MURRAY STATE UNIVERSITY

DEPARTMENT OF INDUSTRIAL AND ENGINEERING TECHNOLOGY

Course Number: ENT 400 Credit Hours: 3

I. TITLE: *Energy Management*

II. CATALOG DESCRIPTION:

Development, distribution, use, and conservation of energy resources relative to societal applications are examined. Heat transfer within manufacturing and energy production systems and options for increasing thermodynamic and economic efficiencies are studied.

III. PURPOSE:

Energy use is vibrational. Thermo is compliant. It makes sense that in any system, in any happening, that all pieces parts can be summarized. In baseball 27 outs complete a game. In any system utilizing energy transference the total number of Btu's, ergs, dynes, kilojoules et al can be counted before and after an event. The totals are equal though the form might alter; like changing kinetic energy (movement) into potential energy (gravitational). This philosophy embodies 1st Law of Thermodynamics.

But thermo is a little weird. Are there really 27 outs in a ballgame? Suppose, Louie LeMuff is catching and he systematically drops a third strike every inning; the batter trotting safely to first base. Now officially there are 36 outs in a game. Huh? In thermo nothing, no how, no way, is truly efficient. Try as best we can from a fundamental energy base 42% is as good as efficiency gets. Where'd the other stuff go? You know the 58% that was identified by the energy balance (1st Law). Good question there. Since no one knows, we'll just blow it off. We'll do that quantitatively via 'Entropy'; a concept invented to assuage our bruised egos. And when we consider mechanical inefficiencies (friction or systematic energy absorption), even 42% is unattainable.

This doesn't sound like a good deal to me. But it's the only deal in town. Another grammatical invention (Exergy) is created to accommodate the energy truly available to use but even that goal is under-whelmed in real systems.

Oy vey.

Wait. It's getting stranger. There are also a pair of other official 'Laws'; the 3rd and 0th. The 3rd Law states that absolute zero temperature exists when all energy transference stops. I don't think anyone's absolutely been there; maybe at Poughkeepsie. It's not too useful in engineered systems since most are maintained between -40 ^{o}C and 250 ^{o}C (233-523 ^{o}K) or -40 ^{o}F and 482 ^{o}F (420-942 ^{o}R). But you may need the news for Jeopardy. And notice that -40 ^{o}C is the same as -40 ^{o}F; just another one of life's little mysteries.

The 0th Law, you'll love this one, says unequivocally, that if the recreational beverages in my fridge are 40 ^{o}F and I find that Leroy's fridge has them at 40 ^{o}F, then both are 40 ^{o}F. Okay fine, now Leroy examines Philbin's fridge and he finds that those road sodas are also 40 ^{o}F. The inescapable conclusion is that Philbin's and my frosties are at 40 ^{o}F. Assuming the obvious? You bet.

So how are we going to get a handle on this stuff? We're going to examine the energy balances of typical systems and the pieces parts thereof. We're going to examine ideal systems, semi-ideal systems and real systems and the pieces thereof. We're going to play in

the lab. We're going to do some thought experimentation; like: "what if all a system's internal energy instantaneously converted to kinetic energy?"

IV. COURSE OBJECTIVES:

ENT 400 focuses upon student understanding of 1st and 2nd thermodynamic law applications

V. CONTENT OUTLINE:

A. Systems
B. Work, Heat, Reversibility
C. 1st Law
D. Properties of Pure Substances
E. Processes
F. 2nd Law and Applications
G. Cycles
H. Energy Resources

VI. INSTRUCTIONAL ACTIVITIES:

What I'll do:
1) create PowerPoint presentations that explain Thermodynamics step by step, inch by inch. We use some in class for demonstrations but all will be available for review, ad nauseum, on the local net.

2) figure out some laboratory experiments that reinforce basic tenets.

3) provide weekly quizzes and exams, if needed, to satisfy the company's lust for quantitative evaluation.

4) talk about this stuff in lectures

What you'll do:
1) show up and pay attention.

2) review the lecture and other notes regularly

3) make a reasonable effort to understand this stuff but BE SURE TO TELL ME IF IT'S NOT COMPUTING.

4) show me, via quiz and/or exam responses that inward seepage exceeds outward leakage.

VII. FIELD, CLINICAL, AND/OR LABORATORY EXPERIENCES:

There are six to eight laboratory experiences. Or maybe there will be one grand laboratory exposition.

VIII. RESOURCES:

The environmental library Rm. 234 includes copies of previously used thermodynamics texts plus answer books. Lecture notes summaries and how to examples are available on the departmental interactive system.

IX. GRADING PROCEDURES:

Lab(s): 40 %
Tests (2) & Quizzes & Final: 60 %

Grading Scale:
90-100% A
80-89% B
70-79% C
60-69% D
Below 60% E

X. ATTENDANCE POLICY:

This course will adhere to the policy published in the MSU Undergraduate Bulletin.

You cannot learn without participation. You cannot participate if you're absent from class

XI. ACADEMIC HONESTY POLICY:

This course will adhere to the policy published in the MSU Undergraduate Bulletin.

Do and submit your own work. In life there are no B's, C's & D's. You get paid or you get fired. Dishonesty now will only get you unemployed later.

XII. TEXT AND REFERENCES:

Text: Thermodynamics Philip S. Schmidt, et al., John Wiley & Sons, copr. 2006, ISBN: 0-471-66126-0

XIII. PREREQUISITES:

Mat 230 or 250

XIV. STATEMENT OF AFFIRMATIVE ACTION AND EQUAL OPPORTUNITY:
"Murray State University endorses the intent of all federal and state laws created to prohibit discrimination. Murray State University does not discriminate on the basis of race, color, national origin, gender, sexual orientation, religion, age, veteran status, or disability in employment, admissions, or other provision of services and provides, upon request, reasonable accommodation including auxiliary aids and services necessary to afford individuals with disabilities equal access to participate in all programs and activities."