EGR 2500: Introduction to Thermal Engineering
Syllabus
Winter 2018

Instructor: C. J. Kobus
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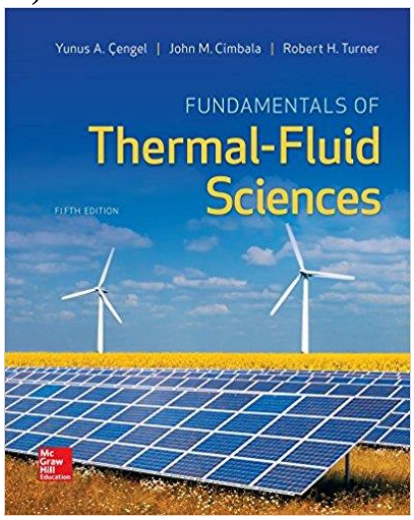
Office Hours:
10:00am-12:00pm T R
301H EC
or by appointment
and/or online via email

Teaching Assistant: TBD
Email: TBD
Office: TBD
Office hours: TBD

Class Times:
T R 8:00-9:47am, 254 EC
T 10:30am-12:30 pm, 356 EC (lab only)
W 2:45-4:45pm, 356 EC (lab only)

Catalog Course Description:
Introduction to the fundamentals of classical thermodynamics and heat transfer; first and second laws of thermodynamics; thermodynamic property relationships; application to engineering systems and processes; introduction to conduction, convection and radiation; steady 1-D conduction and extended surfaces; lumped capacitance method. Offered fall and winter. *Satisfies the university general education requirement in the natural science and technology knowledge exploration area. (Formerly EGR 250)*
Prerequisite(s): (CHM 143 or CHM 1430) or (CHM 144 or CHM 1440) or (CHM 157)], (PHY 161 or PHY 1610) or (PHY 151 or PHY 1510), and (EGR 141 or 1400)
Corequisite(s): (APM 255 or APM 2555)



Text:
Fundamentals of Thermal-Fluid Sciences, 5th edition
ISBN-13: 978-0078027680
ISBN-10: 0078027683

Course Objectives: By the end of the course, you should be able to do the following:

1. List and describe relevant thermodynamic terminology related to thermodynamic systems and properties. Demonstrate proficiency in performing unit conversions. (a)
2. Design and perform experiments. Formulate, evaluate and calculate experimental uncertainties of indirect measurements. Analyze experimental data and write technical reports. (b, d, f, g, i, k)
3. Interpret thermodynamic property tables and graphs. Calculate property values, and apply to various thermodynamic systems and equations of state. (a, e)
4. Explain and apply the First Law of Thermodynamics (Conservation of Energy Principle) and the Conservation of Mass Principle to model a variety of open and closed thermodynamic

systems, such as nozzles, turbines, throttling valves, heat exchangers, refrigeration systems, vapor cycle power plants. (a, e, k)

5. Explain and apply the Second Law of Thermodynamics to a variety of thermodynamic processes and to model a variety of open and closed thermodynamic systems. Describe its implications and influences. (a, e, k)
6. Describe the physical mechanisms associated with the three fundamental heat transfer modes. (a)
7. Apply the concepts of one-dimensional steady conduction to the solution of problems involving plane, curved and composite walls; use the thermal resistance concept to model and solve thermal network problems (a, e, k)
8. Evaluate the steady rate of heat transfer, efficiency and effectiveness of finned surfaces (a, e, k)
9. Formulate and apply the lumped capacitance method for the solution of transient heat transfer problems. (a, e, k)

Labs:

The laboratory has been developed and is taught in accordance with the fundamental philosophy that it should be integrated into, and be part of the lecture material. There will be approximately six one-week laboratory assignments. Emphasis will be placed on writing quality technical reports. All lab reports will be submitted in electronic format (MS Word) by email. The spreadsheet (MS Excel) must accompany the report.

The files ought to be labeled by class, lab and last names. For instance, for lab one both the Word and Excel files ought to be labeled "EGR 2500 Lab1 Howard Fine Besser."

The final exam will contain questions pertaining to the labs. How one does on this portion of the final exam will determine a weighting factor for your lab average. Note: the obtaining of past laboratory write-ups for the purpose of artificially inflating your lab average is considered cheating[1]. Furthermore, doing so will invariably hurt your final grade (see the section on grading).

Students will form teams of not less than three and no more than four students (get the sign-up sheet here). One member will serve as the team leader for that particular lab. Each member of the team must be the team leader at least once. The team leader is responsible for getting the team together to perform the following tasks: run the experiment, put the report together in electronic

[1] **:** Students are expected to read, understand and comply with the Academic Conduct Policy of Oakland University, as explained at http://www.oakland.edu/?id=1610&sid=75. Violations will be taken before the Academic Conduct Committee. Students found guilty of academic misconduct in this course will receive a grade of 0.0 in addition to any penalties imposed by the Academic Conduct Committee. The latest version of the Academic Conduct Committee's procedures is in the Dean's office. Note that Dr. Kobus takes violations of the Academic Conduct Policy extremely seriously! Students caught, for example, cheating on lab reports (by copying from old lab reports), misusing technology (Google glasses, cell phones, tablets, etc), or communicating with each other during a test if a proctor happens to step out of the room, will be dealt with aggressively. A student caught helping another student cheat (for e.g., by allowing him/her to copy off an exam) will dealt with just as aggressively as the student caught cheating.

Please note that the use of cell phones, text messaging and laptops is not allowed in this class unless you receive a special dispensation from the instructor.

format and write the abstract at the end. It is the team leader's responsibility to submit the lab on time. Lab reports (in electronic format) are due the beginning of the class period on the due date. Late reports may be accepted conditional on the group giving an adequate explanation of the circumstances prior to the lab being due.

Individual assessments for team laboratories. All students will be required to submit evaluations of how well they and their teammates performed as team members. These evaluations will be incorporated into the assignment of lab grades via a weighting factor that will range from 0 to approximately 110%.

If repeated efforts to improve team functioning (including faculty intervention) fail, a non-participant may be fired by unanimous consent of the rest of the team, and a team member doing essentially all the work may quit. Individuals who quit or are fired must find a team of three unanimously willing to accept them.

Quizzes and Exams:
There will be an approximately 13 20-30 minute quizzes at the beginning of class on the 2nd class of the week, and a comprehensive final exam. All testing will be closed book, closed-note, with no calculators allowed. Note: Professor Kobus does not reuse old exams, but students are discouraged from obtaining them. Furthermore, doing so may hurt your final grade (see the section on grading).

For makeup quizzes, you MUST contact the instructor (NOT the TA) prior to the quiz or exam and with a valid reason. Otherwise a makeup will not be granted. All makeup quizzes MUST be completed within a week or the grade will automatically turn into a 0. At the instructors discretion, the makeup may be given orally rather than written.

Homework:
Homework will be assigned on a regular basis. They will be collected, graded randomly, and only on a sampling basis (not all individual homework will be collected). Due date for individual homework is 2 class periods from when the homework was assigned. The due date for individual homework does not mean that it will be collected on that day. It means that it may be collected on that date at the earliest, or any date after (therefore, always bring all homework to class with you. "I didn't bring it with me" is not an acceptable excuse)

Use good paper (no scrap), one side of each page, and box or underline the final answers (or feel free to type these out in MS Word). Each completed assignment should be in first-person handwriting. Make a copy of all homework solutions. Dr. Kobus may retain homework sets turned in to him for purposes of assessment.

Late homework. Solution sets will be accepted up to two days after the due date. Late assignments (any that come in after the beginning of the period on the due date) will receive a maximum grade of 50%. However, once you hand in several late assignments, they will no longer be accepted.

Grading:
Quiz and lab averages (QA and LA, respectively) are equally levied. Lab questions will be asked on the final exam (FEX). A students' score on the lab portion of the final exam will determine a weighting factor on the lab average (FLWF), usually a maximum of ±15%. Homework counts for a half of the quiz average. The final exam grade (FEX) counts for 2 times the sum of the lab and quiz averages, unless the final exam score is outside of approximately[2] 10% of the quiz average, in which case the final exam grade counts for 3 times the sum of the lab and quiz averages. The purpose of this weighting factor is two-fold. First, those students doing well on their quizzes cannot let up at the end of the semester. Second, and perhaps of even more importance, those students who may have 'blanked' on a quiz or two can more than recover on the final by improving on those problem areas.

$$Score = \frac{\frac{1}{2}HW + QA + (FLWF)(PE)LA + (2\ or\ 3)FEX}{\frac{1}{2} + 1 + 1 + (2\ or\ 3)}$$

In general (IT DEPENDS ON THIS CLASS AVERAGE WHICH IS NOT KNOWN UNTIL ALL SCORES ARE IN),

85%+ = 4.0
75% = 3.5
65% = 3.0
55% = 2.5
50% = 2.0
Less than 50% = 0.0

Those students artificially inflating their quiz and lab averages by any means will most certainly have a final exam score 10% or more below their quiz average. Therefore, it will hurt the final grade. Obviously, don't do it!

Professor Kobus reserves the right to change any students' grade (slightly) based on class participation (such as finding online resources to be used as supplements to lecture material), use of office hours, participation in on-line activities, participation in extra credit activities (during course time), etc.

Note: A total grade of **50% or less** is not considered passing in this class and will be assigned a 0.0.

[2] Typical range is about 10-15% depending on a number of factors, and is at the discretion of the instructor. Students who meet this requirement on the positive end will have the weighting factor set to whatever yields the best average, in case a higher weighting factor lowers the score (it is possible depending on the various other grade averages).

Extra Credit:
From time to time, I will announce extra credit opportunities, which include volunteering for special events like K-12 STEM field trip days, events taking place on campus, working on ideas for new homework problems, finding supplemental information online for topics in this course, etc.

Please note that you are NOT required to do extra credit, and not volunteering for these opportunities will not hurt your grade whatsoever. Extra credit gets tacked onto the grade at the very end and does not even get computed in averages used to generate a class curve. Extra credit can only help and will not hurt anyone's grade.

After the semester is over and final grades are put into the system, extra credit can no longer be given. This is firm with no exceptions.

Email Policy:
I will return email on the same day during normal business hours. Weekends will be more hit and miss.

When writing an email, put the course – EGR 2500 – in the subject line along with other pertinent information. Address me professionally, and always sign off with your name so I know who you are.

Additional topics:
By request I may do short lectures on current events and new technology as it develops. Interested students are encouraged to ask me for such as they see fit.

Course Credit
This is a 4-credit course, where 3 credits are assigned for 'science' (meaning you will be learning new theory) and 1 credit for 'design' (learning to apply the theory). Throughout Academia, each credit means something. Per credit, there is a certain amount of time you have to spend in class, thus our class schedule that often ends on odd minutes. But also, there is an expectation to time outside of class. Per credit hour, you are expected to spend 3 hours outside of class per week. So for 4 credits, that totals 12 hours per week for homework, studying and for this class, lab time. (between class and out of class time, you can count and see why 12 credits establishes a student as 'full time')

Program Outcomes: ABET 3(a-k)

(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environ., social, political, ethical, health, safety, manufactured ability, sustainability
(d) an ability to function on multi-disciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global economical, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice