ME345: Automation & Manufacturing Methods
Fall 2020

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/remotely through Zoom broadcast directly following lecture.
Office Location: 730 Commonwealth Ave, Rm 216
Lecture Times, Location: Tuesday & Thursday 1:30-3:15 (ENG 245, 110-112 Cummington Mall)
Graduate Student Teacher (GST): Stephanie Flores-Zopf, sfzopf@bu.edu, Instructs labs C1 (Monday 2:30 PM - 5:15 PM) and C2 (Wednesday 2:30 PM - 5:15 PM)
Graduate Teaching Assistant (GTA): Jason Mcgrath, jasonmcg@bu.edu, Instructs labs C5 (Wednesday 8:00 AM - 10:45 AM) and C6 (Monday 8:00 AM - 10:45 AM)
LfA Class Moderator: Elena Sanchez, elesanch@bu.edu
Lab Supervisor: Jeffrey Costello, jdc0214@bu.edu, (617)-358-1691, Instructs labs C3 (Thursday 8:00 AM - 10:45 AM), C4 (Tuesday 8:00 AM - 10:45 AM), and C7 (Friday 8:00 AM - 10:45 AM)
Lab location, Hours: 750 Comm Ave (EPIC), See EPIC Website for hours
Prerequisites: None
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 directly following lecture.
- *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:

- All labs will be live and remote this semester. Each lab will take place in the EPIC ADML facility (EPC 101, 750 Comm Ave). Students are expected to access the live Zoom Broadcast lab during their lab scheduled time, and to actively participate, along with their lab partners, in their remote labs. Students will be notified by their lab instructor on how to join their specific lab section.
- Students must submit their **individual** pre-lab answers on Blackboard prior to the beginning of the lab.
- Students in each lab section will work together (in either teams of 3 or 4, the enrollment of a given lab section) and submit a single lab report for all labs *except for* labs 2 (PLC) and 3 (Vision Systems). For labs 2 and 3, the lab sections that have 4 students will split up into 2 groups of 2 lab partners and each of the 2 groups will be responsible for submitting a lab report for their respective group. For lab sections with an enrollment of 3, there will only be one group for labs 2 and 3. Lab reports are expected to be submitted online through Blackboard as a Word document one week after the corresponding lab session.

Table 1: ME345 Lab Schedule; labs on the same row are conducted in parallel (groups A and B switch the following week. Confirm with your Lab Instructor which group you are in during your first lab.)

Lab#	Title	Lab#	Title
1a	Collaborative Robotics Part I		
1b	Collaborative Robotics Part II		
2	Programmable Logic Control	3	Vision Systems
4	CNC Machining		
5	Advanced Robotics & Integration		
6	Computer Integrated Manufacturing, Part I		
7	Computer Integrated Manufacturing, Part II		
8	Statistical Process Control		

Course Project:

The course project entails the manufacture of a product using the flexible manufacturing cell in the ADML. This project includes five components:1) design of the product and its parts, 2) development of manufacturing strategy and processes, 3) CIM control (BUMES), 4) scheduling, and 5) cost estimation. The 3 or 4 students comprising your lab section is your project group. The detailed instructions and the rubrics for project assignment will be presented during Lecture 8 and 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 will throughtout the semester will include breakout group work. To accommodate this on those specific lecture days, in person students are strongly encouraged to sit in desks adjacent to their lab teams. Students attending remotely will join breakout rooms corresponding to their lab sections to do group in class work. The Zoom link for the lecture is: https://bostonu.zoom.us/j/98089867445?pwd=UjRPd213eTRNUjZTL3NHNkxkTFJsZz09. This link is also posted to the ME345 Google Calendar in the location and details of the lecture events. Anyone joining remotely is expected to share their video feed throughout the lecture. Remote participation is strongly encouraged and will be managed in real time through the LfA moderator.

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:** Any late assignments will be receive deductions of 3% if submitted on the due date but anytime after the time it is due, with an additional 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.
4. **Grade Queries:** It is the student's responsibility to ensure that all quizzes and assignments have been recorded correctly. 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 device (including but not limited to cell phones or laptops) use in lab and class is prohibited; repeat offenses will result in a grade penalty. Due to COVID 19, students will be encouraged to bring their laptops, especially those who have lab teammates who are learning remotely, so that everyone in their group can participate in breakout groups during lecture. **Make sure you bring headphones to avoid feedback.**
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. Students should be prepared to show proof that they are compliant with health attestations and testing in order to attend class. All students are expected to follow all university guidelines with respect to daily symptom checks, 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/.)