

Syllabus: EMC 001 Macro & Micro View of Engineering
Professors Roger Nagel and Richard Vinci

Instructors:

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Description:

This course has seven segments, progressing from the an idealized view of engineering, in which distinct disciplines are defined and straightforward methods for problem-solving exist, to a more realistic view, in which cross-disciplinary work is the norm and societal influences play a strong role in success or failure. The course concludes with a look at the emerging future of engineering, as technology enables new approaches to problem-solving and innovation.

- 1) **How Engineers Are Made.** Exposure to the education of an engineer (disciplinary similarities and differences). Overview of the main areas addressed by the most common engineering disciplines. How training and oversight differs from one discipline to the next. Which disciplines are most important to certain industries. Introduction to cross-disciplinary engineering concepts. Discussion of the “purpose of engineering”.
- 2) **The Engineering Method.** Logical thinking in the engineering context. Problem solving and tools that are used to assist. The cycle of imagination, modeling/simulation, prototyping, testing, reflection, and redesign.
- 3) **Modular Thinking.** Discussion of “previously solved problems”, the nature of engineering as a process of building on past successes, the importance of interchangeable parts, the use of engineering modules (physical or intellectual), importance of interfaces.
- 4) **Systems and Constraints.** The concept of systems being made up of modules that are themselves systems, the need to engineer systems, and their constraints. The Goal as a vehicle for seeing and understanding and engineering constraints.
- 5) **Case Studies: Engineering in the Real World.** The connections between engineering decisions/progress, the individuals that are responsible, and the influences on/from the society at the time.
- 6) **Information.** Its past, current and future influence on engineering: the use of information to enhance the efficiency and or effectiveness of other resources. Engineers use information as a substitute for other resources, or to gain time on a resource and or reduce cost. The role of information as a resource, in resource planning and in engineering based business strategies.
- 7) **Innovation.** What to do when pre-existing ideas fall short. Contrasting traditional and innovative engineering methodologies. Innovative environments and how they can be managed for high quality, rapid engineering innovation. Understanding “needs” revisited.

Specific Learning Objectives for each of the seven segments are given on separate pages. An additional set of Course Objectives integrates course material across segments. *We reserve the right to modify objectives during a segment to reflect actual course flow, but will firmly set the objectives by the end of each segment so that they are clear to everyone.*

Text:

Most readings will be handed out in class. Two books will also be required: *The Goal*, and *Code Name Ginger*. Acquisition plans will be discussed in lecture.

Attendance Requirements:

Students are expected to attend and participate in all classroom hours. Should anyone miss an assignment or an important announcement, it will be his/her responsibility to obtain the necessary information.

Homework:

Written homework assignments will be due in class unless indicated otherwise. The grade for a late assignment will be reduced by 50%. Discussion of homework problems is acceptable (and is encouraged), but plagiarism with respect to written assignments is *not*. Illegible work will be returned ungraded and will be considered late when it is resubmitted.

Reading:

Reading assignments are expected to be up-to-date to enable the student to participate in class discussions and activities. Assigned documents should therefore be read *prior* to the lecture date.

Examinations:

Two take-home examinations will be given during the semester. The final exam will be cumulative. If a student is unable to turn in a scheduled examination paper due to illness or travel, the instructors must be notified and provided with an Absence Information Report (obtained through the Office of Student Life — see Student Handbook) no later than 24 hours after the exam. If possible, notification before the exam is encouraged. Failure to provide adequate notification and an acceptable excuse will result in a grade of zero. There are no exceptions to this rule.

If you have a disability for which you are or may be requesting academic accommodations, please contact your professor and the Office of Academic Support Services, Room 212, University Center (610-758-4152) as early as possible in the semester.

Dishonest behavior during examinations will not be tolerated. This includes, but is not limited to, copying from another student, assisting another student, and using resources that are not allowed during the exam period.

Semester Project:

One semester-long project will be due in the final weeks of the term. More details will be provided in class.