EML 4147C – Thermal Science Design and Lab

1. **Catalog Description**: 3 Credits; Thermodynamics, fluid mechanics, and heat transfer integrated with design and laboratory, including turbomachinery and heat exchanger design, phase-change heat transfer, thermodynamics of mixtures, psychometry, mass transfer, sensible heat recovery, pipe flow, turbomachinery, refrigeration, and combustion. Topics will vary from semester to semester.

2. **Pre-requisites** : *EML 3100, EML 3301C and EML 4140*

3. **Course Objective**: The objective of this course is to provide an intermediate level coverage of thermodynamic, fluid mechanic, and heat transfer topics integrated with design and laboratory experiences. This course stresses fundamental engineering science applied to thermal design and laboratory applications. Students will be exposed to open-ended thermal design topics and will be expected to communicate the design process through written and oral communication. Students are expected to gain a deeper understanding of fundamental thermal concepts via the laboratory experience. The collection procedure and analysis of experimental data will also be communicated through written reports.

4. **Contribution of course to meeting the professional component**:

4A. EML4147C supports several program outcomes in the mission statement of the Department of Mechanical and Aerospace Engineering. Specific ME program outcomes supported by this course include: (1) Applying knowledge of chemistry and calculus-based physics with depth in at least one of them (**ME Program Outcome M1, AE Program Outcome A1**); (2) Applying knowledge of advanced mathematics through multivariate calculus and differential equations(**ME Program Outcome M2, AE Program Outcome A2**); (3) Possessing ability to work professionally in both thermal and mechanical systems areas including the design and realization of such systems (**ME Program Outcome M4**)

4B. Mathematics (20%), Physical Sciences (40%), Engineering Design (30%), Social Sciences and Humanities (10%)

5. **Relationship of course to program outcomes**:

This course achieves the following ABET outcomes [note that the outcome number corresponds to the respective ABET outcomes (a) through (k). Also, note that superscripts represent related ME program outcomes]:

(a) Apply knowledge of mathematics, science, and engineering^{A1,A2,A3,A5,M1,M2,M3} **[outcome (a), high coverage, 40% of the course grade; method of assessment is lab reports and one exam**]

(b) Design and conduct experiments, as well as analyze and interpret data^{A3,M3} **[outcome (b), high coverage, 25% of the course grade; method of assessment is lab reports and design project report**]

(c) Design a system, component, or process to meet desired needs^{A4,M4}**[outcome (c), high coverage, 15% of the course grade; method of assessment is oral and written reports of design project**]

(d) Function on multi-disciplinary teams **[outcome (d), low coverage, 5% of the course grade; method of assessment is lab report and oral and written reports of design project**]

(e) Identify, formulate, and solve engineering problems^{A4,M4} **[outcome (e), low coverage, 5% of the course grade; method of assessment is lab reports and one exams**]

(g) Communicate effectively **[outcome (g), low coverage, 5% of the course grade; method of assessment is lab report and oral and written reports of design project**]

(i) Recognize the need for, and engage in life long learning **[outcome (i), low coverage, 5% of the course grade; method of assessment is several critiques of research papers in the field of experiment and design**]
(k) Use the techniques, skills, and modern engineering tools necessary for engineering practice[A4,A5,M4] **[outcome (k), low coverage, 5% of the course grade; method of assessment is lab reports and one exam**]

6. **Instructor:** Dr. John Abbitt
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   Office hours: NSB 312, see website for hours

7. **Teaching Assistants**:
   See website

8. **Meeting Times**: See departmental website

9. **Class/Laboratory Schedule**: See department website for sections and lab/pre-lab meeting

10. **Meeting Location**: See departmental website

11. **Material and Supply Fees**: $238.50

12. **Textbooks and Software Required**:
   Textbooks as required for pre-requisite courses, listed below. The UF All-Access E-Book that is available comprises the relevant chapters from these books if you do not already own them or an equivalent.

13. **Required**:
   Fundamentals of Heat and Mass Transfer, Incropera and DeWitt, a recent edition
   Fundamentals of Thermodynamics, Sonntag, Borgnakke, and Van Wylen, a recent edition
   Fundamentals of Fluid Mechanics, Munson, a recent edition

14. **Course Outline**: There will two lectures per week. On the Canvas website under "Modules", "Labs" are the topics and activities that will be covered during the laboratory sections. There is a pre-lab video and pre-lab quiz associated with each lab session that must be completed prior to performing the lab. You will have 50 minutes to perform each experiment. Therefore, it is very important you work out your protocol prior to the lab so that you can expedite the actual experiment when that time comes.

   This course also includes a design activity. The scope of the design will be assigned during the first part of the semester.

15. **Topics Covered and Class Schedule :** see Canvas site

16. **Attendance and Expectations**: It is the policy of the University of Florida that you attend all classes. Attendance will be recorded for ***all laboratory periods*** and design activities. You must complete pre-lab assessment and perform each lab to receive credit for the lab. You must perform the lab ***during your regularly scheduled period***. Re-scheduling of labs will be in accordance with the policy shown on the course website. If you do not complete the pre-lab on time, you will receive of grade of "0" for the lab.

16. **Grading** :

Pre-lab quizzes – 5%
Lab reports – 75%
Design project – 20%

Lab reports must be submitted on time to receive full credit. If a lab report is late, you will lose 10% of the total points available every 24 hours. It is OK to be late, but there is a cost associated with being late. The same policy is applied to design reports. One minute late is the same as one day late. For example, if a report is worth 100 points, you will lose 10 points per day.

17. **Grading Scale :**

94 <= A <= 100	90 <= A- < 94	(No A+)
87 <= B+ < 90	83 <= B < 87	80 <= B- < 83
77 <= C+ < 80	73 <= C < 77	70 <= C- < 73
67 <= D+ < 70	63 <= D < 67	60 <= D- <63
E < 60		

There is no rounding up or down.

19. **Honesty Policy:** All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. Typical disciplinary action would be a grade of E in the course for a first offense. A second offense (which includes other courses) would likely result in a two-semester suspension. This statement is a reminder to uphold your obligation as a UF student and to be honest in all work submitted and exams taken in this course and all others. The use of a pirated textbook is unauthorized and constitutes an honor violation.

Important: In this course, all lab reports are group lab reports. That means that all the analysis and write-up is to be the groups own individual work. Information (including data) may not be shared among groups. You may discuss lab concepts and procedures with classmates, and you may get help on how to perform an analysis, but **whatever work you turn in, ultimately must be work performed only by members of the group.** You may ***not*** share tables, graphs, spreadsheets, etc., with other groups unless specifically authorized. ***You may not refer to or use old lab reports from previous semesters in any way*** **even if you were the author. You may not refer to a lab report from the current semester unless it is your own.**

Every assignment should contain the honor pledge "On my honor, I have neither given nor received unauthorized aid in doing this assignment," and all students should sign each assignment acknowledging the honor pledge.

20. **Accommodation for Students with Disabilities:** Students Requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the course instructor when requesting accommodation. For any accommodations involving a test, arrangements must be made with the Disabilities Resource Center at least four business days prior to ***each*** test.

21. **UF Counseling Services:** Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:

- University Counseling Center, 301 Peabody Hall, 392-1575, **http://www.counsel.ufl.edu/default.asp** Personal and Career Counseling.
- SHCC mental Health, Student Health Care Center, 392-1171, Personal and Counseling.
- Center for Sexual Assault/Abuse Recovery and Education (CARE), Student Health Care Center, 392-1161, sexual assault counseling.
- Career Resource Center, Reitz Union, 392-1601, career development assistance and counseling.
- Alachua County Crisis Center - (352) 264-6789.

22. **Software Use:** All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

23. **Class Demeanor:** Class is started on time. On many occasions, notes have already been placed on the board to expedite starting on time. Students are expected to be on time or early. Engineers are expected to be on time for meetings and you are expected to be on time for classes. Turn off cell phones, etc. before coming into class.