**Topics in Robotics**

**College of Biomedical Engineering and Instrument Science**

**Zhejiang University**

**Summer 2023**

**Course Syllabus**

* **Meeting Times**

To be determined. Lectures will be given online.

* **Instructor**

Liangjing Yang (liangjingyang@intl.zju.edu.cn)

* **Course Material**

Course notes and sample code: provided in lecture and posted online

Recommended Textbook (optional): Robotics, Vision and Control, 2nd Ed., Peter Corke 2017

* **Course Description**

The course scope will cover the following: Fundamentals of robotics including spatial coordinate transformation and kinematics analysis; Essential topics on dynamics modeling and control strategies in robotics; Advanced robotics related to robot planning and perception.

The course will equip learners with the ability to understand the contemporary development trend, frontier technology and latest applications in the field of robotics.

* **Prerequisite**s

Basic proficiency in Calculus and Linear Algebra. Prior exposure to programming in Matlab will be helpful in appreciating the examples in class, but not compulsory as the discussion of the topics will be self-contained.

* **Lecture Schedule**

The course will consist of 10 lectures. The first four lectures will focus on building a foundation for the subject with the fundamentals of robotics in spatial representation, transformation, kinematics analysis and dynamics. The subsequent three lectures will provide knowledge in control and planning for robot. Finally, topics in robot vision will be covered before concluding the course with an overview of research and applications representative of modern robotics.

Lecture

1. Overview & Introduction, Spatial Coordinate Transformation
2. Forward kinematics (with D-H convention)
3. Inversive kinematics; Velocity Kinematics; Static Force
4. Dynamics Modeling
5. Robot Control Overview; Independent Joint Control
6. Control Design in Robotics
7. Planning in Robot Applications
8. Robot Vision: Overview & Image Analysis
9. Robot Vision: Camera Model & Pose Estimate
10. Robotics: Research and Applications