

 **CALIFORNIA STATE UNIVERSITY, CHICO**
AMAR 420 – Robotics for Advanced Manufacturing [4 units]

PREREQUISITES: [EECE 344](#) or [MECA 380](#).

COURSE TIME SCHEDULE:

| | | |
|---------------------------|----------------------|----------|
| Lecture M, W, F | 11:00 am to 11:50 am | PLMS 112 |
| Lab Friday | 2:00 am to 4:50 am | PLMS 112 |

INSTRUCTOR: Charlie Pooler

Email: cjpooler@csuchico.edu

OFFICE: OCNL 426 & Online

Cell Phone: 530-519-5439

Department Phone: 530-898-5346

OFFICE HOURS: [Link to my current schedule](#). Also available by appointment.

Course Description

An overview of robotics and its application to advanced manufacturing. Topics include vision, motion planning, mobile mechanisms, kinematics, dynamics, and sensors. Course activities will utilize industrial-scale robots, associated hardware, and modern simulation tools. This course will also introduce contemporary topics in robotics research and its application: 3 hours of laboratory and 3 hours of lecture.

Student Learning Outcomes

Students will be able to:

- Understand specific requirements and guidelines for the safe design, protective measures, and information for use with industrial robots according to ANSI/RIA R15.06-2012, ISO 10218-1, and ISO 10218-2
- Understand robotics foundations regarding the representation of position and orientation for mobile and serial/ parallel robots
- Explain different parts of an industrial robot and understand the advantages and disadvantages of different configurations.
- Apply simulation tools for off-line programming of robots in modern production systems.
- Describe current trends in the industrial robotics field and be oriented about international robotics research.

Required Textbook and Materials

Required (Free): Corke, Peter. *Robotics and control: fundamental algorithms in MATLAB®*. Vol. 141. Springer Nature, 2021. ISBN: 9783319544120

Recommended (also free): Khatib, Oussama, and Bruno Siciliano, eds. *Springer handbook of robotics*. Springer International Publishing, 2016. ISBN: 978-3319325507

Safety

Read and understand the Department's Lab Safety Policies and Procedures. Please complete the Acknowledgement of Lab Safety Policies and Procedures form, sign it, and turn it in for filing. Wear safety glasses is required for this lab whenever any pneumatic devices are in use.

General

1. Use professional judgment: turn off/silence cell phones, avoid distracting other classmates (watching videos, talking in class, etc.), attend class on time, stay for the course duration, etc.
2. Closed-toe shoes are required in the laboratory. Sandals and open-toe shoes are not allowed for safety reasons. Students not safely dressed will be asked to leave the laboratory, resulting in a missed lab activity.
3. Grades will be reduced to one grade each day an assignment is late, up to five days. Homework is not accepted once solutions are posted.
4. You are responsible for understanding the policies and procedures about add/drops, academic renewal, etc., found <http://www.csuchico.edu/catalog/>. You should know the new deadlines and penalties for adding and dropping classes.

Grading

| | |
|-----------------------------|------|
| Homework | 10% |
| Quizzes/In-Class Activities | 15% |
| Laboratory Activities | 25% |
| Midterm | 25% |
| Final | 25% |
| Total | 100% |

Grade Distributions

Final grades will be given according to the following distribution after the weighting above has been performed for each category.

| | |
|----|---------|
| A | 94-100% |
| A- | 90-93% |
| B+ | 88-89% |
| B | 83-87% |
| B- | 80-82% |
| C+ | 77-79% |
| C | 70-76% |
| C- | 65-70% |
| D | 55-64% |
| F | 0-54% |

Note: This distribution is subject to change during the semester.

Americans with Disabilities Act

If you need course adaptations or accommodations because of a disability or chronic illness, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. Please also contact Accessibility Resource Center (ARC), the designated department responsible for approving and coordinating reasonable accommodations and services for students with disabilities. ARC will help you understand your rights and responsibilities under the Americans with Disabilities Act and further assist with requesting and arranging accommodations.

Accessibility Resource Center

530-898-5959

Student Services Center

170 arcdept@csuchico.edu

AMAR 420 Tentative Schedule for Fall 2023 – Subject to Change

| Week | Abbreviated Descriptions of Topics by Week |
|-------------|---|
| 1 | Intro to Industrial Robotics, Ethics, and Safety Standards |
| 2 | Orientation, 2D and 3D Transformations, Rotations, and Pose |
| 3 | Measuring Motion, Understanding Paths and Trajectories |
| 4 | Types of Robots and Forward/ Inverse Kinematics |
| 5 | Robot Joint Control and Gripper Design |
| 6 | Offline Programming and Simulation of Industrial Robots |
| 7 | Collaborative Robots |
| 8 | Linux Systems, Python 3 for Robotics, and ROS Basics |
| 9 | Midterm |
| 10 | Introduction to Industrial Mobile Robots |
| 11 | Navigation |
| 12 | Localization |
| 13 | Computer Vision |
| 14 | Thanksgiving Break |
| 15 | Advanced ROS Navigation |
| 16 | Telerobotics, Digital Twins, and AR/VR Applications in Robotics |
| 17 | Final Project |