ME345: Automation & Manufacturing Methods
Spring 2022

Instructor and Class Information

Instructor: J. William (Will) Boley, Assistant Professor in the Department of Mechanical Engineering and Division of Materials Science and Engineering, jwboley@bu.edu, (617)-358-1134
Office Hours: By appointment - please arrange via email or in person directly following lecture.
Office Location: 730 Commonwealth Ave, Rm 217
Lecture Times, Location: Tuesday & Thursday 1:30-3:15 (EPC 206, 750 Commonwealth Avenue)
Graduate Student Teachers (GSTs):

- Erik Ersland, eersland@bu.edu, Instructs labs C1 (Monday 2:30 PM - 5:15 PM) and C2 (Wednesday 2:30 PM - 5:15 PM)
- Xinhuan (Leo) Sang, leosang@bu.edu, Instructs labs C3 (Thursday 8:00 AM - 10:45 AM) and C4 (Tuesday 8:00 AM - 10:45 AM)

Graduate Teaching Assistant (GTA): Ronak Chougule, ronakc@bu.edu, Instructs labs C5 (Wednesday 8:00 AM - 10:45 AM) and C6 (Monday 8:00 AM - 10:45 AM)
Lab Supervisor: Caroline Carbo, ccarbo@bu.edu, (617)-358-1691, Instructs lab C7 (Friday 8:00 AM - 10:45 AM)
Lab location, Hours: 750 Comm Ave (EPIC), See EPIC Website for hours
Corequisites: ME358: Manufacturing Processes (Co-requisite)
Course Website: `http://learn.bu.edu`

Course Description:

An introduction to the major concepts and practices of modern manufacturing, including computer numerically controlled (CNC) machine programming, scheduling, robotic programming and control, real-time process control, digital imaging and machine vision, programmable logic control (PLC), statistical process control (SPC), production system design (LEAN), and computer-based process simulation. Strong emphasis is given to hands-on laboratory experience, with a lecture component covering fundamental concepts and supporting the laboratory exercises and projects. Includes lab. 4 credits.

Course Objectives

1. Introduce tools, principles, and methods, used in modern manufacturing.
2. Acquire practical experience in computer-aided manufacturing (CAM) and manufacturing process development through a series of laboratory exercises.
3. Understand the strategies and methods used to optimize production system design & operations.
4. Support a team effort to design & manufacture a product with the ADML flexible manufacturing cell.

Required Reading

- Selected readings from *Fundamentals of Modern Manufacturing*, M. P. Groover, John Wiley & Sons, Inc., 6th Edition (2016), posted to Blackboard.
- Selected readings from *Operations and Supply Chain Management*, F. Robert Jacobs and Richard B. Chase, McGraw-Hill Education, 15th Edition (2018), posted to Blackboard.
- *Other readings (articles, excerpted material, etc)* posted to Blackboard.
- *Lecture slides* posted to Blackboard.
- *Lab manuals* posted to Blackboard (read prior to lab).

Grading:

1. Labs (pre-lab questions 25%, lab reports 75%): [30%]
2. Homework (four total) [20%] (Weighted equally)
3. Mid-term Exam* [20%] (Based on lectures, exercises, homework, discussions, labs, reading, etc.)
4. Course Project (based on degree of completeness, level of effort, presentation and reports) [20%]
5. Class & Lab Attendance, in-class exercises, project team and lab partner feedback, quizzes and participation [10%]

Labs:

- Each lab will take place in the EPIC Automated Design and Manufacturing Laboratory (ADML) facility (EPC 101, 750 Comm Ave). Students are expected to attend the full duration of their lab and actively participate, along with their lab partners.
- In order to access that facility, you must take and pass the EPIC Safety quiz: https://www.bu.edu/epic/get-started/safety-quiz/.
- Students must submit their **individual** pre-lab answers on Gradescope the Friday prior to the corresponding lab, in accordance with the course schedule.
- Students in each lab section will split up into 2 groups of 2 lab partners. For lab sections with an enrollment of 3, there will only be one group. Each group will be responsible for doing each lab as a team *except for* labs 2 (CNC MIlling), 7 (Computer Integrated Manufacturing (CIM) Part I), and 8 (CIM Part II). For lab 2, each student will go through the lab procedure individually under the guidance of their lab instructor. For Labs 7 and 8 all students will all students in each lab section will and each of the 2 groups will be responsible for conducting all of the labs submitting a lab report for their respective group. Lab reports are expected to be submitted online through Gradescope as a Word document one week after the corresponding lab session

Table 1: ME345 Lab Schedule

Lab#	Title
1	Robotics 1
2	CNC Milling
3	Robotics 2
4†	Programmable Logic Control (PLC)
5†	Vision Systems
6	Advanced Robotics & Integration
7	CIM, Part I
8	CIM, Part II
9	Statistical Process Control (SPC)

† Labs 4 and 5 will be run in parallel in each lab section. For the first corresponding week, Group A lab partners will perform Lab 4 while Group B lab partners perform Lab 5. The following week, Group A will perform Lab 5 while Group B performs Lab 4. This is further reflected in the schedule for the course. Clarify with your lab instructor which group you and your lab partner(s) are.

Course Project:

The course project entails the manufacture of a **new** product that **positively impacts society** using the automated assembly line in the ADML. This project includes six components: 1) Design of the product and its parts, 2) Development of manufacturing strategy and processes, 3) Computer integrated manufacturing (CIM) control, 4) Scheduling, 5) Implementing Lean principles, and 6) Cost estimation. Your lab group will be all the students in your specific lab section. More details of the project can be found in the project description, available on Blackboard. The detailed instructions and the rubrics for project assignment will be presented during Lectures 6-8 and will be available on Blackboard.

General Class Policies

1. **Attendance:** Attendance and participation in all lectures and labs are expected and are factored into the grade (10% of your total grade, and includes lecture, lab, and project participaton). Any absences of lectures or labs that are within reason must be communicated by the student to the course and lab instructors in advance. 14.3% and 12.5% of possible attendance points will be deducted for every 15 minutes a student is late for each lecture or lab, respectively. The student is also responsible for working with the course and lab instructors and their lab teammates on how to make up any assignments or other work that may be affected by the absence. Some lectures throughout the semester will include breakout group work. To accommodate this on those specific lecture days, students are strongly encouraged to sit in desks adjacent to the classmates that are in the same lab section, and to be active participants.
2. **Making Up Assignments:** Make up of missed work permitted only with approval **before** the scheduled due date/time, otherwise the assignment is considered late.
3. **Late Assignment Grade Deductions:** With the exception of pre-lab assignments and the GibbsCAM checklist for the project prototypes, any late assignments will be receive deductions of 3% if submitted on the due date but after the time it is due. The following deductions will be applied if submitted after the due date. A 5% deduction per day late for the first 2 days, followed by an additional 10% per day late for the next 2 days, then an additional 20% per day late for the next 2 days, and an additional 30% for the 7th day (i.e., students will receive no credit for anything submitted a week late). For the pre-lab assignments and GibbsCAM checklist for the first project prototypes, late assignments wll receive deductions of 20% if submitted on the due date but after the time it is due. An additional deduction of 30% will be incurred for each day after the due date until 5:00 pm two days after the due date (i.e., students will receive no credit for anything submitted after 5:00 pm two days after the due date). This is to allow lab instructors and graders to review the corresponding GibbsCAM and to prepare feedback for the students so that any errors can be addressed in the lab in a timely manner.
4. **Grade Queries:** It is the student's responsibility to ensure that all assignments have been recorded correctly (assignments receiving a 0 due to late or non-submitted assignments do not apply to this). Students have two weeks to review graded work and contact the course instructor about any requested changes. No change in grade will be permitted after this two week period.
5. **Electronic Device Policy:** Non-ME345 electronic devices (including but not limited to cell phones or laptops) use in lab and class is prohibited; repeat offenses will result in a grade penalty. Devices for taking notes (e.g., tablets or iPads) are acceptable.
6. **Academic Conduct Statement:** Students must follow the BU Academic Conduct Code: https://www.bu.edu/academics/policies/academic-conduct-code/. Any violation of this conduct code will be reported to the College of Engineering Academic Conduct Committee. This includes plagiarism, defined by Merriam-Webster as: "to steal and pass off (the ideas or words of another) as one's own." Students should take care to cite any source they use and ensure anything they hand in as their own is their own original work.
7. **COVID 19 & BU Community Health Expectations:** Masks are required and face coverings must be worn over the mouth and nose at all times when in public spaces on campus, including classrooms. All students are expected to follow all university guidelines with respect to vaccinations, testing, social distancing, and mask wearing when they leave their dorm or home. For a detailed description of official BU policies regarding COVID, please visit: http://www.bu.edu/dos/policies/lifebook/covid-19-policies-for-students/.
8. **Inclusion:** I consider this classroom to be a place where you will be treated with respect, and I welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability – and other visible and non-visible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class.
9. **Accommodations for Students with Documented Disabilities:** If you are a student with a disability or believe you might have a disability that requires accommodations, requests for accommodations must be made in a timely fashion to Disability & Access Services, 25 Buick St, Suite 300, Boston, MA 02215; 617-353-3658 (Voice/TTY). Students seeking academic accommodations must submit appropriate medical documentation and comply with the established policies and procedures (http://www.bu.edu/disability/accommodations/.)