC011
  - Office Hours A: 6:30-7:00pm MTW
  - Office Hours Location B: 370 Jay Street, Ground Floor, Center for Robotics and Embodied Intelligence
  - Office Hours B: 12:00pm-1:00pm Thursday

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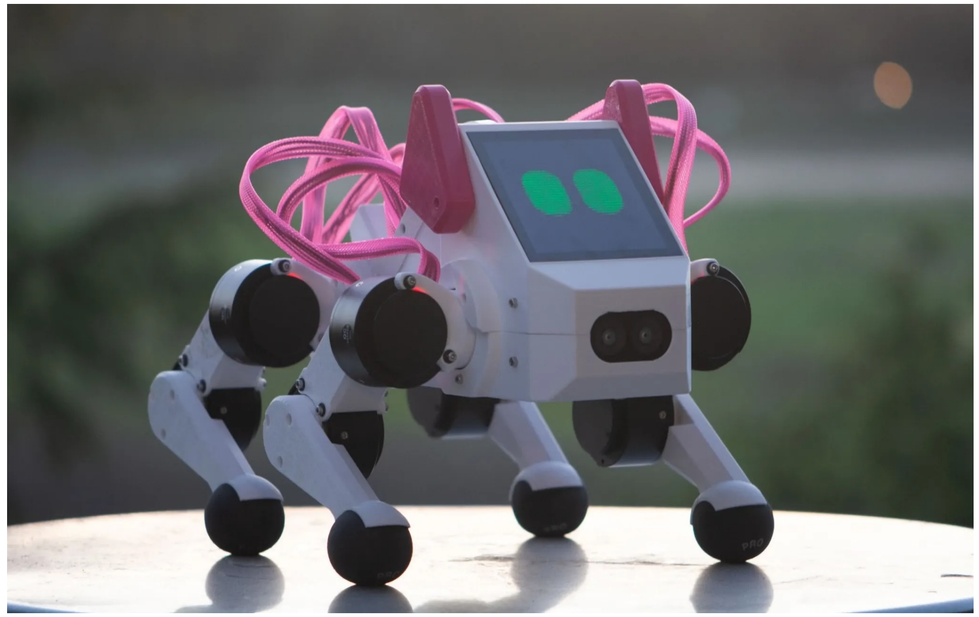
Course Overview

This class introduces basic notions of robotics, from sensors and actuators to kinematics, dynamics, motion planning and control with specific example applications for object manipulation and legged locomotion. Basic algorithms necessary for any robotics practitioner interested in robots with arms and legs are studied in the class. A special emphasis is made on providing a practical experience to students, with a laboratory enabling the implementation of the learned concepts in real applications.



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LECTURE SCHEDULE

- Week 1
  - Jan. 21, 2026 Introduction & Robot Parts
- Week 2
  - Jan. 26, 2026 Mathematical Representations
  - Jan. 28, 2026 Transformations
- Week 3
  - Feb. 02, 2026 Forward Kinematics
  - Feb. 04, 2026 Inverse Kinematics I
- Week 4
  - Feb. 09, 2026 Inverse Kinematics II
  - Feb. 11, 2026 Velocities
- Week 5
  - Feb. 17, 2026 Twists
  - Feb. 18, 2026 Jacobians
- Week 6
  - Feb. 23, 2026 Dynamics I
  - Feb. 25, 2026 Dynamics II
- Week 7
  - Mar. 02, 2026 Control I
  - Mar. 05, 2026 Control II
- Week 8
  - Mar. 09, 2026 Trajectory Planning I
  - Mar. 11, 2026 Trajectory Planning I
- Week 9
  - Mar. 16, 2026 Spring Break
  - Mar. 18, 2026 Spring Break
- Week 10
  - Mar. 23, 2026 Reinforcement Learning I
  - Mar. 25, 2026 Reinforcement Learning II
- Week 11
  - Mar. 30, 2026 Midterm Review
  - Apr. 01, 2026 Midterm Exam
- Week 12
  - Apr. 06, 2026 VLA control I
  - Apr. 08, 2026 VLA control II
- Week 13
  - Apr. 13, 2026 Project Kickoff
  - Apr. 15, 2026 Project Proposals
- Week 14
  - Apr. 20, 2026 Project Lit. Review I
  - Apr. 22, 2026 Project Lit. Review II
- Week 15
  - Apr. 27, 2026 Project working session
  - Apr. 29, 2026 Project working session
- Week 16
  - May. 04, 2026 Project Final Presentations

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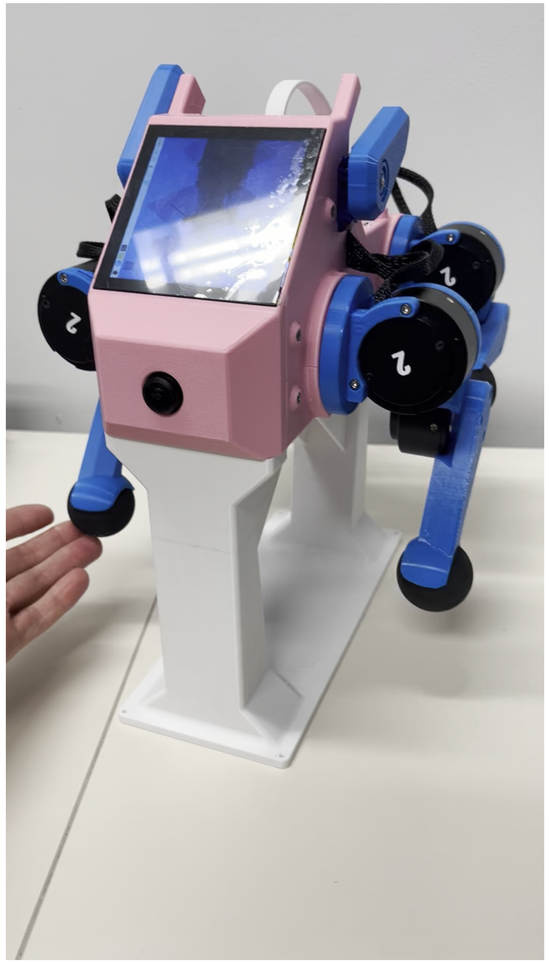
LAB SCHEDULE

Lab manuals are linked here. Labs will be done in pairs of two students. Labs begin on the dates listed left, and are due via Brightspace at 5:00PM EST on the day listed below right.

NOTE: The pupper robot was designed and built by the non-profit Hands-On-Robotics as means to improve robotics education. Much of the labs were derived from the Stanford University undergraduate robotics course which also uses the pupper robot.

Jan. 26-27-28, 2026	Lab 1 - PID Control	Due Feb. 02-03-04
Feb. 02-03-04, 2026	Lab 1 - (cont')	
Feb. 09-10-11, 2026	Lab 2 - Forward Kinematics	Due Feb. 16-17-18
Feb. 16-17-18, 2026	Lab 2 - (cont')	
Feb. 23-24-25, 2026	Lab 3 - Inverse Kinematics	Due Mar. 02-03-04
Mar. 02-03-04, 2026	Lab 3 - (cont')	
Mar. 09-10-11, 2026	Lab 4 - Impedance Control	Due Mar. 23-24-25
Mar. 16-17-18, 2026	Spring Break	
Mar. 23-24-25, 2026	Lab 4 - (cont')	
Mar. 30-31-01, 2026	Lab 5 - RL Control	Due Apr. 13-14-15
Apr. 06-07-08, 2026	Lab 5 - (cont')	
Apr. 13-14-15, 2026	Lab 5 - (cont')	



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ASSIGNMENTS SCHEDULE

Assignments are linked here. Assignments are to be done individually, but students can work together if they don't copy one another. Assignments are released on the dates listed left, and are due via Brightspace at 5:00PM EST on the day listed below right.

Feb. 02, 2026	Assignment 1	Due Feb. 09
Feb. 16, 2026	Assignment 2	Due Feb. 23
Mar. 02, 2026	Assignment 3	Due Mar. 09
Mar. 09, 2026	Assignment 4	Due Mar. 13
Mar. 23, 2026	Assignment 5	Due Mar. 30
Apr. 06, 2026	Assignment 6	Due Apr. 13

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PROJECT OVERVIEW - UNDER CONSTRUCTION

The goal of the final project is to allow students to explore and learn a novel approach to robot manipulation or locomotion. The project will leverage the pupper robot system hardware. Project requirements include:

- Students must deploy on a real robot
- Students must have a performance metric
- Students must work in groups of 3 people.

DELIVERABLES & GRADING

The following deliverables will make up your project's grade. Note that there is a rubric attached to each deliverable that provides guidance on expectations and grading. Note that your peer evaluation scores affect grades in two ways: 1) the evaluation you give a presenter affects the presenter's grade, 2) the evaluation you give a presenter affects YOUR grade. This is used to assess how much you are learning from other student's presenations.

Project Proposal - 10%

- 1-page written project proposal

Literature Review - 20%

- Live presentation of paper - 10%
- Peer evaluations of video presentation (same rubric as above) - 10%

Final Presentation - 70%

- Live presentation of final project - 60%
- Peer evaluations of video presentation (same rubric as above) - 10%

Grading

1. Projects – 35%
2. Labs - 30%
3. Assignments - 15%
4. Midterm Exam - 20%

Grading Late Work Policy

- You will have 3 late days to use on labs throughout the semester.
  - NO QUESTIONS ASKED
  - NO NEED TO REPORT
  - You can divide up your “3” late “days” however you want (all in one lab, or spread across three. This is NOT 72 hours to split up.

- No late work is accepted for project presentations, unless major emergencies.

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Course Website

https://sites.google.com/nyu.edu/rob-uy2004/

Attendance