Lassen Community College Course Outline

WT-52 Robotic Operations and Programming 3.0 Units

I. Catalog Description

This course is the first in a two part series in robotics. The course will provide a student with the skills to safely setup, program, and operate a robot using basic software functions. This course has been approved for hybrid delivery.

Does not transfer to UC/CSU
17 Hours Lecture, 102 Hours Lab, 34 Outside Class Hours, 153 Total Student Learning Hours
Scheduled: Fall

II. Coding Information

Repeatability: Not Repeatable
Grading Option: Graded or Credit/No Credit
Credit Type: Credit - Degree Applicable
TOP Code: 095650

III. Course Objectives

A. **Course Student Learning Outcomes**

Upon completion of this course the student will be able to:

1. Safely power up the controller and jog the robot in world and joint mode within a work cell.
2. Create and run a program.
3. Select an existing program and single-step test that program using the teach pendant.

B. **Course Objectives**

Upon completion of this course the student will be able to:

1. Describe safety concerns when powering down the controller.
2. Demonstrate or explain how to power up the controller.
3. Demonstrate or explain how to power down the controller.
4. Jog the robot in Joint and World mode using the teach pendant.
5. Demonstrate the right-hand rule as it applies to the robot axes.
6. Describe the Cartesian coordinate system.
7. Describe or demonstrate how to teach one or more points.
8. Modify motion instructions
9. Describe or demonstrate how to access the position detail screen for positional information.
10. Describe or demonstrate how to select an existing program using the teach pendant and single step test that program.
11. Describe or demonstrate how to continuous test a program using a teach pendant or standard operator panel (SOP).
12. Demonstrate how to pause a program when step or continuous testing a program in a production environment.
13. Save and edit programs

IV. Course Content

A. Safety and Cycle Power

1. Robotic safety practices
2. Safety devices, inside and outside the robotic cell
3. Operating and programming safety precautions

B. Robot System

1. Robot components
2. Major and minor axes
3. Controller types
4. Operator panels

C. Teach Pendant

1. Pendant use and function
2. Pendant keys/function keys
3. Pendant status indicators
4. Deadman switch
5. Emergency stop button

D. Power-Up, Jogging and Initial Setup

1. Startup methods Robot Singularity
2. Jogging the robot Chain failure detection and recovery
3. Robot motion – Joint vs. World
4. Coordinate system and right–hand rule

E. Error and Fault Recovery

1. Recovery from common faults and errors
2. Robot Singularity
3. Software axis limits
4. Chain failure detection and recovery

F. Motion Programs

1. Create, modiify, and execute a teach pendant program
2. Testing a program
3. Touching up program points

G. Copying and Editing Programs

1. Inserting and deleting program lines
2. Finding program instructions within a program
3. Copying and pasting program lines

H. Branching

1. Unconditional branching instructions
2. Conditional branching instructions
3. If and select instructions
4. Wait instructions

I. Input and Output (I/O)

1. Types of I/O signals
2. Configuring I/O
3. Monitoring I/O signals

J. Macros

1. Create a macro program
2. Assign a macro program

K. Program and File Manipulation

1. Setting the default storage device
2. Deleting a program
3. Loading a program from a device
4. File backup vs. image backup and restore

V. Assignments

A. **Appropriate readings**
Textbook Reading-Students will be expected to complete all assigned chapter reading assignments.

B. **Online lab assignments**
Complete: Robot Operations (five modules)

C. **Writing assignments**
None

D. **Out of class assignments**
Homework – end of chapter review questions from the student manual.

VI. Methods of Evaluation

Traditional method of evaluation will be based on the following:

A. Lab Assignments
B. Homework assignments (Chapter review questions)
C. Tests/quizzes
D. Robot operations master quiz (to be completed online). A score of 80% or higher is required to pass.

Hybrid Evaluation
All quizzes and exams will be administered during the in person class time. Students will be expected to complete on-line assignments and activities equivalent to in class assignments and activities for the onl-ine portion of the course. Electronic communication, both synchronous and asynchronous (chat/forum) will be evaluated for participation and to maintain effective communication between instructor and students.

VII. Methods of Delivery

Check those delivery methods for which, this course has been separately approved by the Curriculum/Academic Standards Committee.

☒ **Traditional Classroom Delivery** ☐ **Correspondence Delivery**

☒ Hybrid Delivery ☐ Online Delivery

Traditional Delivery
Traditional classroom delivery will be used for all required lecture/lab hours. In addition, students will be expected to complete "Robot Operations" using FANUC's online eLearn during lab hours.

Hybrid Delivery
A combination of traditional classroom and on-line instruction will be utilized. Each semester a minimum of 17 hours will be taught face-to face by the instructor and the remaining hours will be instructed on-line through the technology platform adopted by the District. Traditional class instruction will consist of exercises/assignments, lectures, visual aids, and practice exercises. Online delivery will consist of exercises/assignments, lecture posts, discussions, adding extra resources and other media sources as appropriate.

VIII. Representative Texts and Supplies

Text:
Fanuc Robotics - ArcTool Operations and Programming Student Manual
Note: Available from Lassen College book store only

IX. Discipline/s Assignment

Welding Technology

X. Course Status

Current Status: Active
Course Originator: Kory Konkol
Original Approval Date: 09/20/2016
Board Approval Date: 10/11/2016
Chancellor's Office Approval Date: 02/13/2019
Revised By: Kory Konkol
Latest Curriculum/Academic Standards Committee Revision Date: 02/15/2022