# Homework #7 Self Selected-Guide and Possible Topics

**Purpose** Self Selected Homework lets the student explore and learn about manufacturing topics of interest to them. Choose a topic you are interested in learning about, not something which you believe may be of interest to the “Professor.”

**Assignment** A written report is used to document your work and to grade your effort. The estimated time for a self selected is 3-6 hours, 1/2 to conduct and 1/2 to document. Each Self Selected Homework assignment is 6% of the final grade, double the points of regular homework. Because it is about manufacturing, the work and report may have more of an industrial flavor than a academic flavor. The work can be a library research project, a book review, an experimental project, a tour of a manufacturing plant (see 2 below) or attending a trade show. If you know of any manufacturing related Trade Shows in our area this semester please let me know. The key requirement is that you learn about manufacturing. If asked, I will help you define the depth and breadth of your topic. Unless special permission is given, Self Selected #2 should be a different type (book review, tour, etc.) than #1.

**Report Format and Grading** Be as clear and specific as possible. The emphasis is on personal learning not on being a journalist, so please don’t read a topic and reintroduce it to the world with hype like “with this technique the \_\_\_\_\_\_\_ will be changed forever.” Examples of good past reports are posted on Canvas.

**General Format** (20 pts) Typed with a cover page (with a descriptive title, author, date, course name, and summary paragraph), a four part discussion section (details below) and if appropriate, a reference/bibliography section.

**Discussion-Main** **(**50 pts) Explain the topic so a fellow engineer can understand it, minimum one page of text.

**Discussion-Economic or Business Aspect** (10 pts) Paragraph on economic or business aspects of your topic. If there no significant economic or business aspects then a paragraph on the technical aspect.

**Discussion-Relevance for Beginning and Experienced Engineer (**10 pts) Complete the statements, “The significance of this topic for a beginning engineer is \_\_\_\_\_.” “The significance of this topic for an experienced engineer is \_\_\_\_\_\_.”

Recognizing the strengths & weaknesses of beginning vs. experienced engrs. should help you better perform in your career.

**Discussion-Learning** State what you learned in one sentence (5 pts.) and describe the learning path (5 pts.). The path may be chronological (idea, find resource, etc.) or in levels (I believed \_\_, then learned \_\_, so realized \_\_, then learned \_).

Allocation of points for amount of material, relevance, clarity, appropriate technical level

1. Outstanding: 100% of points
2. Very Good: 90% of points (expected level)
3. Good: 80% of points
4. Marginal: 70% of points
5. Unacceptable: 0-60%

**Possible Self Selected Topics *Pick a topic you are interested in. The following are only offered to help you think of a topic. You don’t have to pick a topic from this list. Some good reports from past students are given on Canvas@UD.***

**1. Past Topics**

**Manufacturing Bowling Balls**

**Bucky Balls** (nanotechnology)

**Shelf Milk** (processing & packaging so refrigerated)

**Beer Cans** (how cans made, including coatings to preserve flavor so added testing ☺)

**Beer Bottling Keg Manufacturing**

**How Crispix** (breakfast cereal) **Is Made**

**Designing a Mfg. Plant**

Mfg. of: **Jelly Beans, Ice Cream, Chewing Gum, Tires, Surfboards, Guitars, Drum Sticks, Tennis Rackets, Bicycle Helmets, Hypodermic Needles**

**E-broidery: - Textile Computing**

**PLC’s in Mfg**

**Brake Press Technology**

**Graduate Schools for Mfg.**

**Robotics in Mfg.**

**Science Behind Tire Rubber Mfg.**

**Hydroforming of Tubing**

**World of Plastic Bottle Mfg**

***Passion for Mfg.* book by Dauch**

**LIGA (x-ray lithography)**

**Simulation in Mfg. Facilities Layout**

**ISA Exhibit & Seminars; Design Show**

Tourof **TA Instruments, AMT, DuPont**

**Mfg. of PreFab Homes**

**Coordinate Measuring Machine, CMM**

**Evolution of Car Mfg.**

**Making Saddles**

**2. Plant Tour** Learn about manufacturing by taking a tour of a manufacturing plant (current, not documenting a past tour).

3 area companies give public tours: Herrs (potato chips) in Nottingham, PA, Harley-Davidson in York, PA and SnapCab in Warrington, PA gives a monthly tour on Lean Mfg. Info on these and other public tours are at http://factorytoursusa.com/Index.asp Warning –20pts if you tour Dogfish Head or Yuengling Brewing and you don’t invite me to join you ☺. If asked I’ll try to help arrange tours for groups of 3 or more students.

**3. Books on Manufacturing (not Textbooks)** *Read a book; report on a theme or message of personal interest,*

1. ***The Hunter and the Hunted*** by James Swartz, a novel, travel with Laura (Engr. & MBA) and Lou (old plant manager) as they see actual case histories and learn world class manufacturing procedures. \*\*
2. ***Car Guys vs. Bean Counters*** by Bob Lutz 2011 about stopping the dominance of the number-crunchers and giving the reins to the 'product guys'...those with vision and passion for the customers and their product or service.
3. ***Passion for Manufacturing*** by Richard Dauch who engineered the manufacturing renaissance at Chrysler. \* & \*\*
4. ***Comeback*** 1995\*\* ***Crash Course*** 2010, ***Engines of Change*** to be published, books by Paul Ingrassia about: the fall & rise of the American auto industry, the road from glory to disaster, the improvements in gas mileage of car engines
5. ***The Machine That Changed The World*** by James Womack, Daniel Jones, Daniel Roos, Rawson Associates 1990\*
6. ***Lean Thinking*** James Womack, Daniel Jones, Simon & Schuster, 1996 about Lean Manufacturing. \*
7. ***The Goal*** by Eli Goldratt, explains in a fictional novel the principle of “constraints” in manufacturing. \*\*
8. ***All I needed to Know About Manufacturing I Learned in Joe’s Garage*** by William Miller, gets good reviews \*\*

*\*available Morris Library \*\*available my office 102C Spencer*

**4. Hot Topics,** cover a facet of any one of these Topics

1. Explore advances in 3D Printing methods or materials
2. Nanotechnology/Nanofabrication (very hot research area in mfg.; making computer chips smaller, carbon nanotubes are fabricated at the molecular level; MEMS (micro-electro-mechanical, ie create motion/power), medical implantable sensors with/without pumps for delivery of drugs, nanofibers, nanoparticles, nanocomposites, big area-everyone one could do this topic and not have any repeats).
3. Explore Tesla Mfg techniques, what they did, why with lots of automation they had problems meeting quantity goals.
4. Research the use of computer simulation in Ergonomics
5. Learn how a Parts Identification System uses Bar Codes, Machine Vision, etc. to track parts thru manufacturing.
6. Research “contract manufacturing” (having a company do part or all of your mfg.) done in chip making, circuit board assembly, and sport shoes (NIKE).
7. “Machine Vision’s” applications vary from being the eyes for a robot to inspecting a product; how is a computer “taught” to recognize a part, a problem, a label or a position. Use Cognex software In-Sight to flag out of spec products.
8. Research “manufacturer recalls,” learn about their cost, the cause, ways to prevent.
9. Robots: Explore the merits and uses of Collaborative (with people) Robots or research Delta (hi speed) robots.
10. Learn more about robots from a webinar at [www.robotics.org](http://www.robotics.org) Please review topic with Dr. F. before doing; not for his approval but to assure there is a plan for this research.
11. Learn more about \_\_\_\_\_ from a webinar at \_\_\_\_\_\_\_\_\_\_\_\_\_\_ Please review topic with Dr. F. before doing to assure this is a creditable webinar and there is a plan for this research.
12. Contact ACI Technologies near Philly Airport to see if they’ll give you a show and tell on new techniques for populating a circuit board https://www.aciusa.org/manu-proto.html

**5. More Depth on A Topic Covered in Manufacturing Processes**

1. Explore CNC programming (g-code and Computer Aided Manufacturing). Please review topic with Dr. F. before doing; not for his approval but to assure there is a plan for the research.
2. The “minimum feature size” in electronic chips continues to get smaller and smaller. Research what the past obstacles were to achieving smaller feature size, how the obstacles were overcome and what the current obstacle is.
3. Investigate the work to speedup of the rate parts can be made in Additive Mfg. so it can be more of a production method.
4. Weighing of packages; how to do it accurately and quickly.
5. Learn more about Sustainable Energy or Manufacturing.
6. Build a Simulation model, see Ch. 33 System Simulation in Course Notes and Homework 9.
7. Study web coating operations-techniques and problems or investigate fluid mechanics of a web coating operation.
8. Inspect and report on web handling (and printing) at the News Journal or other printing plant.
9. Investigate web handling basics (textbook, article [sources in Chapter 22] or tour of web handling plant [NewsJournal?]).
10. Learn more about Food Processing (manufacturing) from TV Show “Unwrapped” on the Food Channel
11. Study the application of a ME Fundamental in Food Processing (or other manufacturing process)
12. Use infinite long cylinder heat transfer theory (Heisler) to determine can heating time so food is at X temp. for Y time.
13. Study and document clean room design for the pharmaceutical or microelectronic industry.
14. Investigate the Mechanical Engineer’s role in the design and/or manufacturing of medical devices.
15. Learn how new processes with lower impurities in steels the increased fatigue life of ball/roller bearings.
16. Investigate the contact pressure between a pair of contacting rolls, as in steel rolling or paper making presses.
17. Investigate the heat transfer and evaporation in paper making dryers.
18. Find out why the Auto Industry left Detroit and moved to South (what’s the basis of *Detroit South?*)
19. Investigate how simple fixtures can make low-medium quantity manual operations more labor efficient. (For example, fixtures for cutting and assembling plastic pipe for a shower chair for the handicapped.)
20. Make an ergonomic assessment of a manufacturing operation; point out insufficient operations and offer suggestions.
21. Investigate the use of PLC’s in manufacturing for sequence control (automatic controls). Use LogixPro, see Ch. 17.
22. Learn how the LabVIEW program by National Instruments can be used to control processes.
23. Investigate the work in developing lead free solder for electronic circuit boards and connectors.
24. Conduct the Deming Funnel Experiment or the Deming Red Bead Experiment (simulates how it feels to be a worker trying to make a quality product with a process which can’t produce quality and having the management blame you)
25. Investigate the mfg. issues in recycling plastics, cars, computers, paper or \_\_. (mfg., to consumer & back thru mfg.)
26. Investigate graduate schools in Manufacturing Engineering; what are the hot programs, hot schools?
27. Investigate a topic of interest from trade magazine: 3D Printing, Machine Vision, Wafer Making, Assembly, etc. )
28. How do they make aluminum beverage cans with uniform thin walls?
29. Learn how a manufacturing plant is designed (laid out) (I have some resource info from a grad student).