

Course syllabus

Spring Semester 2011

Department of Industrial Technology
University of Northern Iowa
Cedar Falls, IA 50614--0178

330:183/330:133 Fundamentals of Manufacturing Engineering (TECH 3183)

Instructor: Dr. P. Nageswara Rao
Office: ITC Rm 35
Telephone: 273 6429
Email: Posinasetti.Rao@uni.edu

CLASS SCHEDULE: Tuesday 5.00 to 7.50 p.m. Room 24, ITC

OFFICE HOURS: Wed 8:00 - 12:00 hrs. or by appointment

Course Description: Application of technical knowledge to solve industrial problems within the functional area of manufacturing engineering. Preparation for examination through the manufacturing Engineering Certification Institute (MECI). Prerequisite(s): junior standing or consent of instructor.

Required Material:

1. Philip Rufe (2002) Fundamentals of Manufacturing, Second Edition. Society of Manufacturing Engineers. Dearborn MI: SME. ISBN: 978-0872635241
2. C Mfg T/E Book of Knowledge (Download from http://www.sme.org/downloads/cert/CMfgE_BOK.pdf)

Optional Material:

1. Philip Rufe (2005) Fundamentals of Manufacturing Supplement, Society of Manufacturing Engineers. Dearborn MI: SME. ISBN: 978-0872637474
2. Philip Rufe (2006) Fundamentals of Manufacturing Workbook, Society of Manufacturing Engineers. Dearborn MI: SME. ISBN: 978-0872638457

(Get used books from Amazon.com – cheaper)

Course Objectives: This class has been designed to enable the student to achieve the following objectives:

1. Understand and proficiently utilize the fundamental components of manufacturing engineering with respect to its theoretical foundations in physics, mathematics, statistics, and engineering science.
2. Develop an in-depth understanding of the various elements of product design, management issues, strategic and tactical planning, and processes with respect to the manufacturing engineering discipline.
3. Successfully complete the Certified Manufacturing Technologists/Engineer exam offered through the Manufacturing Engineering Certification Institute division of the Society of Manufacturing Engineers.

Course Requirements:

1. Class sessions will be a combination of lecture, discussion, and review of relevant materials. Attendance is expected for all sessions.
2. Students will be expected to complete homework assignments, readings, and other tasks on time.

3. Quizzes, short exams, and the Midterm exam will be structured to simulate the Certification Exam as closely as possible. Students are expected to have a calculator, the text, class notes, and other necessary materials on hand for these exercises.
4. Students will be given to join the Society of Manufacturing Engineers at the start of the semester. This is not required, but if you plan to take the Certification Exam, the cost savings more than offset the expense of joining SME.
5. The Certification Exam is not a requirement of the course, but it is a natural culminating exercise. Students not electing to sit for the exam will have an alternative exercise during the normal time assigned for the final exam. The decision on whether to sit for the exam must be made early in the semester to facilitate applications being submitted to SME-MECI.
6. Students are also expected to research a technology and bring the information to the class to share in presentation format. Overheads, handouts, and any other materials will be part of this exercise.

Assignments are a means by which you will be able to appreciate how the principles will be applied in practice. A number of assignments are therefore included as a part of this course with substantial weightage. Each of the assignment, after completion needs to be submitted on the due date specified. No late submissions. The solutions will be posted on the eLearning in a week from the date of submission. The report should be word processed and submitted through eLearning. If there is a justifiable reason for late submission, please explain it to me well in advance so that I may consider it. Use a cover page giving the following information

- a. Name of the Course
- b. Name and number of the project
- c. Project due date
- d. To: Nageswara Rao Posinasetti
- e. From: Your name

Any submissions that do not follow the above instructions will not be evaluated.

Grading Policies:

Course grade will be based on the following components:

| | | |
|----------------------|-----|---------|
| Quizzes, short exams | 20% | 100 pts |
| Presentation | 8% | 40 pts |
| Midterm Exam | 30% | 150 pts |
| Homework | 30% | 150 pts |
| Final Exam* | 12% | 60 pts |
| Final Exam** | 12% | 150 pts |

* if MECI Certification Exam taken 450 pts.

** if standard final exam taken

Grade scale:

| Percentage range | Grade | Percentage range | Grade |
|------------------|-------|------------------|-------|
| 95 – 100 | A | 74 – 76 | C |
| 90 – 94 | A- | 70 – 73 | C- |
| 87 – 89 | B+ | 67 – 69 | D+ |
| 84 – 86 | B | 64 – 66 | D |
| 80 – 83 | B- | 60 – 63 | D- |
| 77 – 79 | C+ | < 60 | F |

Body of knowledge for the SME Examination (Effective Oct. 2010)

| | | CMfgT | CMfgE |
|----|---|-------|-------|
| 1. | Mathematics, Science, Engineering and Materials | 12% | 10% |
| 2. | Product Design | 12% | 10% |
| 3. | Manufacturing processes | 14% | 15% |
| 4. | Production Systems | 21% | 20% |
| 5. | Automation | 9% | 7% |
| 6. | Quality | 10% | 13% |
| 7. | Management | 14% | 15% |
| 8. | Personal Effectiveness | 8% | 10% |

The CMfgT exam takes three hours and consists of 130 multiple choice questions covering subjects including math, applied science, design, materials, manufacturing processes, manufacturing management, manufacturing economics, quality control, computer applications, and automation. (60% is considered as pass)

The Manufacturing Engineering Exam is a three-hour exam containing 150 multiple-choice questions. Of these questions, 110 cover a breadth of knowledge in manufacturing engineering. The other 40 questions are designed to test in-depth knowledge in one of the 4 focus areas listed below.

- **Integration & Control** — CIM, robotics, machine vision, common networks, computer systems, CAM.
- **Processes** — Electronics manufacturing, material removal, material forming, fabrication, assembly, finishing, molding, casting.
- **Support Operations** — Maintenance, material handling, scheduling, planning, management, design.
- **Management** — Quality, systems, projects, leadership, planning, staffing, organization, laws and regulations.

Professionals who earn a CMfgE demonstrate a comprehensive knowledge of manufacturing processes and practices. Pursuing a CMfgE certification requires a minimum of 8 years of combined manufacturing-related education and/or work experience, including a minimum of 4 years of work experience. A CMfgT with a minimum of 7 years manufacturing-related work experience and/or education also qualifies.

Recommended Review Books

Since the Certification Exam is an open book exam, the following are suggested material by SME (http://www.sme.org/cgi-bin/certhtml.pl?cert/cmfgep_prepare.htm&&&SME&)

- [Fundamentals of Manufacturing Workbook](#)
- [Fundamentals of Manufacturing Supplement](#)
- [Machinery's Handbook, 28th Edition](#) (Large Print Edition or Toolbox-sized)
- [Fundamentals of Tool Design](#)
- [Manufacturing Processes and Materials](#)
- [Tool and Manufacturing Engineer's Handbook \(TMEH\) Knowledge Base CD-ROM](#)

In addition the following books would be useful additions to the above in my opinion.

- Introductory Physics Text (Light, Sound, Thermodynamics, Electricity & Magnetism)
- Statics and Strengths of Materials Text
- Production and Operations Text (Heizer & Render, or Chase, Jacobs, Aquilano)
- Manufacturing Processes Text (Kalpakjian, Groover, or DeGarmo, Black, Kohser)
- Technical Mathematics

Tentative Lecture schedule:

| Week | Date | Topics | Textbook |
|-------------|-------------|--|-----------------------|
| 1 | 1/11 | Overview of the course Mathematics, Statics and Strength of Materials | Chapt. 1, 2, 6, 7, 8 |
| 2 | 1/18 | Engineering drawing, G D & T, CAD, and product design | Chapt. 16, 17, 18, 19 |
| 3 | 1/25 | Machining operations | Chapt. 20 |
| 4 | 2/1 | Machining processes | Chapt. 21, 49 |
| 5 | 2/8 | Metal forming | Chapt. 22, 23, 50 |
| 6 | 2/15 | Casting, and Welding | Chapt. 25, 26, 51 |
| 7 | 2/22 | Production planning and control | Chapt. 32 |
| 8 | 3/1 | Lean production | Chapt. 33 |
| 9 | 3/8 | Midterm Exam | |
| 10 | 3/15 | Spring break | |
| 11 | 3/22 | MM, and Process engineering | Chapt. 34, 35, 53 |
| 12 | 3/29 | Automation | Chapt. 36, 37, 38 |
| 13 | 4/5 | Robotics, Material handling | Chapt. 40, 41 |
| 14 | 4/12 | QA, SQC | Chapt. 42, 43, 54 |
| 15 | 4/19 | Presentations | |
| 16 | 4/26 | Review | |
| 17 | 5/3 | Final Exam | |

Academic dishonesty: Cheating of any kind on examinations and/or plagiarism of papers or projects is strictly prohibited. Any one caught passing off the work of others as their own (i.e., copying from a book/journal or cut and pasting from internet sources without appropriate citation) runs the risk of immediately failing the course and expulsion from the class and the University. For more institutional rules regarding academic dishonesty, please see the University catalogue on “Academic Ethics Policies” (<http://www.uni.edu/policies/301>).

Special needs: The Americans with disability Act of 1990 provides protection from illegal discrimination for qualified individuals with disabilities. Students requesting instructional accommodations due to disabilities must arrange for such accommodation through the Office of Disability Services. The ODS is located at 103 Student Services Center, and the phone number is (319) 273 2677 (<http://www.uni.edu/resources/disability>).