

ISE 215
Fundamentals of Modern Manufacturing
Fall Semester 2018
(version 1)

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Office Hours: M, W, F Before or after class or by appointment in Packard 304

Course Description: Study of modern production methods. Manufacturing processes and systems. Metal machining and forming, polymer shape processes, powder metallurgy, assembly and electronics manufacturing. Introduction to automation, numerical control, and industrial robots. Prerequisite: MAT 33.

Course Objectives: Upon completion of this course, students will:

- know the terms, basic process capabilities, and limitations of manufacturing processes used to process metals and plastics
- be able to apply analytical models to manufacturing processes and from these models determine the effects of changes in the process parameters
- be able to analyze mechanical assembly methods such as screw, nuts, and bolts; press fits; and snap fits including design for assembly principles
- be able to analyze and design simple manufacturing production lines involving automated machines
- understand the numerical control (NC) machine tool and robot anatomy and elementary programming of NC machines

Text: M.P. Groover, *Fundamentals of Modern Manufacturing: Materials, Processes, and Systems*, 6th ed., Wiley, 2015 and 2016. ISBN 978-1-119-12869-4 (loose leaf or electronic)

Grading Policy: The grade in the course will be based on the student's performance in three one-hour quizzes, a final exam, homework submissions, in-class activities, and a project. Each hour quiz is worth 100 points and the final exam is worth 200 points. The homework will be worth approximately 20-40 points, depending on the number of assignments. In-class activities will be worth about 60 points. About half the points will be mandatory exercises. The other half will be extra credit. The project will be worth 60-90 points. Each student will be graded according to the total points accumulated out of the total of approximately 610-660 points. All hour quizzes and the final exam are closed book, but a formula sheet is allowed (see below).

Hour Quiz Policy: There will be three one-hour quizzes during the semester, each worth 100 points. The dates are fixed and listed on the syllabus. The material covered on the exam will be announced prior to the exam. In order to qualify for a makeup exam, an excused absence must be approved prior to the exam.

Hour Quiz Formula Sheet: Each student will be allowed to use a formula sheet that they have prepared in advance of each hour quiz. A one-page formula sheet is recommended, but the formula sheet can consist of multiple pages if needed. The same formula sheets used for the hour quizzes can be used for the final

exam. The formula sheet should contain only equations and formulas, with up to three words to identify each equation and symbol, and the proper units can be listed for each equation and symbol (both SI and USCS). There are to be **no example problems, no sketches, no diagrams, no lists, nor other text material** on the formula sheets. Formula sheets are subject to inspection and collection by the instructor during or after the quiz. If items are crossed out or blackened, a photocopy must be used and the crossed out items must not be visible. If a formula sheet is found to be in violation of the guidelines, no credit will be given for the quiz or exam problem to which the violation refers and that portion of the formula sheet will be confiscated if found during the exam.

Attendance Policy: Students are encouraged to attend class and will be held responsible for all material covered in class, including any announcements about homework or quizzes. Throughout the semester there will be in-class activities that cannot be made up. Students who elect not to attend class are expected to maintain a “passing” level of performance. If they do not, the instructor may use the Section III policy to issue warnings of possible failure. If a student is missing class and does not take the first hour quiz, a Section III warning may be given. If a student misses the first two hour quizzes, a Section III will be issued regardless of his/her attendance record.

Homework Policy: Homework problems will be assigned approximately once per week. Students will turn in their homework assignments at the beginning of class on the day they are assigned. Solutions will be posted on Coursesite. Students are encouraged to ask about solutions during class or at office hours.

Laboratory Work: ISE 216 is the companion laboratory course for ISE 215. Laboratory exercises will be assigned in ISE 216 that relate to the topics covered in ISE 215. Accordingly, if students plan to take ISE 216, it is recommended that it be taken in the same semester as ISE 215, although it is permitted to take the lab course in a later semester.

Neatness and Legibility in Submitted Work: On any work submitted for course credit, students are responsible for expressing their solutions and written material in a neat, orderly, concise, and legible fashion. Problem solutions should exhibit a logical, step-by-step progression toward the final answer. Reports and case problems should be in the most appropriate format and be written in ink or typewritten. The student is responsible for proofreading all submitted reports. Failure to accomplish any of the above may constitute grounds for a reduction of credit on submitted work.

Accommodations for Students with Disabilities:

If you have a disability for which you are or may be requesting accommodations, please contact both your instructor and the Office of Academic Support Services, University Center C212 (610-758-4152) as early as possible in the semester. You must have documentation from the Academic Support Services office before accommodations can be granted. More information can be found here:
<http://studentaffairs.lehigh.edu/disabilities>

The Principles of Our Equitable Community:

Lehigh University endorses The Principles of Our Equitable Community (<http://www4.lehigh.edu/diversity/principles>). We expect each member of this class to acknowledge and practice these Principles. Respect for each other and for differing viewpoints is a vital component of the learning environment inside and outside the classroom.

IE 215 Course Schedule:

Week	Topic	Text Reference	Background
Aug 27	Introduction to manufacturing Metal machining, chip formation, forces and power, cutting temperatures	Ch 1 Ch 20	Ch 2, 3, and 6 (emphasis on Sec 3.1)
Sep 3	Machining Operations	Ch 21, omit Sec 21.6, 21.7, and 21.8	
Sep 10	Cutting tool technology Machinability, tolerances and surface finish	Ch 22, omit Sec 22.4 Ch 23 omit Sec 23.3 and 23.4	Ch 3 (emphasis on Sec 3.2, 3.3)
Sep 17	Fundamentals of metal casting	Ch 10	Ch 6, Sec 3.4, 4.1
Sep 24	Shaping processes for plastics	Ch 13, omit Sec 13.10, 13.11, 13.12	Ch 8, Sec 3.4 3.5
Sep 28	Hour Quiz 1 (Friday)*		
Oct 1	Shaping processes for plastics	Ch 13, omit Sec 13.10, 13.11, 13.12	
Oct 8	Rapid Prototyping and Additive Mfg Powder metallurgy	Ch 32 Ch 15	Ch 6
Oct 15-16	Pacing Break		
Oct 19	Fundamentals of Metal Forming	Ch 17	Ch 6
Oct 22	Bulk deformation processes: forging, extrusion only	Ch 18, omit Sec 18.1, 18.4	Sec 3.1
Oct 26	Hour Quiz 2 (Friday)*		
Oct 29	Sheet metalworking: cutting, bending, drawing and other processes, dies and presses	Ch 19 through Sec 19.4	
Nov 5	Joining and assembly processes (welding) Mechanical assembly	Ch 28 Ch 31	
Nov 12	Electronics manufacturing Electronics packaging	Ch 33 Ch 34	Sec 27.2, 27.5
Nov 19	Numerical control and industrial robotics	Sec 37.3, 37.4	
Nov 21-23	Thanksgiving break		
Nov 26	Integrated mfg systems: production lines, Cellular mfg, flexible mfg systems Integrated mfg systems: cellular and flexible	Ch 38 Sec 38.1-4 Ch 38 sec 38.5-7	
Nov 30	Hour Quiz 3 (Friday)*		
Dec 3	Microfabrication Technologies Nanofabrication Technologies	Ch 35 Ch 36	
Dec 7	Classes End		

*Exam dates are fixed. Material on exams will depend on pace in course