

Time: F 6:00pm – 8:40pm

Instructor: Ivan Arturo Renteria Marquez, PhD (Research Assistant Professor), e-mail: iarenteria@utep.edu; office: A-240

Office Hours: Tuesday & Thursday 3:00 PM-4:30 PM

Course Description: In MFG 5314 –Robotics and Flexible automation, students will get exposure to Smart Manufacturing (SM) architecture, industrial robotics, and automation technologies. First, the SM enablers such as cybersecurity, cloud, mobile devices, standardized visualization, data analytics, and sensorization will be introduced. Subsequently, robot architectures, modeling techniques, and commercial robot programming will be covered. Finally, students will learn flexible automation concepts, programmable logic controller programming, design of industrial human machine interfaces, and automation system integration techniques.

With the emphasis on industrial automation techniques, upon completion of this class, students will:

Be familiar with the Smart Manufacturing Vision and digital technologies that encompass it.

Understand the integration of hardware and software in a Smart Factory.

Understand robot modeling techniques, including forward and inverse kinematics of robots, Denavit-Hartenberg representation, and inverse kinematic solution of robots.

Have the ability to explain the architecture of industrial robots and the role of them in production floor.

Be familiar with programming languages of commercial collaborative robots.

Have the ability to work with logic gates and gate combinations.

Understand the principle of operation of programmable logic controllers. This includes interfaces, symbology and programming languages.

Gain exposure to industrial system integration technologies. Students will operate an industrial station composed by robots, sensors, actuators and conveyors belts through a supervisory control and data acquisition system.

Method of Instruction: Face-to-face class.

Exams/Homework Policies

Students are required to complete the exams and homework within the specified time. Dates for exams and homework will be announced as the semester advances.

Academic Dishonesty: Scholastic dishonesty is the attempt of any student to present the work of another as his or her own work, any work which he or she has not honestly performed or attempting to pass any examination by improper means. Scholastic dishonesty is a serious offense and will not be tolerated. Appropriate University policies and procedures will be followed for suspected scholastic dishonesty. You are encouraged to discuss any aspect of the course with classmates and project team members, but do not plagiarize the work of others by copying from the web, other students, articles, or other sources without properly referencing your sources. **See Class Addendum for further information and policies.**

Reference Books:

- “Smart Manufacturing”. Masoud Soroush. 2020
 “Introduction to Robotics: Analysis, Control, Applications”. Saeed B. Niku. 2019
 “Digital fundamentals: a systems approach”. Thomas L. Floyd. 2013.
 “Programmable Logic Controllers”. Frank Petruzella. 2017.
 “Automating with SIMATIC S7-1200: Configuring, Programming and Testing with STEP 7 Professional”. Hans Berger. 2014.

Additional Resources:

Universal Robots User Manual
 SIMATIC programming with Step 7 manual.

Center for accommodations and support services (CASS): If you have a disability and need classroom accommodations, please contact The Center for Accommodations and Support Services (CASS) at 747-5148, or by email to cass@utep.edu, or visit their office located in UTEP Union East, Room 106. For additional information, please visit the CASS website at www.sa.utep.edu/cass.

Course grading distribution

Homework/ Assignments	20%
Mid-Term Exam	40%
Final Exam	40%

Grading scheme:

Grades will be distributed based on the following scale:

% of Points Possible	Grade Assigned
90	A
80	B
70	C
60	D
60	F