COURSE CONTRACT

INSTRUCTORS

Sections	Days / Hour / Room	Instructor	Office	Campus Phone	Home Phone
ES201-01	MTRF / 8 / O167	T. Adams	Moench C-110	872-6089	478-9176
ES201-02	MTRF / 9 / O167				
ES201-03	MTRF / 8 / O169	M. Moorhead	Moench D-220	877-8829	607-342-2659
ES201-04	MTRF / 9 / O169				
ES201-05	MTRF / 5 / O167	D. Richards	Moench C-101	877-8477	232-0006
ES201-06	MTRF / 6 / O167				
ES201-07	MTRF / 5 / O267	A. White	Moench C-101A	877-8373	234-0403
ES201-08	MTRF / 6 / O267	G. Livesay	Moench D-223	877-8504	877-9741
ES201-09	MTRF / 5 / O269	P. Cornwell	Moench C-217	877-8232	466-5303
ES201-10	MTRF / 9 / O103	L. Olson	Moench D-104	877-8324	298-9876
ES201-11	MTRF / 9 / O101	C. Lui	Moench C-102	872-6998	387-8548

RESOURCES

- Textbook: D. E. Richards, ***Basic Engineering Science—A Systems, Accounting, and Modeling Approach*** (*NEW* Fall 2007 Edition) is available for purchase at the Rose-Hulman Book Store. Supplements to the textbook, including additional homework problems will be available on the course website.
- Course URL: **www.rose-hulman.edu/~richards/courses/es201/index.htm**
- Handouts distributed throughout the course will supplement the notes.
- Reference on closed reserve in the library: J. Glover, K. M. Lunsford, and J. A. Fleming, *Conservation Principles and the Structure of Engineering*, 5th Edition, McGraw-Hill College Custom Series, New York, 1995.

COURSE GOAL & CONTENT

The overall goal of this course is to help you ***begin to think like an engineer* so that you can *solve real-life engineering problems***. Specifically, this course will present a unifying framework for solving engineering problems based upon common engineering science concepts: systems, conservation and accounting principles, properties of matter, constitutive equations, and physical constraints. This framework combined with the appropriate mathematics will enable you to begin developing models that describe the behavior of real engineering systems.

Course goals have been prepared for this course and will be distributed separately. In addition, lists with specific objectives will be distributed throughout the quarter to help guide your study and monitor your progress. These lists will serve as one of your best study guides.

COURSE ACTIVITIES & PHILOSOPHY

-Mastering any new subject requires continuous effort by the learner to make sense of new ideas and concepts and to relate them to what you already know. Learning to identify, formulate, and solve problems requires diligent practice in applying a logical problem-solving methodology. Learning to solve *real-life* engineering problems also requires a willingness to deal with ambiguity and uncertainty.

None of the objectives of this course are supported by passively sitting in a classroom, listening to a lecture that repeats the assigned reading, and copying down material you were supposed to have read last night. Throughout this course, we will try to make learning an active instead of a passive process.

Studies have repeatedly shown that students learn more when they are *actively engaged* in applying new material. Educational research has also shown that *cooperative learning* is one of the most productive, although not the only, type of active learning. Active learning requires that you do things to help you learn, e.g. questioning the material, figuring out how it relates to what you already know, looking for connections, looking for differences, creating a visual outline of the material (concept mapping), outlining, paraphrasing, teaching it to a friend—in short, getting to feel like you "own" the material.

Both individual and cooperative active learning exercises will be used throughout this course. In cooperative learning, you interact with others in a small group to perform a specific task. Working with peers provides immediate feedback and support as you work together to complete the task and understand the material. In addition, working in groups teaches you social skills that will be invaluable as you move into the team-oriented world of industry.

Course activities are to two types: development and evaluation. **Development activities** will occur continuously throughout the quarter and give you opportunities to develop your skills and improve your understanding of the material. **Evaluation activities** give you opportunities to demonstrate to the instructor your understanding of and ability to apply the course material. These will occur four times during the quarter: three mid-term exams and a final exam.

DEVELOPMENT ACTIVITIES

Homework (HW): The purpose of homework is to give you an opportunity to learn and practice new skills—in short to help you learn new material. Do the homework daily and don't let it pile up. Attempt to solve all homework problems on your own *before* you discuss the problem or seek help from others. *Experience has shown that a significant benefit of doing homework comes from an independent attempt of the homework, i.e. applying your skills and knowledge with a problem statement and a blank sheet of paper.* (In hindsight, most solutions look obvious.) Hints for the homework will be provided and Solutions for most assignments will be available after they are turned in. Ask your instructor where they can be found.

Readiness assessment tests (RAT): Everyday you should come to class prepared to take a brief quiz -- a Readiness Assessment Test (RAT). A RAT will typically cover the key points of the assigned reading, key ideas from the previous lecture(s), and key concepts and definitions. Sometimes the instructor will indicate specific material for a RAT. RATs will be brief (approximately 5 minutes) and will be given at the beginning of class. Makeup RATs will not be given to latecomers or absentees.

Active Learning Exercises (ALE): Active learning exercises require you to work individually or in groups and will be used frequently in class to help you understand the course material. These activities may or may not be graded. Makeup ALEs will not be given.

COURSE EXPECTATIONS:

Work Load: This is a four-credit course. The workload for this course should average 8 to 12 hours a week outside of class. This time should be spent reading the text and notes, working problems, discussing material with your colleagues, and thinking about the material in this course. You should expect 2-4 homework problems daily.

Reading Assignments: You are expected to complete the reading assignments *before* class. In-class activities assume that you are familiar with the assigned reading material.

Homework Assignments:

- Homework problems are assigned daily and each day's homework is treated as a set. A set will typically consist of 2–4 problems. Unless you are told otherwise, you should begin work on the homework problems immediately following the class period in which they are assigned.
- Homework sets will be collected at the beginning of the class period on the days indicated in the schedule.
- Late homework will not be accepted except for medical reasons or prior arrangements with the instructor.
- See detailed Homework Guidelines for more information.

Attendance: Excused absences must be arranged in advance. The instructor reserves the right to reduce your final course grade by one letter grade for every four unexcused absences. Eight or more absences excused or unexcused may result in your failing the course. *If you miss class, it is **your** responsibility to obtain all assignments and handouts from students who were present in class*.

Final Exam: The final exam will be comprehensive. Every student is expected to be available during the Final Exam Period scheduled by the Registrar.

COURSE GRADE COMPONENTS:

Development Activities**:
- Homework Sets (HW), Readiness Assessment Tests (RAT's), and other graded activities....................... 15 %

Evaluation Activities**
- Mid-term Exams (3 x 17% each).. 51 %
- Comprehensive Final Exam.. 34 %

Total............................... 100 %

> **NOTE: **Your average grade on the Evaluation Activities must be passing to pass the course.** Performance on Development Activities will then be considered and may raise or lower your final grade.

GRADING STANDARDS:

Letter grades in this course are established by comparing your performance against an absolute standard of performance. Typically, 90% and above is an A, 80% and above is a B, and 70% and above is a C, and 60% and above is a D. A performance level below 60% will typically result in a letter grade of F.

> **You *must* earn at least a C or better in ES201 before you can take the next two courses in the Sophomore Engineering Curriculum: Fluid & Thermal Systems (ES202) and Mechanical Systems (ES204).** In the judgment of the SEC faculty, at least C-level performance in ES201 is required for satisfactory performance in ES202 and ES204.

ACADEMIC HONESTY

Any act of academic misconduct is grounds for discipline in accordance with the most recent edition of the Rose-Hulman Institute of Technology *Academic Rules and Procedures*. If in doubt, ASK! The most recent information can be found on the Registrars web page under *Academic* Rules. See Homework Guidelines for specific guidance about collaboration and the use of files.

HOMEWORK GUIDELINES

*Engineering problem solving involves both **constructing** and **documenting** a solution*. The ability to solve an engineering problem is worthless if the engineer is unable to communicate the solution to those who need it. In industry, engineering solutions are often archived and used later to troubleshoot a problem, as evidence in a lawsuit, or as the basis for a new design; thus, documenting your thought process is essential.

The following guidelines are presented to help you effectively document and communicate *both* the solution to the problem *and* the process used to obtain it. The correctness of any solution can only be judged after evaluating the solution process with its underlying assumptions.

Mechanics of Preparing Solutions

A. Format

1. Standard engineering problem paper *must* be used for all homework. (Recommended for class notes.)
2. Each homework set consists of a **cover page** followed by the homework problems arranged in the order they were assigned. Write your *name* and *campus mail box number* in the upper right-hand corner and the problem number in the upper left-hand corner of the first page of a problem. Without a campus mail box number, your homework may never make it back to you. (See Appendix A of the course text for sample formats.)
3. *Start each problem on a new page* and *use only one side of each page*. (We will not look on the backside.)
4. Multi-page solutions *must* be stapled together and have a notation on *each* page that indicates the number of pages, e.g. Page 2 of 3, or 2/3, or 2 of 3, etc. Note that many students err by trying to cram a solution onto a single page. This not only hurts the appearance but also often "cramps" your logic.
5. Each solution *must* be both legible and understandable. If you use the computer, e.g. Maple, Mathematica, Excel, or EES, to solve any part of a problem, a printout *must* be included with the solution to support your result. Computer printouts are supporting documents but are not the solution. Depending on how they are used they must be annotated appropriately so that they make sense in the context of your solution.

B. Coherence & Correctness

1. Your work must be CLEAR and COMPLETE. In particular, note the following:
   a) *Solutions must be prepared using the **problem solving format** discussed in the notes*, i.e. Known, Find, Given Data & Schematic, Analysis, and Comments. Assumptions must be explicitly stated, but may be made as appropriate in the Analysis section.
   b) *As a minimum a **schematic diagram** depicting the **physical system** should be present*. Sometimes multiple views or details may be helpful. Identify symbols to represent the important physical information.
   c) *The solution should be **worked through with symbols** as appropriate*. Typically you are actually developing a mathematical model of the physical system. Equations should be reduced to final form, i.e. the unknown isolated on one side of the equal sign, before substitution of any numbers. This will aid you in understanding the physics of the problem without getting bogged down in units.
      Students frequently carry this to extreme producing excessively long expressions. To prevent this, look for logical intermediate answers to calculate along the way. For example, you may need the mass m of gas in a tank in a long equation but the mass also depends on pressure, volume, temperature, and the ideal gas constant through the relation $m_1 = (P_1V_1)/(RT_1)$. Rather than continuing to recopy and manipulate $(P_1V_1)/(RT_1)$, use the symbol m_1 for the mass in the larger equation and do a side calculation to compute the numerical value of m_1. Then at the appropriate point in the problem insert the numerical value. This has the added benefit of giving you multiple places to check the reasonableness of your answers.
   d) *Never write the magnitude of a physical quantity without the appropriate **units.*** Experience has shown that failing to carry units along in a calculation is a major cause of mistakes. (That's also why using symbols as long as possible is a good idea.) Numerical answers reported without units are worthless and unacceptable! Unit errors are also easier to check with several intermediate answers as mentioned above instead of one long equation.
   e) *State the source of values not given or calculated*, e.g. From Table 3.1 in Textbook XYZ.
   f) *Clearly identify **intermediate** and **final answers***.

2. Check your work. In particular,
   a) check the answer for correct dimensions *and* units.
   b) evaluate the reasonableness of the trends and calculated values.
   c) try to find a "ballpark" estimate to bracket and support the correctness of your answer. (What calculation could your boss perform in thirty seconds on the back of an envelope that checks your results?)

C. Miscellaneous

1. You are encouraged to attempt every homework problem assigned. Homework problems are selected to illustrate specific points or approaches; thus, failing to attempt a problem may keep you from a key learning experience.
2. If you are unsuccessful in solving the problem, but you submit an **acceptable partial solution** you will receive a substantial part of the credit.

   An **acceptable partial solution** *must* include the following sections:

   Known

   Find,

   Given Data & Schematic

   Analysis: This section documents your solution attempt and *must* include an explicit statement or question indicating why you are stumped, e.g. what is giving you problems or what's missing that you need to know to proceed?

Getting Help with Homework[1]

A fundamental principle of academic integrity is that you must fairly represent the source of the intellectual content of work you submit for credit. ***Unless otherwise directed*, *collaboration on homework in this course is allowed as long as all sources consulted (both literature and people) are acknowledged clearly at the end of each problem.*** Failure to acknowledge the contributions of others to your homework solution will be considered cheating. Verbatim copying all or part of a solution that you submit for credit when you have not made any intellectual contribution is academically dishonest.

If you need help on the homework use the following resources:

- Get help from a classmate, but do not copy their solution. Discussion among students to understand homework problems or to prepare for exams is encouraged. Working in a group on the homework can be an excellent way to learn the material; however, do not get in the habit of letting others do the thinking for you. Do not divide up the problems, but help each other when you get stuck. Remember that every student will be individually accountable for the material on the exams.
- Get help from the instructor. Check with your instructor for office hours and availability.
- Try the Learning Center. They have Peer Tutors with experience in the Sophomore Engineering Curriculum.

[1] Adapted from the "Academic Honesty" section of *Course Facts* for Unified Engineering Course 16.010 and 16.020, Department of Aeronautics and Astronautics, Massachusetts Institute of Technology, Cambridge, MA.