

ARCE 764 -- Advanced Thermal Analysis of Buildings Fall Semester 2006

Meeting Time: TR 9:30 a.m. to 10:45 a.m.

Meeting Place: 120 Marvin Studios (MARS)

Instructor: Brian A. Rock, Ph.D., P.E., F ASHRAE
Office: 2134-D Learned Hall, 864-3603, docrock@ku.edu

Office Hours: TR 12:30 to 2:00 p.m.

Catalog Description:

Manual and computational methods for determining steady-state and transient thermal loads in buildings. Advanced analysis of energy consumption given choices in building materials and mechanical systems.

Prerequisites: ARCE 660, or consent of the instructor.

Textbook: Fundamentals volume of the ASHRAE Handbook, I-P edition, ASHRAE, 2001 or 2005; see the instructor.

References: Cooling and Heating Load Calculation Manual, a.k.a. "ASHRAE GRP-158", Rudoy and Cuba, ASHRAE, Inc., 1979.
Cooling and Heating Load Calculation Manual, 2nd ed., McQuiston and Spitler, ASHRAE, Inc., 1992.
Cooling and Heating Load Calculation Principles, Pedersen et al., ASHRAE, Inc., 1998.
Heat transfer textbook(s), e.g., Fundamentals of Heat and Mass Transfer, Incropera and DeWitt.
Various software and programming manuals.

| | | | |
|-----------------|------------------|------|-------------------|
| <i>Grading:</i> | Homework | 70% | Final Grades: |
| | Semester Project | 30% | 90% to 100%="A" |
| | | | 80% to 89.9%="B" |
| | | | 70% to 79.9%="C" |
| | | | 60% to 69.9%="D" |
| | Total = | 100% | 59.9% or less="F" |

Individual homework assignments are due one week after assignment unless otherwise stated, and will be graded on a 0 to 10 scale. Late assignments not accepted for credit. The final scores may be curved up.

Final Exam: No “exam”, but students will present their semester projects to the class and maybe others during the 7:30-10:30 a.m. Tuesday, December 12th final exam session.

Other: Students are referred to and expected to abide by the academic misconduct policies that are located in the online Timetable of Classes. Instructor’s penalties for discovered academic misconduct range from no credit given on a particular requirement to course failure.

Semester Project: Each student will research a particular topic over the semester, do a study, write a paper on it (using technical-paper style), and present his or her findings to the class.

Potential, specific topics will be discussed in class. Examples of general topics are “zero energy” buildings, foundations’ heat transfer, and optimal insulation levels. Feel free to propose an ATAB topic for your semester project, discussed in class or not, to the instructor.

Final Presentation:

Your presentation should be about 20 minutes long; have paper copies of your full presentation as handouts. An overhead projector and screen are available in the classroom if you prepare “viewfoils”. If you present with PowerPoint or other software, you’ll need to secure and setup a computer, LCD projector, etc. in advance.

The CEAE office (2150 Learned Hall) has some to check-out, but be sure to reserve the equipment well in advance of the presentation day.

Some suggestions for the organization of your presentation are:

- Title page
- Problem statement
- Description of your approach
- Results and discussion
- Conclusion and recommendations

Semester project due dates:

| | |
|----------------------------------|--------------------|
| Title & abstract | August 31, 2006 |
| Outline & reference list | September 21, 2006 |
| First paper draft (hardcopy) | November 2, 2006 |
| Final paper (hardcopy and files) | December 5, 2006 |
| Presentation | December 12, 2006 |

ARCE 764 -- Advanced Thermal Analysis of Buildings

Fall 2006 Semester

Course Objectives

Methods of teaching: lectures, examples, discussions, readings, homework, project assignments, etc.

- ☞ To continue learning the terminology and "language" of the arts and sciences that form the field of heating, ventilating, and air-conditioning engineering and energy management
- ☞ To understand and apply methods for the steady-state and transient analysis of moist air processes, ventilation, thermal loads, and energy use
- ☞ To evaluate and optimize energy consumption in buildings
- ☞ To consider the energy conservation properties of various building materials
- ☞ To perform an independent study (project) of an ATAB topic

Homework

- ☞ Be neat. Rewrite if needed.
- ☞ Use engineering paper (front side only) for calculations, graph or computer paper for graphs, and appropriate paper for drawings and computer output.
- ☞ Show all calculations, units, conversions, and references. Show a complete sample calculation for repetitive calculations.
- ☞ Box only the *final* answer for each problem. If your solution set is very lengthy, also provide a cover page that shows a summary of your results.
- ☞ Staple pages together in the upper left-hand corner.
- ☞ If less than about 12 pages, fold lengthwise and write your name on the outside. If greater than about 12 pages, leave flat.