

# Syllabus

## 5314/Robotics and Flexible Automation

3 credit hours  
3 total contact hours

Fall 2018

### Instructor Information

Instructor	Email	Office Location & Hours
Dr. Ivan Renteria	iarenteria@miners.utep.edu	E-113 T & R 3:00 PM-4:30 PM

### Course Materials

- **Textbook:**

“Industrial Automation: Hands On”. Frank Lamb. 2013.

- **Supplemental material:**

“Industrial electronics”. James Rehg. 2005.

“Digital fundamentals: a systems approach”. Thomas L. Floyd. 2013.

“Technician’s guide to programmable controllers”. Terry Borden. 2013

“Grob’s basic electronics”. Mitchel Schults. 2016

### General Information

#### Description

Modern concepts of robotics and flexible automation including power and control mechanisms, flexible material handling systems, programmable controllers, interfacing and end-of-arm tooling.

#### Course objectives

After successfully studying this course, student will be able to:

Understand the basic industrial automation technology and techniques on which the design of modern automation is based. These include: industrial power electronics, electrical motors, pneumatic actuators, motor control and sensors.

Understand the principle of operation of PLCs. This includes interfaces, symbology and programming language.

#### Topics

- Automation and manufacturing
- 1.1 Automation
- Introduction to digital systems

## *Department of Industrial, Manufacturing and Systems Engineering*

- 2.1 Digital and analog signals and systems
- 2.2 Binary digits, logic levels, and digital waveforms
- 2.3 Logic operations
- 2.4 Combinational and sequential logic functions

- Logic gates and gate combinations

- 3.1 Introduction to Boolean algebra
- 3.2 The inverter
- 3.3 The AND gate
- 3.4 The OR gate
- 3.5 The NAND gate
- 3.6 The NOR gate
- 3.7 The exclusive-OR and exclusive-NOR gates
- 3.8 Gate performance characteristics and parameters

- Combinational logic

- 4.1 Basic combinational logic circuits
- 4.2 Boolean expressions and truth tables
- 4.3 DeMorgan's theorems

- Ohm's Law

- 5.1 The current
- 5.2 The voltage
- 5.3 The resistance
- 5.4 Electric power
- 5.5 Open-circuit and short-circuit troubles

- Series circuits

- 6.1 Series IR voltage drops
- 6.2 Kirchhoff's voltage Law (KVL)
- 6.3 Polarity of voltage drops
- 6.4 Total power in series circuits
- 6.5 Troubleshooting: Opens and shorts in series circuits

- Parallel circuits

- 7.1 Parallel voltage
- 7.2 Kirchhoff's current Law (KCL)
- 7.3 Resistances in parallel
- 7.4 Total power in parallel circuits
- 7.5 Troubleshooting: Opens and shorts in parallel circuits

- Components and hardware

- 8.1 Controllers
- 8.2 Operator Interfaces
- 8.3 Sensors
- 8.4 Power Control, Distribution, and Discrete Controls
- 8.5 Actuators and Movement
- 8.6 AC and DC Motors
- 8.7 Pneumatic actuators

**Course Grading Distribution:**

Homework/Assignments/Quizzes	20%
Exam I	20%
Exam 2	20%
Final Exam	40%

**Grading Scheme:**

Grades will be distributed based on the following scale:

% of Points Possible	Grade Assigned
$\geq 90$	A
$\geq 80$	B
$\geq 70$	C
$\geq 60$	D
$< 60$	F

The instructor reserves the right to lower the grading scale at the end of the semester. It is expected that each assignment (homeworks, examinations and projects) be professional. The instructor reserves the right to penalize unprofessional responses to any assignment up to including awarding a zero (0) for the assignment.