



Year and Semester	FA2017
Course Number	MNT 217-01
Course Title	Process Automation and Robotics
Class Time	Friday 11am-1.50pm
Class Location	111Q (Quest)
Professor: Damian Kieran	Office Hours
Email: dkieran@qcc.mass.edu	Tuesday 6pm-7pm
Office: 116Q (Quest)	Wednesday 6pm-7pm
Phone: 508-854-4578	Friday 2pm-4pm
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COURSE DESCRIPTION

Students learn and practice systematic troubleshooting, using a highly automated manufacturing system as course provides students with an overview of the systems and concepts involved in today's highly automated manufacturing environments. Robotic systems, an important component of an automated system, are also studied. Topics include automation design, robotic systems, manufacturing execution systems (MES), and statistical process control (SPC) as well as robotic systems.

Pre-requisite: CIS 111, Coreq: MNT 115


COURSE MATERIALS (REQUIRED)

Fanuc E-Learning Online Tool (details will be discussed in class).

STUDENT LEARNING OUTCOMES

Through a combination of lectures, demonstrations, assignments, weekly readings, and completion of worksheets, students will:

1. Identify and list the main components of a robotic automated system.
2. Understand and follow the safety procedures required to ensure safe operation of a robot.
3. Understand the major software settings of a robot such as tool frames, collision guard and payload.
4. Learn to jog the robot using the teach pendant.
5. Learn to create programs using the teach pendant.
6. Learn to test programs using the teach pendant.
7. Learn to run programs using the cycle start feature.
8. Learn to manage and manipulate files on the robot.
9. Operate and maintain an automated system through the use of manufacturer's equipment manuals, schematics, and maintenance procedures.
10. List the components of a typical highly automated manufacturing installation.
11. Define terms related to Highly Automated Manufacturing such as:
 - MES – Manufacturing Execution System
 - SCADA
 - AMHS – Automatic Material Handling System
 - OEE – Overall Equipment Efficiency

	<p>Students who successfully complete the course will receive a certificate with the FANUC CERT logo.</p>
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TEACHING PROCEDURES

1. There will be a strong emphasis on “hand-on” learning using the Roboguide software, robots and other automated tools.
2. Fanuc CERT Student Manual
3. PowerPoint presentations
4. Supplementary handouts as needed
5. Homework and laboratory assignments

The Instructor will introduce each new subject and demonstrate using the examples. The students will be given examples to complete in class to help them practice. During these practice examples, the students may work in teams and ask the instructor any relevant questions about the subject matter.

BASIS FOR STUDENT GRADING

A student’s grade is determined according to the following method:

Percent	Section
40%	Completion of lab assignments as observed by Instructor.
30%	Weekly assignments (Fanuc).
20%	Final exam/project. This will be a detailed Fanuc program generated from scratch.
10%	Attendance
100%	TOTAL

CRITERIOR FOR GRADING

1. The weekly lab and homework assignments will be graded as complete and accurate 100% or incomplete (percentage awarded by the instructor after reviewing the assignment).
2. The final project will be evaluated using the following criteria:
 - a. Documentation
 - b. Accuracy
 - c. Calculation
 - d. Communication

TENTATIVE EXAM SCHEDULE

Mid Term Exam: Friday 10/20 from 11 AM to 1pm in Room 111Q

Final Exam: Friday 12/15 @ 11:00 – 01:00 in 111Q

ATTENDANCE POLICY

Student must maintain a 75% attendance rate to pass this course.

NOTES:

1. The college provides computers with the required software. NO EXCUSES ARE ACCEPTED FOR LATE ASSIGNMENT BASED ON YOU HOME COMPUTER TECHNICAL PROBLEMS.
2. You must be able to manage your own computer files and personal computer set up.
3. Late assignments may be graded as a zero.
4. Labs and Tests must be attended.
5. It is the responsibility of the student to make up their work. Absence is not an excuse.
6. No cell phones are allowed during class time.

The instructor reserves the right to make any necessary adjustments to this syllabus. Notification of syllabus changes or modifications may be sent by E-mail to the class list.

It is important to become familiar with the Q Portal. This is one portal for QMail, Blackboard, Starfish, Atomic Learning and the Helpdesk and it provides a unified electronic foundation for your communication as well as all other areas of the college. The Advising Office will be hosting "The Q Review" sessions in the first weeks of the semester to get students familiar with the technological tools they are required to use while enrolled here at QCC.

Services for Veterans

QCC is proud to support veterans. If you are a veteran of the armed forces, please visit the Veteran Affairs Office located in 125A (Administration Building) or email veteranaffairs@qcc.mass.edu.

Concerning students with special needs:

Every effort will be made to meet the individual needs and various learning styles of students in this course. It is of the utmost importance that you inform me at the beginning of the semester of your particular needs. If you have concerns about this course, please make an appointment with me. If your concerns are about a learning disability or other specific need, please make an appointment with me and with a learning specialist at the Disability Services office, Room 246A. All information is strictly confidential.

Concerning attendance (taken from the Student Responsibilities section of the Student Handbook):

Students are expected to attend their scheduled classes. Instructors will disseminate attendance requirements in writing to their students during the first week of classes.

Concerning plagiarism (taken from the College Policies section of the Student Handbook):

Plagiarism means taking someone else's ideas or words and presenting them as one's own. The offense can take many forms including cheating on a test, passing in a paper taken from the Internet or from another student, or failing to properly use and credit sources in an essay. Sometimes the issue is subtle, involving getting too much help on an assignment from someone else. In every instance, plagiarism means cheating both oneself and the owner of the source. Since the cheating sabotages a student's learning experience, consequences range from no credit for the assignment to failure for the course and possible expulsion from the college.

Any student considering plagiarism should recognize the consequences and consider alternatives. Students uncertain about what constitutes plagiarism may request help from faculty or from appropriate college services.

COURSE OUTLINE

Week	Date	Topic(s)	Learning Objectives	Assessment
1	9/8/2017	Syllabus Review Intro to Robots (Slides: Ch 1 Robotics in Manufacturing) Lab Orientation – Safety Fanuc Course Overview	Understand the requirements of the class and the topics to be covered.	Verify Roboguide login and setup Verify Fanuc Online Login
2	9/15/2017	Robot Safety. CERTBRO1 Slides 1-12 LRMate Education Training Cart MH1. CERTBRO1 Slides 13-43	This section provides guidelines to emphasize the importance of safety whenever robots are used. This section presents a general overview of the LRMate Education Training Cart MH1 and its components, its safeguards, and its start-up and shut-down procedures	Complete robot lab procedures using Roboguide and LRMate robots. Complete online Fanuc assignments.
3	9/22/2017	Teach Pendant CERTBRO1 Slides 44-50	This section provides guidelines on how to use the teach pendant, how to use the function menu and become familiar with the status indicators.	Complete robot lab procedures using Roboguide and LRMate robots. Complete online Fanuc assignments.
4	9/29/2017	Power Up, Jogging and Initial Setup Error and Fault Recovery Frames CERTBRO1 Slides 51-81 CERTHT2 Slides 1-16 (Frames)	This section describes how to power up the robot, how to jog the robot in Joint and World, how to view positional data. This section demonstrates how to recover from faults and errors. The Frames section teaches the Cartesian Coordinate system and the main frames used (WORLD, TOOL, USER, JOG)	Complete Labs 1, 2,3 and 4 from manual (p. 83-86). Complete Labs 5 and 6 from manual. Complete Labs 7 and 8 from manual.
5	10/6/2017	Motion Programs Motion Instructions CERTHT1 Slides 1-42	This section teaches the creation of motion programs, naming methods, recording and testing of programs. This section teaches motion types, position registers, termination types, how to add/delete instructions and using predefined positions.	Complete Lab 9 from manual. Complete Labs 10 thru 13 from manual.

6	10/13/2017	Copying and editing programs. Chapter 11 in Manual Branching Chapter 12 in Manual CERTHT2 Slides 18-29	This section teaches inserting, deleting, finding replacing and renumbering lines within a program as well as copying and pasting lines. Understand Unconditional and Conditional Branching. Understand Data registers, IF, SELECT, WAIT instructions.	Complete Lab 14 from manual. Complete Labs 15 thru 19 from manual.
7	10/20/2017	MID TERM Position Register and Miscellaneous Instructions CERTHT2 Slides 27-29	COMPLETE PRE TEST Understand Position Registers and know how to use Position Register instructions. Understand Miscellaneous Instructions.	Complete robot lab procedures using Roboguide and LRMate robots.
8	10/27/2017	Input and Output CERTHT1 Slides 43-54 CERTHT2 Slides 30-44 System Variables and Macros CERTHT2 Slides 57-59	Know how to configure, monitor and control I/O. Understand System Variables. Know how to create and assign Macros.	Complete robot lab procedures using Roboguide and LRMate robots.
9	11/3/2017	Running a Teach Pendant Program	This section includes running a teach pendant program in step mode and continuous through the teach pendant and also running a program utilizing the cycle start button on the operator panel.	Complete robot lab procedures using Roboguide and LRMate robots. Complete online Fanuc assignments.
10	11/10/2017	No Class	Veteran's Day	No Class
11	11/17/2017	Program and File Manipulation CERTHT1 Slides 55-61	This chapter covers the different methods to back up and restore programs, files and the controller.	Complete robot lab procedures using Roboguide and LRMate robots.
12	11/24/2017	No Class	Thanksgiving Holiday	No Class
13	12/1/2017	Final Exam/Project	Synthesize the learning from this course into a final project.	Preparation
14	12/8/2017	Final Exam/Project COMPLETE POST TEST	Synthesize the learning from this course into a final project.	Preparation
15	12/15/2017	Final Exam/Project @ 11:00 – 01:00 in 111Q	Synthesize the learning from this course into a final project.	Presentation

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