SYLLABUS

DESCRIPTION

Lecture/discussion course on the analysis of dynamic heating and cooling requirements in buildings and building systems. The course develops the mathematical foundation for heat and mass transfer analysis using finite difference, analytical, and transfer function-based methods of analysis. Methods are developed for modeling the transient heat and mass transfer and storage in building elements, radiative exchange within buildings, ground coupling, and interactions of solar radiation with buildings. Students apply the methods using state-of-the-art dynamic building simulation programs.

ADMINISTRATION

LECTURES 9:30 – 10:45 Tuesday, Thursday
Room ECST 1B21

INSTRUCTOR Michael J. Brandemuehl
ECCE 246A, 492-8594
(In JCEM offices, above CAD Lab)
michael.brandemuehl@colorado.edu

Office Hours: 11:30 – 1:00 Tuesday
10:00 – 11:30 Wednesday

TEXT None. Handouts to be available from Webpage.

WEBPAGE http://cven.colorado.edu/classes/cven5070/

READING LIST

American Society of Heating, Refrigerating and Air Conditioning Engineers, *ASHRAE Handbooks - Fundamentals*, 1997.

Kimura, *Scientific Basis of Air Conditioning*, Applied Science Publishers, London, 1977.

McQuiston, F.C., J.D. Parker, and J. Spitler, *Heating, Ventilating, and Air Conditioning*, Wiley, 1999.

Meyers, G.E., *Analytical Methods in Conduction Heat Transfer*, McGraw-Hill, 1971.

Kuehn, T.H., J.W. Ramsey, and J.L. Threlkeld, *Thermal Environmental Engineering, Third Edition*, Prentice-Hall, 1998.

EVALUATION

Homework and class participation	25%
Simulation Exercises	20%
Final Project	25%
Exams	30%

DRAFT

DETAILED COURSE OUTLINE

	Topic	
8/29	1.	Introduction and overview of building loads
8/31	2.	Heat transfer fundamentals
9/5	3.	Finite difference analysis
9/7	4.	Introduction to analytical solutions: separation of variables
9/12	5.	Analytical solution to simple problems
9/14	6.	Superposition and Duhamel's theorem
9/19	7.	Application of superposition
9/21	8.	Introduction to Laplace transforms
9/26	9.	Laplace analysis for multi-layer walls
9/28	10.	Response factor analysis
10/3	11.	Transfer function analysis
10/10	12.	Radiative exchange in buildings
10/12	13.	Transfer function analysis with radiation
10/17	14.	Integrated load calculations
10/19	15.	ASHRAE load calculation procedures
10/24	16.	**Hour Exam**
10/26	17.	Solar and windows
10/31	18.	Fenestration calculations
11/2	19.	Ground heat transfer fundamentals
11/7	20.	ITPE method
11/9	21.	Application analysis
11/14	22.	Mass transfer and adsorption fundamentals
11/16	23.	Mass transfer in building materials
11/21	24.	Application analysis
11/28	25.	**Hour Exam**
11/30	26.	Inverse modeling methods
12/5	27.	Neural networks for building load modeling
12/7	28.	Application of neural networks
12/12	29.	Advanced topics
12/14	30.	Advanced topics