ISE 215
Fundamentals of Modern Manufacturing
Fall Semester 2017
(version 1)

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Associate Dean of Undergraduate Studies, RCEAS
Packard 310 (610-758-4025)
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Teaching Assistant:  TBA
Office hours: TBA

Office Hours:  M, W, F Before or after class or by appointment in Packard 310

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


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 40 points,
depending on the number of assignments. In-class activities will be worth about 40 points. Some will be
mandatory and others will be extra credit. The project will be worth 50 points. Each student will be graded
according to the total points accumulated out of the total of approximately 600-630 points. All hour
quizzes and the final exam are closed book, but a formula sheet is allowed (see below).

Hour Quiz Policy: Three one-hour quizzes will be offered during the semester. For students who take all
three quizzes, the lowest grade will be dropped and the average of the other two quizzes will be substituted
in its place. For students who miss one quiz, the average of the other two quizzes will be counted for the
missing grade. Students missing more than one quiz must have an excused absences prior to the second
missed quiz. In these cases, an adjusted grade based on the final exam will be used as the missing quiz
grades. 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 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:

<table>
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<tr>
<th>Week</th>
<th>Topic</th>
<th>Text Reference</th>
<th>Background</th>
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| Aug 28 | 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 4  | Machining Operations                                                  | Ch 21, omit Sec 21.6, 21.7, and 21.8 |                     |
| Sep 11 | 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 18 | Fundamentals of metal casting                                          | Ch 10           | Ch 6, Sec 3.4, 4.1              |
| Sep 25 | Shaping processes for plastics                                         | Ch 13, omit Sec 13.10, 13.11, 13.12 | Ch 8, Sec 3.4  
3.5 |
| Sep 27 | Hour Quiz 1 (Wednesday)*                                               |                 |                                 |
| Oct 2  | Shaping processes for plastics                                         | Ch 13, omit Sec 13.10, 13.11, 13.12 |                     |
| Oct 9  | Rapid Prototyping and Additive Mfg  
Powder metallurgy                                                        | Ch 32  
Ch 15 | Ch 6               |
| Oct 16-17 | Pacing Break  
Oct 18Fundamentals of Metal Forming                                  | Ch 17           | Ch 6               |
| Oct 23 | Bulk deformation processes: forging, extrusion only                    | Ch 18, omit Sec 18.1, 18.4 | Sec 3.1  
18.4  |
| Oct 27 | Hour Quiz 2 (Friday)*                                                  |                 |                                 |
| Oct 30 | Sheet metalworking: cutting, bending, drawing and other processes, dies and presses | Ch 19 through Sec 19.4 |                     |
| Nov 6  | Joining and assembly processes (welding)  
Mechanical assembly                                                   | Ch 28           |                                 |
| Nov 13 | Electronics manufacturing  
Electronics packaging                                                      | Ch 33           | Sec 27.2, 27.5               |
| Nov 20 | Numerical control and industrial robotics                              | Ch 34           | Sec 37.3, 37.4               |
| Nov 22-24 | Thanksgiving break                                                                     |                 |                                 |
| Nov 27 | 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 |                     |
| Dec 1  | Hour Quiz 3 (Friday)*                                                  |                 |                                 |
| Dec 4  | Microfabrication Technologies  
Nanofabrication Technologies                                               | Ch 35           |                                 |
| Dec 8  | Classes End                                                            | Ch 36           |                                 |

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